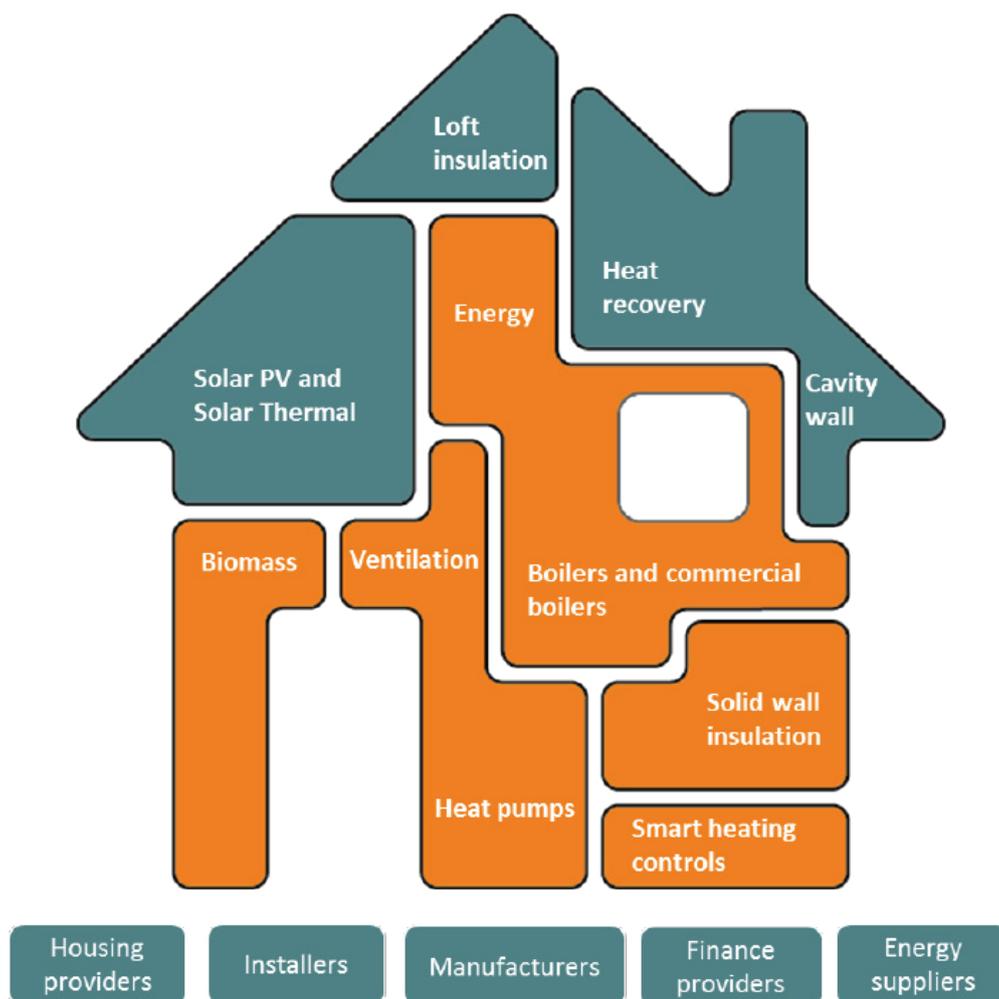




Member Case Studies





The Sustainable Energy Association is technology agnostic, taking a whole house and whole heating system approach which does not favour one technology over another, but rather focuses on the right solution. We promote holistic 'fabric first' approaches to developing energy policy. Our membership includes energy suppliers, housing and finance providers and manufacturers, distributors, retailers and regulators of a range of products including energy saving measures, heating systems, controls and insulation.

We engage in the development of long term policy, which gives directional certainty for investors and drives market change. This case study brochure outlines a range of projects delivered by our members across a breadth of property types and across various tenures.

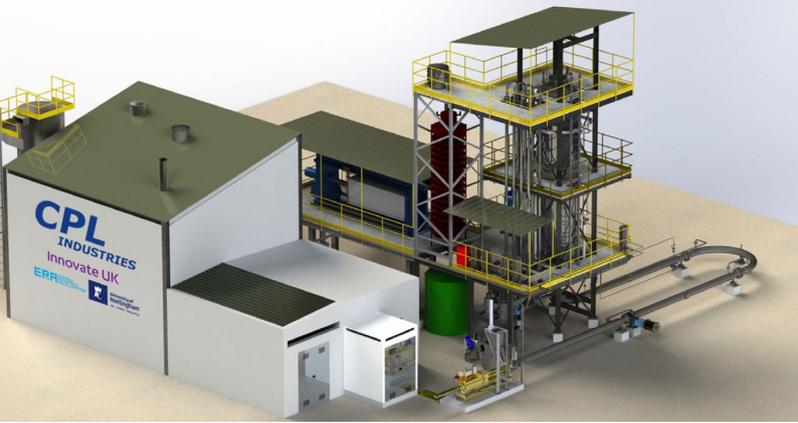
If you would like further information on any of the case studies included in this document or would like to see further examples of our members' work, please contact us:

Samantha Crichton E: samantha.crichton@sustainableenergyassociation.com

Lesley Rudd E: lesley.rudd@sustainableenergyassociation.com

Sustainable Energy Association | www.sustainableenergyassociation.com

E: info@sustainableenergyassociation.com | T: 0121 709 7740



**LOCATION: IMMINGHAM,
LINCOLNSHIRE**



THE PROJECT

Hydrothermal Carbonisation (HTC) is an advanced conversion technology that processes high-moisture content biomass at moderate temperatures and high pressures to create a drop-in replacement fuel for coal. The process effectively mimics the natural process of coal formation in a matter of hours to produce a high-quality fuel.

CPL's new HTC unit in Immingham, Lincolnshire, is the UK's first commercial-scale example of this technology which uses liquid phase torrefaction and can process a wide range of biomass feedstocks. CPL has invested £1.8 million to construct the plant which will ultimately reduce emissions from homes and help minimise avoidable landfill waste.

PROJECT:

**BIOMASS SOLID FUEL CONVERTED
FROM ORGANIC WASTE**

PREVIOUS FUEL:

COAL

TECHNOLOGIES:

HYDROTHERMAL CARBONISATION (HTC)	✓
BIOMASS	✓

SPECIFICATION

Coal is the most commonly used solid fuel in the UK, even though the implications of fossil fuel burning is well documented. Using CPL's advanced conversion technology products allows consumers to continue burning a solid fuel, but from a waste source instead of a fossil fuel.

