

# HEALTH & INNOVATION PROGRAMME



# TECHNICAL INNOVATION FUND

INTERIM REPORT (PUBLISHED SEPTEMBER 2017)





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## Foreword

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For over 35 years, NEA has been working to ensure everyone can afford to live in a warm, dry home. There remains around 4 million households living in fuel poverty across the UK and we need to innovate and bring new resources to retrofit our most energy inefficient homes. The current heating and insulations measures being deployed under government-mandated schemes are making a real difference to the affordability of energy and contribute to our national Carbon Budget targets. But there are new products entering the market that have the potential to address harder-to-treat properties and that have wider social and environmental benefits that have so far had limited application and evaluation in the social housing sector.

Our track record in trialling a range of insulation and heating products over the past 15 years made us confident that we could take on a substantial new technical innovation programme when the opportunity arose. In 2015 we had this opportunity and were able to design a programme that would help stimulate innovation in the delivery of retrofit programmes to tackle fuel poverty.

The Technical Innovation Fund has been ground-breaking because it enabled us to get an insight into how many new technologies can help households in vulnerable situations to reduce their energy bills and improve the comfort of their homes. Whilst there was a strong element of performance monitoring of the

products installed under this programme, all of the technologies were deemed market ready and were already in or entering the 'able to pay' market. The focus for us was their suitability as measures to tackle fuel poverty and usability for more vulnerable households. The programme was not designed purely as a technical research project, as the majority of the funding was for the capital measures installed, but we have learned a great deal about the products and how fuel poor households are able to maximise their potential benefits.

We are incredibly proud of the positive impacts that this programme has had and we are extremely grateful to our funders and for the efforts of our dedicated partners in making this happen. I hope that by sharing the insights from all the projects we supported under the Technical Innovation Fund programme we will help to inform future energy efficiency and fuel poverty policies and programmes. It is clear that we need to reduce demand for heat and power as we work towards our decarbonisation goals. It is also clear that we need to take all households along this journey and provide additional support to those who are most vulnerable. Innovation in product performance must be accompanied by innovation in the services we provide to maximise their impacts for all users.

**Jenny Saunders OBE, DCL**  
**Chief Executive, NEA**





## Foreword

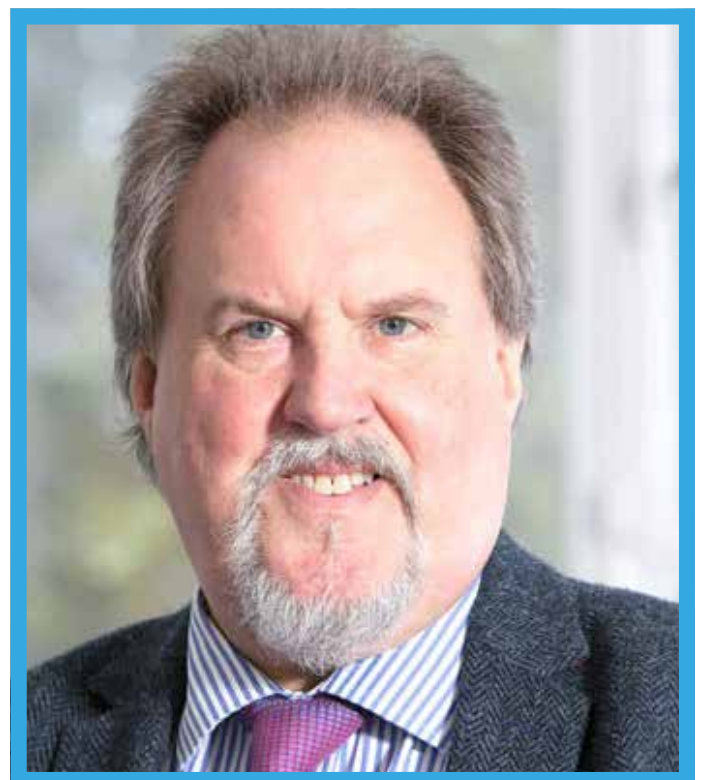
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NEA's Technical Innovation Fund provided us with a unique opportunity to trial new innovative technologies aimed at improving the warmth and affordability of energy for people on low incomes. The programme was designed to inform and drive the sea change in ambition and attitudes required to achieve an equitable, low cost, low carbon energy economy. A diverse range of technologies were involved, including insulation systems, heating controls, battery storage and heat pumps, to name a few.