This provides a low-carbon solution for those homes that are not connected to the gas-grid and are using a solid-fuel as their main heating fuel, as well as for those who use solid fuel in secondary appliances (e.g. multi-fuel stoves, log burners and open fires) – secondary appliances are estimated to burn 2 million tonnes of solid fuel a year alone.

With the arrival of a commercial-scale HTC unit, UK consumers will be able to purchase a biofuel replacement for their fossil fuel burner, without the need for a costly heating system to be retrofitted.

BENEFITS

The high calorific value of the fuel created from CPL's process means that it can be used in a range of applications as a drop-in replacement for coal.

The process uses organic waste materials, serving as a cost effective, hygienic form of waste management that also contributes to reducing the UK's Greenhouse Gas emissions.

The capacity of the current Immingham unit is scalable once there is enough demand, and it may eventually help support a systematic shift away from fossil fuel burning.



LOCATION: DUMFRIES



THE PROJECT

When Chris Kirk, his wife and two children moved into the 126m² Cargenbridge house, they wanted the space it offered – compared to their old home – but not its outdated and inefficient electric storage radiators and the immersion heater hot water system.

The family opted for a Daikin Altherma Hybrid heat pump. Developed to meet the need for gas boiler replacement, the Daikin Altherma Hybrid is an efficient and advanced new heating solution for customers replacing mains gas or LPG combi boilers. As one of the first Daikin Altherma Hybrid installations, the Kirks' was included in an independent metering and monitoring project in the 11 months to 31 March 2015.

PROPERTY:

THREE BEDROOMS
SEMI-DETACHED FAMILY HOME
SIZE: 126m²

PREVIOUS FUEL:

ELECTRIC STORAGE HEATERS AND IMMERSION HOT WATER SYSTEM

TECHNOLOGIES:

- HYBRID AIR SOURCE HEAT PUMP** ✓
- HEAT EMITTERS** ✓
- COMBI BOILER** ✓
- HEATING CONTROLS** ✓
- GAS GRID CONNECTION** ✓

SPECIFICATION

An 8kW Daikin Altherma Hybrid system with the air-to-water heat pump was installed at the side of the Kirk's house, and the combi boiler with combined Hydrobox, wall mounted in a utility room. Previously not on the gas grid, the house was connected to supply the combi boiler.

New radiators were fitted throughout and the redundant domestic hot water tank was removed to provide additional space. The new system has a design flow temperature of 50°C at -3.4°C.

BENEFITS

Results of the monitoring project show the heat pump achieved an annual Seasonal Performance Factor of 4.0 and was able to provide 80% of the space heating requirements – 8,448kWh of the 10,610kWh total. Primary energy efficiency of the whole system was 131%. Running costs for space heating were £292 – against an estimated £405 if only a gas boiler was used instead. This translates to a running cost saving of 28%.

In addition to blending renewable energy with intelligent use of natural gas, the Daikin Altherma Hybrid uses smart logic that automatically selects the most energy efficient and cost-effective mode of operation, based on the user's energy tariff.



"It was an old heating and hot water system, due for replacement. The heat was patchy and you could only ever run half a bath. We were always cold: wanted a gas central heating system, like we'd had before. With the Hybrid you don't have to feed it fuel – it just sits there and does its job for you. It's all computerised and works in the background to give us constant heating throughout the house, and keep the costs down." Chris Kirk, owner



**LOCATION: ROWINGTON,
WARWICKSHIRE**



THE PROJECT

Amy bought her first house in 2004, a two-bedroom, ex-local authority, end of terrace property in the picturesque hamlet of Rowington, Warwickshire. The property was off the gas grid and heated using manual electric night storage heater technology which is around 30 years old, as well as an open fire.

After 11 years in the house, and despite having replaced the open fire with a solid-fuel stove, Amy and her husband Saleem researched how they could further reduce heating bills in the 1960s property, which also suffers heat loss due to poor insulation. Amy replaced one of the three storage heaters with a Dimplex Quantum heater, added a further Quantum heater to the kitchen, and also added a Dimplex Q-Rad electric radiator in the hallway.

PROPERTY:

**TWO BEDROOMS
EX-LOCAL AUTHORITY
END OF TERRACE**

PREVIOUS FUEL:

**MANUAL ELECTRIC NIGHT STORAGE HEATERS
AND OPEN FIRE**

TECHNOLOGIES USED:

**DIMPLEX QUANTUM STORAGE HEATERS ✓
Q-RAD ELECTRIC RADIATOR ✓**

SPECIFICATION

The Dimplex Quantum system draws energy during cheaper, off-peak periods and offers controllable heat on demand, with an intelligent controller which monitors the user's heating habits and provides easy operation. It was combined with the Dimplex Q-Rad electric radiator, which offers direct acting heat and includes a self-learning algorithm with delayed start feature so the heaters calculate when they need to start heating in order to reach the user defined target temperature, at a specified time. Together, they provide an intelligent, future-proof heating system which is already compatible with smart meters.

BENEFITS

Partially upgrading a system of manual electric storage heaters to a combination of Dimplex Quantum and Q-Rad heaters is all it took for homeowner Amy Ahmed-Dolphin to cut her heating bills by more than £500 per year – and improve comfort and controllability too.

Chris Stammers, product marketing director for Dimplex, said: "Mrs Ahmed-Dolphin's experience shows the opportunity for homeowners, private landlords and social housing providers to upgrade manual storage heaters with Dimplex Quantum, which is categorised as a high heat retention heater – the only product to be recognised in this category in SAP 2012 specification criteria."



"The results were instantaneous. From the very first time we turned the Dimplex heaters on, we could see the benefits they delivered. We have greater control, we're no longer relying on supplementary heaters in the evening and the house is far more comfortable, even in the coldest days of winter. At the point we upgraded the heating system, we were paying an average direct debit of £119 per month to the energy company. Now, we've dropped to an average of less than £73 per month. That's a saving of more than £500 across the year – and on those calculations we're expecting the upgrade to pay for itself in around five years." Amy Ahmed-Dolphin, owner



LOCATION: FLINTSHIRE, WALES



THE PROJECT

Blue Lab, EDF Energy's innovation accelerator, has partnered with Flintshire County Council and Warmer Energy Services to develop an effective and sustainable replacement for off-gas heating systems, which provide affordable heat and comfort for vulnerable tenants.

It's estimated over 1m UK households use electric storage heaters and another 1m use other fuel types for heating rather than gas. Affordability is a chief concern for tenants occupying social housing and those in off-gas properties have few options for affordable heat, most coming with significant disadvantages.

In line with our commitment to Energy Company Obligation, EDF Energy is undertaking several consumer trials through Blue Lab, in relation to solar PV, battery storage, electric heat and electric vehicles. We are creating opportunities for start-ups to help develop and shape ideas into a reality.

PROPERTY:

29 OFF-GAS SOCIAL HOUSING PROPERTIES
MIXED TENANTS

PREVIOUS FUEL:

MIX OF ECLECTIC STORAGE HEATERS AND OIL BOILERS

TECHNOLOGIES USED:

CAVITY AND LOFT INSULATION	✓
SOLAR PV	✓
SOLAR BATTERY STORAGE	✓
AIR SOURCE HEAT PUMP	✓
ENVIRONMENTAL SENSORS	✓

SPECIFICATION

In 24 of the 29 properties, night storage heaters have been replaced with the new system at an estimated cost of £15,800 per property. All installations have been provided and installed at no cost to the occupant.

Solar PV and battery storage power the heat pump in a low cost, low carbon way. In addition to powering the pump, it is estimated up to 70% of the household's electricity will come from solar energy, significantly reducing their energy bills.

The battery allows for unused solar energy to be stored to run the heat pump in the evening and benefits the grid by shifting load away from peak time.

Sensors will be used to measure the health of the environment, which will help us to understand if we can help maintain home air quality.

BENEFITS

Tenants will have freedom to move away from Economy 7 tariffs, giving them a cheaper daytime tariff for general usage. A heat pump can produce three units of useful heat for every unit of electricity, making it cheaper than a storage heater on Economy 7. Unlike storage heaters, heat pumps can be used at any time of the day.

Each property will be eligible for a combined Feed-in Tariff and Renewable Heat Incentive of £10,800 over the 20 year lifetime of the project.



"The whole system's very good. I would think we're going to save a quarter (on our energy bill) It's a definite improvement. The main problem with storage heaters was you didn't have any control over it at all." – Mr Davies, Gwaenesor



**LOCATION: WEST MIDLANDS - UK
CENTRAL HS2 INTERCHANGE STATION
CAR PARKS**



THE PROJECT

Due to the increase in demand for Electric Vehicles (EVs) and consequently charging points, high-density car parks are moving towards becoming MW-scale battery storage facilities. Vehicle to grid (V2G) technology enables two-way charge and discharge of energy that is stored in EV batteries, this enables it to be exported to help manage electricity demands at peak times. Egnida undertook a study to identify best practice in monitoring and control of the charging demand from connected EVs on the local network. Constraints on the local electricity network at the new HS2 Birmingham Interchange could limit the number of EV charging points that can be connected to the local network without significant investment in additional infrastructure. The project also aimed to identify any other barriers to the deployment of large-scale EV charging within car parks.

PROJECT:

LARGE-SCALE EV CHARGING

TECHNOLOGIES USED:

ELECTRIC VEHICLES	✓
SMART NETWORK MANAGEMENT	✓
VEHICLE TO GRID	✓

SPECIFICATION

Net-Form was an in-house smart network management algorithm developed by Egnida to control electricity flows within a large-scale car park of electric vehicles.

Egnida's modelling demonstrated how Vehicle to Grid technology can be combined with demand side management in order to reduce the peak loads on the local electricity network while still meeting consumer requirements. Through this they were able to evaluate the impact of the proposed architecture and solution on real data and grid networks, using a variety of established data handling practices.

Car parks of between 300 and 3000 spaces were modelled, including a 22kW EV charger for each space. Without smart management beyond 1000 spaces would prove prohibitively expensive.

Peak electricity import from the grid was reduced by over 70% when utilising the Net-Form algorithm, this offers significant cost savings in terms of the required infrastructure and potentially lower costs to consumers.

BENEFITS

The benefits are stakeholder-wide: For car park operators, Net-Form could offer the opportunity to unlock additional revenue streams through demand side response (DSR) a significant USP that could help attract additional trade and improve occupancy. For EV drivers, the new revenue streams available to car park operators may allow parking spaces to be provided at very competitive rates, or free of charge whilst still charging their vehicle battery. For Energy System Operators, Net-form could help with grid balancing, and also manage network capacity by reducing or avoiding costly reinforcement upgrades. Where energy balancing is concerned suppliers can boost profits by utilising the energy from vehicle batteries at the correct time and passing this saving on to consumers.



"The project has been successfully completed with a good output achieved. The end result was a good understanding of the market needs in this fast-moving sector. Insights into the tipping point reached in the economics of charging point numbers are especially powerful." – Innovate UK Monitoring Officer



**LOCATION: TARBOLTON,
SOUTH AYRSHIRE**



THE PROJECT

The Tenant originally had a solid fuel back boiler which was extremely uneconomical and required fuel 365 days of the year for hot water purposes which incurred increased energy costs. The Tenant is also asthmatic and he commented that the soot and smoke was making his asthma worse on a daily basis.

The Local Council and Tenant agreed that a more reliable and cost effective method for Heating and Hot Water was required to provide a more comfortable heating experience.

PROPERTY:

2 BEDROOM GROUND FLOOR FLAT

LOCAL AUTHORITY

PREVIOUS FUEL:

SOLID FUEL BACK BOILER

TECHNOLOGIES USED:

EHC 9KW COMET ELECTRIC BOILER	✓
150LITRE INDIRECT HOT WATER CYLINDER	✓
ELECTRONIC PROGRAMMER AND ROOM THERMOSTAT	✓

SPECIFICATION

An EHC 9kW Comet Electric Boiler was installed which is a fully modulating appliance to provide both Heating and Hot Water via our Neptune 150Litre Indirect Stainless Steel Cylinder which stores Hot Water to provide on demand use at any time. A 2 Channel Programmer for separate Heating and Hot Water control and a Room Thermostat was also installed.