Trials of this scale naturally come with challenges but the combined commitment from NEA and our partners ensured the end result for householders was very positive and we have some new insights into the potential for many of the products in alleviating fuel poverty. This impact report provides a summary of the overall outcomes which should help inform future programme design and delivery.

I would like to congratulate NEA and partners involved in delivery of the Technical Innovation Fund in making this a very successful programme.

**Chris Underwood, Professor at Northumbria University,  
NEA trustee and Chair of the Technical Oversight Group**



# Executive Summary

**NEA is the national charity seeking to end fuel poverty.**

**We work across England, Wales and Northern Ireland and with our sister charity Energy Action Scotland, to ensure that everyone can afford to live in a warm, dry home. In partnership with central and local government, fuel utilities, housing providers, consumer groups and voluntary organisations, we undertake a range of activities to address the causes and treat the symptoms of fuel poverty. Our work encompasses all aspects of fuel poverty, but in particular emphasises the importance of greater investment in domestic energy efficiency.**

The **Technical Innovation Fund (TIF)** is part of a wider £26.2 million **Health and Innovation Programme (HIP)** launched in April 2015 with the aim of bringing affordable warmth to over 6,500 fuel poor and vulnerable households in England, Scotland and Wales. The HIP programme comprised three distinct funds:

- A **Warm Zones Fund**, which has enabled the installation of heating and insulation measures, managed and delivered by NEA's not-for-profit subsidiary Warm Zones CIC, and operating in England, Scotland and Wales.
- A **Warm and Healthy Homes Fund**, which built on guidance and new quality standards issued by the National Institute for Health and Care Excellence (NICE) for addressing excess winter deaths and the health risks associated with cold homes. NEA partnered with local delivery partners to effectively target support to those in most need. This Fund featured three elements:

The **Partnerships programme**, which awarded **eleven** health and housing partnerships across England and Wales with grants to provide households most at risk of fuel poverty and cold-related illness with heating and/or insulation measures.

The **Small Measures programme** which awarded **eight** home improvement agencies across England and Wales with a charitable grant fund to install a range of low cost energy efficiency interventions.

NEA's sister charity **Energy Action Scotland (EAS)** was awarded a grant to manage a programme of high value and lower cost interventions across **three** fuel poor areas in Scotland: the Western Isles, the Orkney Islands and Glasgow.

- A **Technical Innovation Fund**, to investigate the impact on fuel poverty of a range of innovative technologies in households in England and Wales, using measures that would not traditionally be within the scope of current mandated schemes.

## Background

NEA believes that there is huge potential for new technologies to provide solutions for some of the 4 million UK households currently living in fuel poverty, particularly those residing in properties which have traditionally been considered too difficult or expensive to include in mandated fuel poverty and energy efficiency schemes. There has been a lack of the robust monitoring and evaluation needed to understand the application of these technologies and assess their suitability for inclusion in programmes such as the Energy Company Obligation (ECO) and other publicly funded programmes across the UK.

## What we did

Through TIF, NEA provided charitable grants to help install a range of innovative technologies. Up to £5.1 million was made available to meet the capital and installation cost of high cost (large) and low cost (small) in-home measures in fuel poor and vulnerable households across England and Wales, with the aim of reducing the cost of heating their homes and addressing the underlying causes and symptoms of fuel poverty.

Applications for grant funding under this programme were invited from:

- **Local authorities**
- **Housing associations**
- **Charities**
- **Community Interest Companies**
- **Community organisations**

These not-for-profit organisations were also encouraged to work with other partners including manufacturers of the products they wished to install. The programme was in two parts: TIF 1 covering England and Wales, and TIF 2 open to applications from organisations within seven distinct local authority areas across England. These reflected the agreements with Ofgem and the funders. Greater levels of householder assistance were encouraged through the provision of match and/or gap funding by the project partner

200 expressions of interest (EOI) were received, and 78 bidders were selected by the Technical Oversight Group to complete a Call for Proposal (CFP) application. 44 projects were awarded funding (with an additional two programmes granted funding in 2017), involving 19 types of technology and 66 products. The grant recipients agreed to work with NEA to ensure that appropriate monitoring and evaluation could take place, and NEA also delivered a programme of community engagement and support in each project area.