BENEFITS

Upgrading Mark's old system of solid fuel back boiler to the Electric Heating Company's Comet Boiler drastically cut his bills from £50+ per week down to an average of less than £25 per week which represents a saving of 50% whilst offering greater control and a better all-round heating experience.



"My old solid fuel back boiler often broke down which left us with no heating or hot water. I suffer from asthma and the smoke and fumes from the solid fuel fire aggravated this to an extent where I never felt comfortable in my own home. Straightaway I noticed the health benefits with the new EHC Comet Boiler as my health has improved. I found paying for coal and electric expensive as I required coal all year round. My costs now with electric only are much cheaper."
Mark Harden, Tenant



LOCATION: WATTON, SOUTH NORFOLK



THE PROJECT

Orchard Close consists of 30 flats built in 1986 and owned by Flagship Homes. The flats are fully occupied by tenants, many of whom are elderly.

All had electric storage heaters, which were ineffective and expensive to run. Hot water was provided by electric immersion. Energy costs for heating and hot water were very high. Fearful of big bills, many tenants were inadequately heating their homes. Heating maintenance could be challenging as residents were frequently out when Flagship engineers called.

Flagship Homes are committed to continual improvement in energy use and carbon emissions. Stuart Longbottom, Strategic Director for Asset Management at Flagship explained: "Ground source heat pumps are a low maintenance, sustainable way of heating our homes which are a fantastic solution for our customers."

PROPERTY:

30 SOCIAL HOUSING FLATS, BUILT IN 1986

HOUSES, BUNGALOWS, TWO-STORY FLATS AND MAISONNETTES.

PREVIOUS FUEL:

ELECTRIC STORAGE HEATERS

TECHNOLOGIES USED:

- 2 X 60KW GSHP ✓
- THERMAL STORE ✓
- HEAT METERS ✓
- HEAT INTERFACE UNITS (HIU) ✓
- RADIATORS ✓

SPECIFICATION

Finn Geotherm undertook a precise flat-by-flat heat loss assessment resulting in a 76kW requirement. To deliver this, they installed two Lampoassa Eli60 60kW ground source heat pumps linked to a 2000 litre thermal store. These were located within an external, insulated plant room. The heat pumps were connected to a 1600m bore hole array.

Heat was distributed via an underground insulated ring main, linked to individual heat interface units in each flat. The HIU delivered all heating and domestic hot water. Individual heat meters allowed each flat to be billed for the heat they used. The system was linked to the internet enabling remote monitoring and control.

All tenants retained heating and hot water during installation. There is no sign in the close of either the bore hole array or ring main having been installed. The entire system was delivered within the original proposed budget and the agreed 8-week timeframe.

BENEFITS

Heating and hot water costs are approximately 25% of the previous level (COP approx. 4:1). The flats can be fully heated without big bills removing the challenge of fuel poverty and delivering associated benefits such as positive impacts on health through a reduction in damp and improved air quality and a three quarters reduction in heating and hot water emissions. The installation qualifies for the Commercial Renewable Heat Incentive (RHI) and the project is expected to payback in less than 10 years. The installation cost per flat is approximately half that of individual air source heat pumps. Having one central plant room has slashed maintenance costs and tenants are not disturbed for servicing. The cost savings and RHI will enable Flagship to invest in similar energy and carbon saving schemes.



"Our home is constantly warm throughout and I have been very impressed with its performance." - resident "I can't speak highly enough of the heat pump system and the service we received." - Matt Smith, Contracts Manager at Flagship Homes



LOCATION: JERSEY



THE PROJECT

This family home in Jersey shows that creating a dream, energy-efficient property, doesn't have to mean compromising on sustainable principles. Through the use of the Kingspan TEK® Building System, the dated, poorly insulated bungalow has been transformed into a modern, 3-bedroom home which meets the requirements of the Passivhaus EnerPHit Standard.

The retrofit work on Les Jardin de Bas includes a sizeable extension and a new roofspace to create room for attic bedrooms, both fabricated from the Kingspan TEK® Building System. Despite the extensive works, little of the original building has gone to waste, with tiles and blockwork crushed to form hardcore, and timbers re-used within the extension.

PROPERTY:

1960s 3-BEDROOM, BUNGALOW

TECHNOLOGIES USED:

SOLAR PV / THERMAL	✓
EXTERNAL SOLID WALL INSULATION	✓
TRIPLE GLAZED WINDOWS AND DOORS	✓
ROOF INSULATION	✓
MVHR	✓
AIR SOURCE HEAT PUMP	✓
SOLAR PANELS	✓

SPECIFICATION

The Kingspan Insulation products used in this build were:

- The Kingspan TEK® Building System panels installed above the new and existing walls to form a pitched roof, achieving a U-value of 0.18W/m²k, along with 50mm thickness of Kingspan Kooltherm® K5 External Wall Board, breather membrane, slate roof tiles then airtight tape and plasterboard on timber battens.
- Kingspan TEK® Building System was also used to form the body of dormer windows.
- The existing walls were retrofitted with a layer of external insulation with a render finish. The same combination of materials for the roof was used on the new external walls. Resultant U-value for the external walls is 0.16 W/m².k.
- Tripled glazed windows and doors
- A Passivhaus certified MVHR unit was installed for a constant flow of fresh air
- Solar panels and air source heat pump were installed to generate hot water
- Electric towel heaters and a small wood burning stove are the only other sources of heat within the house.

BENEFITS

Air tightness within the property is 1 m³/hr/m² at 50 Pa.

The occupants have reported their energy bills are only just over £100 a month.



LOCATION: BOSTON, LINCOLNSHIRE



THE PROJECT

Boston Mayflower, a housing association in Lincolnshire, wanted to improve the energy efficiency of around 50 of its semi-detached and terraced homes. As well as lowering energy bills, it was important that any works could be carried out with minimal disruption to residents.

Boston Mayflower decided to use Knauf Insulation's Supafil® Party Wall, a Glass Mineral Blowing Wool insulation, designed specifically for use in separating party walls. Supafil® Party Wall is non-combustible, with a Euroclass A1 Reaction to Fire classification. It offers excellent thermal and acoustic performance, and is manufactured with up to 80% recycled content.

PROPERTY:

SEMI-DETACHED AND TERRACED HOUSING ASSOCIATION HOMES (50 PROPERTIES)

TECHNOLOGIES USED:

PARTY WALL INSULATION ✓

SPECIFICATION

Field tests have proven that heat is lost when party cavity walls are uninsulated. This is due to a phenomenon known as party-wall thermal bypass, which occurs when cold air enters the uninsulated cavity at exposed edges. The cavity creates a chimney effect and the cold air rises as it is warmed by heat conducted through the eaves of the party wall from the adjoining homes. It then escapes from the cavity to the external environment.

Knauf Insulation's Supafil® Party Wall insulation has been independently proven to eliminate the air movement that causes party-wall bypass without compromising on acoustic performance. The insulation is manufactured with a blue colour, for easy on-site identification and to promote compliance with Robust Details - a means of satisfying the sound insulation requirements of the building regulations.

BENEFITS

The energy efficiency of 50 homes has been improved, reducing their carbon footprint.

Residents are benefitting from reduced energy bills and warmer, more comfortable environments.

Boston Mayflower has improved the quality of its housing stock.



"When we heard about the benefits of Supafil® Party Wall insulation and how it reduced heat loss between two properties, we knew that it would be a great fit for our homes and would allow our current and future tenants to live comfortably in a warm house with lower bills." Paul Benton, Property Investment Manager, Boston Mayflower



LOCATION: MALDON DISTRICT, ESSEX



THE PROJECT

Salvation Army Housing Association (Saha) owns and manages over 3,500 homes across England. When a mixture of 35 flats and houses in Brewers Yard, Southminster, in the Maldon district of Essex required an upgrade, TSG Building Services were appointed as a result of a competitive tender to install new Air Source Heat Pumps heating systems to replace the existing electric heating systems.

PROPERTY:

SOCIAL HOUSING

MIX OF 35 FLATS AND HOUSES

PREVIOUS FUEL:

ELECTRIC SYSTEM

TECHNOLOGIES USED:

AIR SOURCE HEAT PUMPS	✓
HOT WATER CYLINDERS	✓
HEATING CONTROLS	✓
HEAT EMITTERS	✓

SPECIFICATION

TSG recommended the Ecodan air source heat pump system from Mitsubishi Electric, with units installed ranging from 5kW to 8.5kW depending on the property size, along with pre-plumbed cylinders.

Ecodan is designed for retro-fitting making it suitable for almost any property. It can even work alongside existing heating systems in a hybrid situation deciding when it is most efficient to use the renewable heating.

BENEFITS

Saha is committed to upgrading expensive to run heating systems with ones that are more energy efficient and therefore comparatively cheaper to run. Residents have realised lower energy bills and are benefiting from warmer, more comfortable homes. In addition, the carbon footprint associated with these homes has been significantly reduced.



"We believe in working together with our residents, so we can help combat high energy costs and alleviate fuel poverty. We've already had good feedback from a customer satisfaction questionnaire in regards to savings on their energy bills in comparison to their previous electric heating systems as well as the increased thermal comfort of their homes," added Mr Sitton, Capital Projects Manager, Saha "Of course there is also the added benefit of being able to attract regular payments from the Renewable Heat Incentive."



LOCATION: OUTWELL, NORFOLK



**Natural
Building
Technologies**

THE PROJECT

Natural Building Technologies were asked to provide insulation materials for a number of affordable homes in the village of Outwell. Hastoe Housing Association were approached by the local district council to develop 15 affordable homes to passive house standard.

John Lefever of Hastoe commented on the affordability of the properties “We have to charge what’s called affordable rents, which are slightly higher than the old social rents. So our board took the view – is there any way we can offset this? The obvious way forward is to deliver something that will ensure that [residents] fuel costs are much lower than normal. Hence passive house.”

The project was initiated with a people first approach. Thinking about the needs of the inhabitants, the materials were chosen in response.

PROPERTY:

AFFORDABLE HOMES

NEW BUILD

PASSIVEHAUS

TECHNOLOGIES USED:

BIOMASS	✓
GAS BOILERS	✓
INSULATION	✓

SPECIFICATION

Natural Building Technology’s Pavatex wood fibre insulation was selected for use in the project, with 100mm of Pavatherm-Plus installed over a 140mm deep insulated timber frame. The thermal performance of building envelopes are primarily based on three main factors: U-values, airtightness and Y-values. The latter two can be improved at no cost to reduce the U-value requirement and wall thickness, eventually reducing overall cost.

The insulation was installed both within and over the timber frame to ensure thermal continuity through the immediate floor zones. Wrapping the timber frame with woodfibre not only provides better U-values but also minimises thermal bridging at floor junctions, around windows and at other similar junctions where insulating between the frame is impossible.

BENEFITS

The properties achieved EPC ratings of B83-B86 with average space heating demands of 9 kWh/m² per year. Primary energy use was around 105 kWh/m² year. The homes achieved an average Airtightness Level (at 50 Pascals) of 0.57 ACH. The homes benefited from low U values with the walls, roof and floor achieving U-values of 0.137 W/m²K, 0.105 W/m²K, and 0.17 W/m²K respectively.



“The way we approached it was to keep it as simple as we can, use tried and tested products and material, keep the building footprints as tight as they could be to meet the housing association requirements and not put lots of fancy bolt-ons on”- David Thompson, Architects Ingleton Wood



LOCATION: NOTTINGHAMSHIRE



THE PROJECT

Nottingham Community Housing Association (NCHA) is one of the largest locally-based housing groups in the East Midlands, managing over 8,900 homes and housing more than 15,000 tenants in Nottinghamshire,

NCHA was awarded a charitable grant of over £350,000 to deliver an innovative energy project which will help tackle fuel poverty in 74 properties across Nottinghamshire. The funding came from Technical Innovation Fund (Health and Innovation Programme), designed and administered by National Energy Action, the national fuel poverty charity.