## Who we helped

Whilst we provided some eligibility guidance to partners, we did not want beneficiaries to have to meet rigid criteria. It was important that partners had flexibility in helping households in or at risk of fuel poverty. NEA utilised its extensive experience to work with local partners in areas experiencing high levels of fuel poverty. Where possible, there was a focus on rural and off-gas communities and EPC band D, E, F and G properties. TIF beneficiaries were predominantly living in social housing (82%). 522 (24%) were living off the mains gas network and reliant on more expensive heating fuels.

## Key achievements to March 2017



**44 TIF projects** involving **19 types of technology** and **66 products**



**£4.5m** awarded in grants for capital measures installation



**£2.5m** additional match and/or gap funding securing 49p for every £1 spent, and increasing the number of households assisted



**2,166 households** receiving at least 1 measure  
**forecast to increase to 2,204** during 2017/18, **exceeding the target by 48%**



**2,681** measures installed forecast to **increase to 2,719** during 2017/18



**292 frontline workers trained**, enabling them to cascade **advice to approximately 98,000 residents a year**



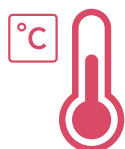
**946 residents directly supported** by NEA Project Development Coordinators with 700 engaged in the product monitoring processes



**61% of the residents had incomes under £16k**

**SAP ratings increased between 1-25 points** (where appropriate to measure)

## Technologies



**Heating:** air to air heat pumps; air source heat pumps; domestic multi-fuel stoves; ground source heat pumps; gas absorption heat pumps; micro CHP; electric storage heating; electric heating



**Insulation:** including external wall insulation, non-traditional cavity wall insulation, park home insulation



**Controls:** including smart controls and TRV/Zoning



**Energy storage:** PV battery storage, thermal storage, solar thermal



**Complementary measures:** flue gas heat recovery, heating enhancement devices, ventilation, heated seat covers, Voltage Power Optimisation

## Benefits to the householders

Analysis of the initial household surveys indicate the TIF programme has brought about significant benefits with high levels of satisfaction reported across the programme. These include:

- **Keeping warm and comfortable at home** - A large majority (78.2%) of households have experienced increased thermal comfort as a result of TIF interventions.
- **Energy bills and affordability** - Almost three quarters (73%) of households thought the affordability of their energy bills had improved since receiving their measures, with over a third (35.5%) agreeing that it had improved a lot while a further (37.5%) thought it had improved a little.
- **Managing energy bills** While almost half of households (48%) thought their energy bills were manageable before they received measures, this increased to over half (62%) after installation of the TIF measures.

### • High levels of satisfaction with our programme:

The majority (85.5%) of households were satisfied or very satisfied with the assistance they had received from the TIF programme overall

**Mr M (19):**

*"It helps because the house is genuinely warmer. Before the heating [was installed] I just got so cold, studying wasn't an option. I am currently studying for a degree in Health and Social Care. With a Warm room studying is so much easier; I don't feel rushed, before I got done as quickly as possible as my hands were so cold I couldn't type."*

**Mr S:**

*"The insulation definitely did its job, we are now spending half of what we used to on LPG and during the summer months it was a lot more comfortable too. The insulation helped to improve overall energy efficiency of our park home which is great."*



## Building capacity on the frontline

TIF improved awareness of fuel poverty among frontline workers. 292 frontline workers were trained during 26 training sessions across seven local authority areas. Feedback questionnaires revealed that respondents' knowledge of fuel poverty and/or energy efficiency-related programmes was improved considerably as a result of training sessions delivered under our programme.



## Recommendations and observations

Our TIF programme has provided real insight into the challenges and opportunities when deploying innovative technologies in vulnerable households, and our report clearly sets out a number of recommendations.

### Policy practitioners

- There should be further support by way of incentives for social and private housing to stimulate innovation and the application of new technologies.
- Many of the technologies installed under TIF had not gone through the testing process required for inclusion in RdSAP methodology, which can prevent local authorities and social landlords from investing in innovation where no SAP improvement is possible.
- It is essential that innovation can bring about equitable opportunities for all consumers regardless of circumstances. Policy-makers should help to create and stimulate the right market conditions to encourage private and social landlords to deploy innovative domestic technologies.