PROPERTY:

74 SOCIAL HOUSING

PREVIOUS FUEL:

ELECTRIC

TECHNOLOGIES:

HIGH HEAT RETENTION	✓
SMART STORAGE HEATERS	
VOLTAGE OPTIMISATION	✓
HIGH HEAT RETENTION HOT WATER CYLINDERS	✓
LED LIGHTING	✓

SPECIFICATION

NCHA is committed to upgrading existing homes to improve the energy efficiency and help reduce fuel bills for residents. The introduction of High Heat Retention, Smart Storage Heaters alongside further complimentary energy saving measures such as Voltage Optimisation; High Heat Retention Hot Water Cylinders; LED Lighting; alongside tenant training and tariff switching services and guidance is helping to change the habits of tenants, resulting in even further savings.

The work was completed at the end of September 2016 and the results will be fully evaluated in a two-year monitoring programme to demonstrate the impact it has had.

BENEFITS

The project is expected to reduce tenant energy bills and incite tenant behavioural change. Through this project the average EPC rating of the properties has increased with over 90% now rated EPC band C.

NCHA completed the work by end of September 2016 and the results will then be fully evaluated in a two-year monitoring programme to demonstrate the impact it has had.



"The new storage heaters are much easier to use, gave heat when I needed it." - Mrs Theideman, North Nottinghamshire

"The heaters are brilliant and like the ease of use with the controls" - Mr Snell, Newark

"The heaters are a lot better than the old ones, a lot more controllable, can use them on a timer and are cheaper than the previous electric storage heaters" - Mrs Holland, Nottingham

"The heaters can be set at a warm temperature of 21 degrees, they are brilliant, more controllable than the old storage heaters. Can get the heat when and where need it" - Mr Brookes, North Nottinghamshire



**LOCATION: WHITEMORE,
CONGLETON, CHESHIRE**



THE PROJECT

The four bedroom, detached property was built around 20 years ago in a semi-rural location. The property offers spacious family accommodation boasting two bathrooms. It is of typical brick construction with cavity wall insulation. Using an LPG heating system, the homeowners energy bills were almost £2500 per annum. With high energy bills and low hot water pressure, the family began looking for alternative energy solutions.

PROPERTY:

SEMI-RURAL RESIDENTIAL

PREVIOUS FUEL:

LIQUID PETROLEUM GAS (LPG)

TECHNOLOGIES USED:

AIR SOURCE HEAT PUMP	✓
CONTROLS	✓
WATER CYLINDER	✓
BUFFER TANK	✓

SPECIFICATION

NIBE VIP installers were able to make substantial beneficial changes to the property efficiently, using a variety of their clean technologies:

- NIBE F2040 (12kW) air source heat pump
- A NIBE Megacoil was installed compatible with the F2040 in order to improve the hot water pressure
- SMO NIBE Controller
- 7 year warranty on all NIBE Equipment
- Solar panels were also installed so the hot water cylinder could be removed

BENEFITS

Considerable cost savings have been made by the family. Energy bills are predicted to be less than half compared to the LPG system, Feed in Tariffs for 20 years will reduce this even further and Renewable Heat Incentive (RHI) payments from the Government are as estimated at £1400 per annum. The RHI payments and savings from no longer purchasing LPG will see a payback period for the heat pump of just 4 years.

The carbon footprint and EPC of property are now improved significantly, helping to tackle climate change as well as improving family life. For example, the family benefited from more space where the old boiler and tank were situated, improved hot water service with better pressure.



"We opted for the NIBE system due to the positive reviews it receives and it being a tried and tested system. Our home can be a shining example to other LPG and oil users who want, or need, to reduce their energy bills and also to those who wish to have heating and hot water provided by a renewable energy source. The Air Source Heat Pump system is easily retro-fitted to existing properties with the minimum of fuss and disruption and we found the benefits were reaped immediately – piping hot water, powerful water pressure for showers and, from our smart meter, a daily cost reduction on our energy costs." Keith Brooks, homeowner



LOCATION: BARROW-IN-FURNESS



THE PROJECT

The Maritime buildings were built to accommodate railway line workers but over time they fell into disrepair and were expensive to heat so the buildings required a complete internal refurbishment and upgrade. In 2014 the main contractor and operator, Cenergist, secured planning permission to convert the 320 tenement flats into 318 new apartments, and to install a biomass and back-up gas communal heating system to provide affordable, low carbon heating to the development.

npower was able to provide funding under the government’s Energy Company Obligation scheme to part finance the retrofit of two new, low carbon, biomass and gas community heating systems to replace the old, high-cost electric heating.

PROPERTY:

BARROW-IN-FURNESS

PREVIOUS FUEL:

ELECTRIC SYSTEM

TECHNOLOGIES:

- COMMUNITY HEATING ✓
- BIOMASS ✓
- HEAT INTERCHANGE UNITS ✓
- GAS INFRASTRUCTURE ✓
- ELECTRICITY METERS ✓

SPECIFICATION

npower installed new low carbon heating systems in each apartment. Each heating system included a Heat Interchange Unit, fitting into a space no bigger than a typical domestic gas boiler, as well as the connecting pipeworks. npower also replaced a number of missing and damaged electricity meters in the buildings.

Previously off the mains gas national network, npower also installed new gas infrastructure for the development, and is now supplying the gas used to provide back-up power to the plant.

BENEFITS

Completed in late 2015, the Maritime Apartments provide tenants with more controllable and affordable low carbon heating. In addition, the project has played an important role in bringing these historic buildings back to life and contributing to the regeneration of the area.

In terms of environmental impact, the redevelopment has resulted in a significant reduction in lifetime carbon emissions of 70,000 tonnes.



“This has been a fantastic project to be involved in. We’ve worked with our partners to totally transform the buildings and delivered real benefits for the environment and the local community.”
Mark Brough, Head of Community Energy Solutions at npower



**LOCATION: GERRARDS CROSS,
BUCKINGHAMSHIRE**

FEEL
GOOD
INSIDE



THE PROJECT

Developer Mentmore Homes have built two five-bedroom houses in Gerrards Cross, Buckinghamshire, which are valued at £2.5million each. The walls required an insulation panel that achieved better U-values whilst maintaining traditional cavity widths. Eurowall +, manufactured by Recticel Insulation, proved the ideal solution.

PROPERTY CHARACTERISTICS:

NEW BUILD RESIDENTIAL

TECHNOLOGIES USED:

WALL INSULATION



SPECIFICATION

Eurowall+ is a premium, high performance full fill insulation board with precision cut tongue and groove joints on all four sides, ensuring boards lock tightly together. This minimises heat loss through thermal bridging.