### Manufacturers

- There is huge potential for new technologies to provide solutions for fuel-poor households, however more robust monitoring and evaluation is needed. Further trials would help to inform future product development and improve end user experience.
- Manufacturers should ensure communication channels, formats and guidance materials are tailored to the needs of vulnerable consumers.
- Manufacturers should provide more hands-on support to social landlords and their contractors when technologies are installed.

### Local authorities and social housing providers

- The pace of technological development is creating real opportunities to improve domestic energy efficiency. Innovation should be embraced but deployed with caution. Trials provide an opportunity to learn about the suitability of each technology and instil further confidence before investing in wider deployment.
- Additional time and resource should be factored in to support vulnerable consumers through the installation process and beyond.
- There should be a dedicated point of contact between delivery partners and contractors.
- Local authorities and social housing providers should actively share and disseminate the outcome of trials, encouraged by go-to housing bodies such as the National Housing Federation.

## Looking forward

During the remainder of 2017 and into 2018, we will undertake a programme of dissemination of the individual product and project results to ensure all programme insights and lessons are shared to help improve future programme delivery.

The monitoring has been extended on fourteen TIF projects to improve on the data collected. Efficiency savings and interest generated from proper investment of advance payments across HIP is also funding a further two trials, the results of which will be available in summer 2018.

# Health and Innovation Programme Overview

**The Health and Innovation Programme (HIP) was a £26.2 million programme to bring affordable warmth to fuel poor and vulnerable households in England, Scotland and Wales. The programme launched in April 2015 and was designed and administered by NEA as part of an agreement with Ofgem and energy companies to make redress for non-compliance of licence conditions/obligations. To date, it remains the biggest GB-wide programme implemented by a charity which puts fuel poverty alleviation at its heart.**

The HIP programme comprised three distinct funds:

- A **Warm Zones Fund**, which has enabled the installation of heating and insulation measures, managed and delivered by NEA's not-for-profit subsidiary Warm Zones CIC, and operating in England, Scotland and Wales.
- A **Warm and Healthy Homes Fund**, which built on guidance and new quality standards issued by the National Institute for Health and Care Excellence (NICE) for addressing excess winter deaths and the health risks associated with cold homes. NEA partnered with local delivery partners to effectively target support to those in most need. This Fund featured three elements:

The **Partnerships programme**, which awarded **eleven** health and housing partnerships across England and Wales with grants to provide households most at risk of fuel poverty and cold-related illness with heating and/or insulation measures.

The **Small Measures programme** which awarded **eight** home improvement agencies across England and Wales with a charitable grant fund to install a range of low cost energy efficiency interventions.

NEA's sister charity **Energy Action Scotland (EAS)** was awarded a grant to manage a programme of high value and lower cost interventions across **three** fuel poor areas in Scotland: the Western Isles, the Orkney Islands and Glasgow.

- A **Technical Innovation Fund**, to investigate the impact

on fuel poverty of a range of innovative technologies in households in England and Wales, using measures that would not traditionally be within the scope of current mandated schemes.

## The Technical Innovation Fund

The drivers for TIF were born out of a cross-sectoral desire to explore the potential for innovative solutions to tackle fuel poverty:

- NEA's goals of increasing access to sustainable solutions for vulnerable households, funded by levies placed on their energy bills.
- Acknowledgement that existing measures and programmes are insufficient to meet the UK governments' fuel poverty strategy goals.
- Forward-thinking social housing providers wanting to harness innovation to help tackle fuel poverty but needing an evidence base upon which to base their investment decisions in times of increasingly constrained budgets.
- Commercial drivers of manufacturers wanting to test the application of their products in a variety of settings.
- Government goals of decarbonising energy systems and meeting carbon budgets as well as meeting fuel poverty targets.

NEA was aware of several new technologies which could benefit low income and vulnerable householders. In many cases there was a lack of robust evidence of the effectiveness of the technologies and how householders could use them to best effect. Many technologies included in TIF are low cost and have the potential to improve the comfort and wellbeing of people living in fuel poverty. Some products complement other technologies, such as enhancing the efficiency of heating systems through improved performance or better controllability.

Through this programme, NEA aimed to facilitate community-level trials of innovative solutions within selected geographic areas, funding measures that would not traditionally be within scope for current mandated fuel poverty and retrofit energy efficiency programmes.

NEA complemented these trials by providing an integrated package of community engagement, training and support to promote a better understanding of the nature of fuel poverty and the assistance available to tackle it.

Where possible and applicable, NEA sought to improve housing standards to EPC band C and target the worst housing occupied by those on low incomes.

TIF was managed by NEA to trial a range of innovative solutions across English regions and within Wales. TIF 1 was open for applicants across England and Wales, TIF 2 was restricted to the following seven local authority areas:

- **Halton Borough Council**
- **Cheshire East Council**
- **Chester West and Chester Council**
- **North East Lincolnshire Council**
- **North Lincolnshire Council**
- **South Holland District Council**
- **Thurrock Council**

NEA utilised its extensive experience to work with local partners in areas experiencing high levels of fuel poverty. There was a focus on rural and off-gas communities and EPC band E, F and G properties.

#### **TIF comprised two strands of projects running concurrently:**

**Large measures** - projects evaluating **higher cost technologies** with NEA grants up to £6,700 per household. In line with the Government's new fuel poverty targets, NEA aimed where possible to improve energy efficiency standards up to EPC band C under the large measures programme. The type of measures under this strand included:

- **Heating improvement**
- **Energy storage**
- **Communal heating**
- **Fabric improvement**

**Small measures** - a package of **lower cost energy saving measures** with grants available of up to £1,000 per household. The type of measures under this strand included:

- **Heating enhancements**
- **Controls**
- **Complementary products**

### **Gap and match funding**

Greater levels of householder assistance were encouraged through the provision of match funding and/or gap funding by the project partner. Gap and match funding are defined as:

- **Gap funding:** Partners bridge a gap in the funding required to install measures into vulnerable households. Example, NEA provides £5,000 per household and partner contributes additional £1,000 to cover the cost of installation.
- **Match funding:** Partners match the grant awarded by NEA. Example, NEA funds installations of innovative measures into 15 households and partner matches the funding for additional properties.

Gap funding was intended to bring additional funding to assist the targeted households, whilst match funding was to enable the project to support a greater number of households.

A prerequisite of the grant funding was that lead partners were not able to source match funding and/or gap funding from the Energy Company Obligation (ECO) or any other energy efficiency scheme administered by Ofgem.





## The Application Process

Organisations were asked to submit expressions of interest

Housing  
Associations

Charities

Community  
Interest  
Companies

Community  
Organisations

Local  
Authorities

Expressions of interest received

**149**<sup>TIF 1</sup>

**51**<sup>TIF 2</sup>

NEA and Technical oversight panel review the expressions of interest. 54 TIF1 and 24 TIF2 expression of interest are invited to call for proposal stage.



NEA and Technical oversight panel review the call for proposals. Refinements to proposals are requested where applicable.

Final contracts  
agreed



Programmes  
awarded grant from  
NEA

Negotiations with prospective partners begin on scale and cost of proposals. 47 programmes begin the due diligence process.



**27**<sup>\*TIF 1</sup> Proposals approved

**15**<sup>\*TIF 2</sup> Proposals approved

\*42 projects approved initially, with an additional 4 projects agreed during 2016-2017












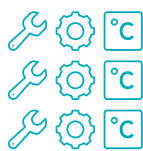
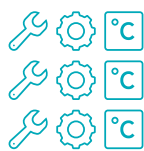
## The projects

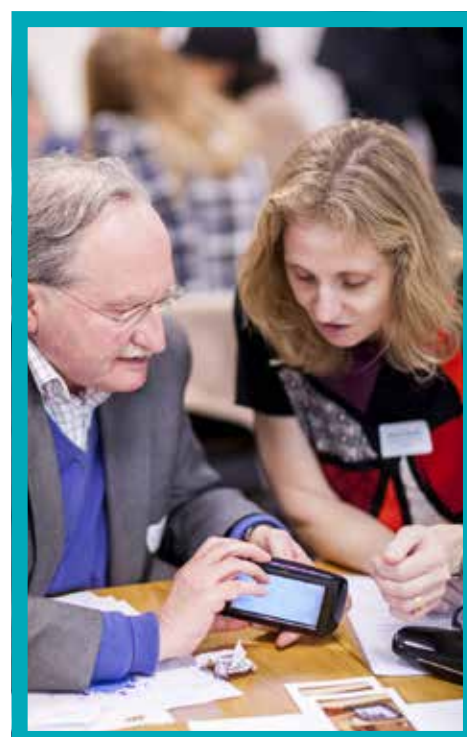
42 projects were approved initially, with an additional four projects agreed between 2016 and 2017 (this impact report reflects impacts from 44 programmes funded to date). Approximately £2.5m gap and match funding, representing 49p for every £1 in grant funding, generated from successful partners enabled greater levels of household assistance.