- Guarantees increased protection against wind-driven rain
- 75mm, 90mm, 115mm and 140mm thick insulation boards
- Leaves space for bricklayers to use conventional installation techniques
- Can achieve a U-value of 0.18 Wm²K in 100 mm cavities
- Lightweight board and easy to cut, handle and install

BENEFITS

The end-user will benefit from living in a property that exceeds building regulations in terms of thermal performance. The insulation plays a crucial part in the overall specification meaning it plays its part in a well-considered construction that is industry leading in terms of residential build.



"We wanted to make the properties as energy-efficient as possible. To make this happen, the best place to start is the insulation. Specifying Eurowall + meant we didn't have to increase the size of the wall cavity and lose space inside the properties. The panel's interlocking feature was another reason for its specification because it slots together so easily and will remain solid and airtight. We required a high-quality product for this extremely high-profile project - Eurowall + didn't disappoint." Nicholas Peck, Mentmore Homes



**LOCATION: HOBART AND PITCAIRN,
NOTTINGHAM**



Showersave®

THE PROJECT

The aim of the project was to design 35 homes that delivered a high specification of fabric efficiency merged with economic use of hot water, ensuring that there was minimal wasted energy.

Showersave, albeit only one element of the overall build, has contributed towards achieving the project objectives. Showersave effectively acts as insulation for the drain and is a simple, passive and cost-effective technology ideal for projects aimed at reducing energy and maintenance costs.

Showersave is widely used by UK house builders and is an ideal solution for the build to rent market as no product maintenance is required for the life of the building.

PROPERTY:

NEW BUILD 35 HOMES

TECHNOLOGIES:

**WASTE WATER HEAT
RECOVERY SYSTEM**



SPECIFICATION

Showersave was specified by Blueprint for the following reasons:

- Showersave is recognised by BRE in SAP
- Low cost and therefore a hugely competitive £ per point in SAP
- Offers developer a cheaper alternative to Mechanical Ventilation and Heat Recovery, Solar PV or Triple glazing, yet achieves similar carbon and energy savings.
- Showersave remains one of the most cost-effective solutions to achieve the new demands of Part L 2013
- Customers benefit from reduced heating costs
- Showersave is a “fit and forget” technology, lasting the life of the building and requires zero maintenance

BENEFITS

The 35 homes designed by Blueprint are now sold and occupied. Over the last 12 months the owners have seen utility bills that most of us could only dream of. Typically, the average gas bill on these family homes is coming in at less than £30 per month, with some homes nearer to £15 per month.



“Our objective was to build a quality family environment, which was competitively priced to own and run. The inclusion of Showersave has helped greatly in achieving this” Rachel Hopwell, Blueprint



**LOCATION: CHESHAM,
BUCKINGHAMSHIRE**

Your insulation team
Superglass

The PROJECT

Highfield is a new ultra-low carbon detached rural dwelling. The previous property was highly inefficient with solid walls, no insulation and a 30-year-old boiler achieving a SAP rating of <30 (Band F). This 180sqm 3-bed dormer bungalow property incurred high annual energy costs, which led the consumer to seek a more efficient and cost effective ultra-low carbon solution.

Owner, Richard Hurd had a genuine interest in building a house that used the latest low carbon technology to minimise energy usage. The aim was to build a home that looked like a traditional house from the outside, but was modern and contemporary inside and did not cost any more than a normal build.

PROPERTY:

ULTRA-LOW CARBON

PREVIOUS FUEL:

**MANUAL ELECTRIC NIGHT STORAGE HEATERS
AND OPEN FIRE**

TECHNOLOGIES USED:

- MINERAL WOOL INSULATION** ✓
- MVHR** ✓
- EARTH DUCT** ✓
- SOLAR THERMAL PANELS** ✓
- WOOD BURNER** ✓
- ECONOMY 7 IMMERSION HEATER** ✓

SPECIFICATION

The design solution involves a mixture of efficient integrated heating and insulation solutions to negate the need for traditional boilers for space heating. A fabric first approach was taken, minimising the cost and complexity of the energy systems. Extremely low design U-values were achieved in the walls and ceilings due to the innovative twin-wall construction and Superglass mineral wool batt insulation combination.

Solar thermal panels and a wood burner charge a heat store in the summer and winter respectively, topped up overnight by an Economy 7 immersion heater to maintain optimum operating conditions and sufficient heat in the store for both hot water and space heating. The system is further optimised using a highly efficient mechanical ventilation and heat recovery (MVHR) system linked to a passive Earth Duct, which pre-warms (winter) & pre-cools (summer) the property's incoming supply air.

BENEFITS

Incurring costs of £3,500 in oil to heat and over £1,000 in electricity per annum, the previous property was expensive to heat. Highfield is a larger property; it has 4 bedrooms, 3 floors, and covers 330sqm. Despite the increase in size, electricity usage totals approximately £925 per annum and £560 in wood logs – that's a saving of over £3,000 per annum on energy costs.

The property scored an Environmental Impact rating of 95 (A) and an Energy Efficiency rating of 84 (B) compared to the previous property's rating of less than 30. Coventry University have undertaken a 3-year study as part of a Government funded project to monitor the property and consider how the property performed against design attributes. The study showed that performance U-values were above design values. Data is available on request regarding the heat production, electricity use, MVHR and Earth Duct performance, water consumption and internal conditions.



"The home meets our family's needs, it is efficient, looks great externally & internally, feels fresh at all times, has no draughts, and has a pretty constant temperature throughout the year. Also, it is very cheap to run." Richard Hurd, owner Highfield



LOCATION: SHROPSHIRE



THE PROJECT

Bromford is a social enterprise dedicated to providing housing and housing support services.

In 2017, Bromford refurbished a number of properties across two sites in Shropshire, as part of a trial scheme to tackle fuel poverty for residents.

Vaillant worked closely with long-standing partner J Tomlinson and a comprehensive assessment and viability works were carried out on several heating products to source the best solution for the project.

PROPERTY:

15 SOCIAL HOUSING
PROPERTIES BUILT DURING
THE LATE 1980-90S

PREVIOUS FUEL:

ELECTRIC STORAGE HEATING

TECHNOLOGIES:

GROUND SOURCE HEAT PUMP ✓
HEAT PUMP CYLINDERS ✓

SPECIFICATION

With no gas available, a communal Ground Source Heat Pump scheme was suggested to replace the inefficient electric storage heating system.