## Key achievements in numbers

Description	Target	Achieved at 31 March 2017	Forecast during 2017/18	% variance against target
Number of <b>households</b> receiving at least one intervention	1,488 	2,166 	2,204 	+48% 
Number of <b>measures</b> installed	N/A 	2,681 	2,719 	N/A

	Large measures	Small measures	Total measures at 31 March 2017
Total <b>households</b> with at least 1 measure installed	880 	1,286 	2,166
Total number of <b>measures</b> installed	1,265 	1,416 	2,681





## Geographic spread of TIF projects

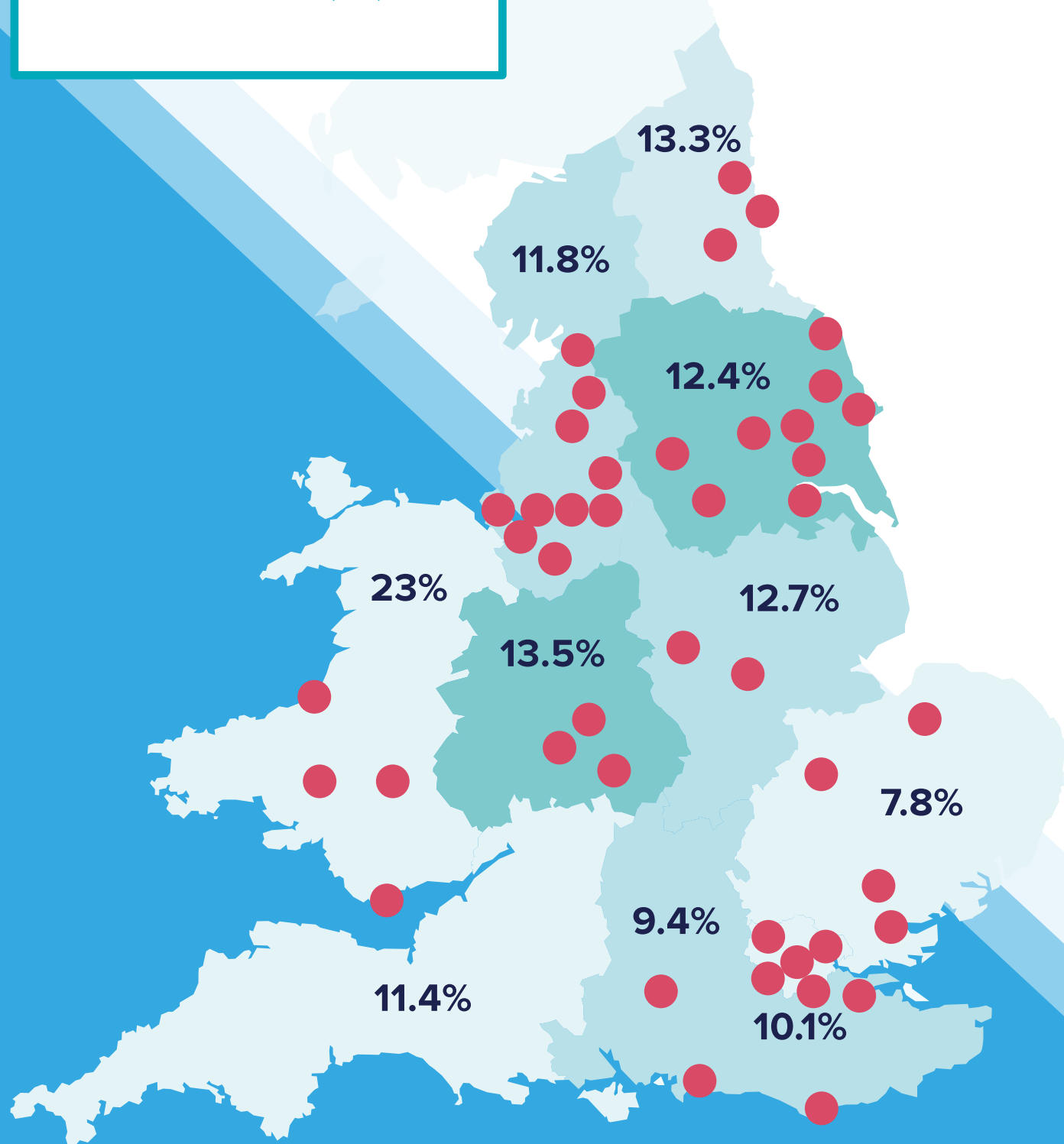
● TIF Projects (see Appendix A, p42)