The Vaillant geoTHERM mini ground source heat pumps were deemed the most sustainable and cost-efficient option for these properties. Ground source heat pumps use thermal energy from the ground via boreholes approximately 110m deep.

The energy extracted from the boreholes is then passed through the compressor of the geoTHERM mini and turned into efficient heating and hot water for 15 properties. Each property was fitted with an individual heat pump and a new, wet central heating system. Three properties feed from one shared collector, known as a Micro District ground source heat pump system for maximised efficiency.

BENEFITS

The new, highly efficient system will help the residents to significantly reduce their heating bills and their social landlord, Bromford, will also be eligible for RHI payments for 20 years on a deemed tariff.

Feedback from Bromford and the occupiers has been very positive, with one customer already reporting savings of 42% in comparison to last year's energy bills.

The success of the scheme has led to plans to extend it to another 12 properties earmarked for geoTHERM mini installation.



"Integrating renewable solutions within our housing portfolio addresses fuel poverty issues for our customers by offering a more affordable and efficient way to heat their homes. Vaillant were excellent in working with our customers to address any questions they had, as well as providing a demonstration vehicle that helped to show the heat pump in action. This was much better than just a leaflet for them to read" Nigel Gosling, Senior Contracts Manager at Bromford



LOCATION: CAMBUSLANG, GLASGOW



THE PROJECT

Previously using electric storage heaters exclusively, the residents of West Whitlawburn were suffering from high heating and hot water bills across the estate. Situated in the bottom five per cent band of the Scottish Index of Multiple Deprivation, the West Whitlawburn Housing Co-operative (WWHC) faced a challenge in implementing a cheaper, more sustainable fuel source.

Initially, the WWHC invested £22.4 million to improve the energy efficiency of these buildings, work which included cladding, insulation, new windows and re-roofing as well as enclosing exposed balconies in six high-rise blocks. The project, part funded through the Warm Homes Fund, involved the construction of a new energy centre.

PROPERTY:

HOUSING CO-OPERATIVE

432 FLATS IN SIX TOWER BLOCKS

11 LOW RISE FLATS

14 TENEMENT CLOSES

PREVIOUS FUEL:

ELECTRIC STORAGE HEATERS

TECHNOLOGIES USED:

BIOMASS	✓
LOW TEMPERATURE GAS BOILERS	✓
COMMUNAL THERMAL STORE	✓

SPECIFICATION

The new energy centre contains a 740 kW Pyrotec biomass boiler and 50,000 litre thermal store. The system burns woodchips or pellets at up to 92% efficiency and is fed via an automated charging screw from an underground store beneath the energy centre. Due to the combustion manager within the boiler, a greater variety of wood fuel can be used to heat the system.

The energy from the fuel is transferred from the thermal store to each property via a network of insulated underground pipes. This heats each unit's individual heating system, comprising of a heat exchanger, radiators and hot water tank.

The West Whitlawburn scheme also uses three 1300 kW Vitoplex low temperature gas boilers to provide backup heat, providing a highly resilient system. With wide water galleries and large water content, the Vitoplex boilers require no minimum flow rate, and cater for both high and low energy demands from the estate.

BENEFITS

This large scheme, completed in December 2014, is expected to bring hundreds of residents out of fuel poverty, with an expected saving of 20% on heating and hot water bills compared to the previous system. The Community project will save 1600 tonnes of CO₂ each year, equating to 48,600 tonnes of CO₂ over its 30 year lifespan.



"The new biomass district heating scheme is a true community energy project. We are delighted to be making a real difference to the West Whitlawburn Community." Stephanie Marshall, Deputy Director of West Whitlawburn Housing Co-operative



LOCATION: WARWICKSHIRE



THE PROJECT

Warwick District Council working with Windhager were successful in a bid sponsored by government for funding aimed at rural homes with no access to natural gas. They were awarded a grant of £118,000 which was invested into the installation of approximately 25 biomass heating systems. The Windhager biomass boilers provide whole house heating and hot water to each individual property.

The award represented 50% of the total cost of the proposed installations and has benefited up to 25 tenants currently living in rural properties, which previously were being heated through solid fuel back boilers or electric storage heaters having no access to natural gas.

PROPERTY:

25 SEMI-DETACHED HOMES

BUILT AROUND 1948

POORLY INSULATED CAVITY WALLS
(15MM)

PREVIOUS FUEL:

PARTIAL COAL HEATING / ELECTRIC
STORAGE HEATERS

TECHNOLOGIES:

BIOMASS	✓
HEAT EMITTERS	✓
CENTRAL HEATING SYSTEM	✓
HEATING CONTROLS	✓
COMMUNAL THERMAL STORE	✓

SPECIFICATION

The VarioWIN is a practical complete solution, as well as being a pellet boiler it also includes a feed system and pellet store all under one shell. It has a 12kw output and provides all the heat and hot water for the property.

The VarioWIN works even more efficiently with low heating demand properties, making it the ideal solution for energy efficient homes.

BENEFITS

With an approximate heating demand of 17,000 kWh, the previous annual fuel cost for these homes was estimated to be £1,044. The wood pellet biomass boilers have reduced the annual fuel costs by around £344, a saving of 30%. Tenants previously had to top up their coal heating systems twice daily in the winter and regularly empty the ashes - a time-consuming task. The homes now have full central heating systems and are all fitted with mains-fed hot water cylinders, this means that all rooms are efficiently heated and tenants can now run hot showers.



"We are absolutely over the moon with the new biomass system. Our house is so much warmer and we no longer dread going into a cold bathroom. Our system was installed two days before Christmas and in the first month we have made a £60 saving on our energy bill. I have been recommending it to all my friends" commented A Resident from Rising Lane.



For more information on these case studies please contact:

Samantha Crichton E: samantha.crichton@sustainableenergyassociation.com

Lesley Rudd E: lesley.rudd@sustainableenergyassociation.com

Jessica Ralston E: Jessica.Ralston@sustainableenergyassociation.com

Sustainable Energy Association | www.sustainableenergyassociation.com

Radcliffe House, Blenheim Court, Solihull, B91 2AA

E: info@sustainableenergyassociation.com | T: 0121 709 7740