% Proportion of fuel poor households

Source: BEIS (2017) relate to fuel poverty in 2015

Wales fuel poverty (in 2016)

Source: Welsh Government (2017)



# The technology

19 different technologies and 66 products were installed

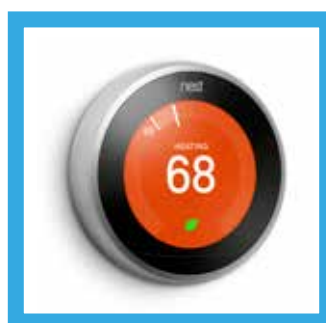
Heating	
<b>Air to air heat pump</b>	Worcester Bosch
<b>Air source heat pump (Hybrid)</b>	Daikin; Mitsubishi
<b>Domestic multi-fuel stove</b>	Charnwood
<b>Ground source heat pump</b>	Vaillant geoTherm
<b>Gas absorption heat pump</b>	Worcester Bosch
<b>mCHP</b>	Flow Products Ltd
<b>Electric storage heating</b>	Dimplex Quantum
<b>Electric heating</b>	Rointe; Osily; Fischer

Energy Storage	
<b>PV battery store</b>	Powervault; Sonnen; Smart Power Systems; Moixa Maslow; Powerflow Sundial; Victron; Growatt; XStorage
<b>Solar thermal</b>	Worcester Bosch; Greenskies; Baxi SolarFlow; Solar Angel

Insulation	
<b>Insulation</b>	The Energy Savers; Isothane; Icynene; Jablite; SPS Envirowall; Logisor; Caribou; Moxia; Rotkraft; Envirovent
<b>Park home Insulation</b>	Aerogel Superslim; Celotex; Walltite; Alumasc; Actis Insulation; Jubizol Premium

Controls	
<b>Controls</b>	Honeywell; Chopcloc; Switchee; Co-Control (formerly Canary Controls); Volt@; Spirotech; Smart Power Systems; Vaillant; Nest; Efergy; Heatmiser; tado; Netatmo; Heat Genius; Climote; Hive
<b>TRV/Zoning</b>	OpenTRV; Pegler Terrier; Evohome; VPO; Matt:e

Complementary	
<b>Flue gas heat recovery</b>	Potterton Multifit; Silavent Energex
<b>Heating enhancement devices</b>	Oxypod; Magnaclean; Tadpole; Radfan
<b>Ventilation</b>	Spirovent; Ventaxia; Ventive-S
<b>Heated seat</b>	HomeGlow B-Warm
<b>VPO</b>	Matt:e



# Programme oversight

**Independent oversight was a critical element of the HIP programme to ensure transparency and due diligence when awarding programmes for funding.**

## Technical Oversight Panel

NEA set up an independent Technical Oversight Panel comprising NEA Technical Managers and individuals from social housing, academia and social enterprise. It was chaired by NEA's Trustee Chris Underwood, who is professor of Energy Modelling at Northumbria University's Department of Mechanical and Construction Engineering.

The role of the panel was to provide oversight and expertise in relation to some of the technologies proposed by the partners and to scrutinise the processes and decisions for the selection of the successful projects. In addition, Newcastle University provided independent oversight of NEA's evaluation and monitoring methodology advising and amending our approach where appropriate.

## Fund Control Committee

To govern the release of funds across the wider HIP programme, a Fund Control Committee (FCC) was set up comprising representation from BEIS, Ofgem and the funders, along with senior representatives of NEA's Board of Trustees and management team. NEA reported to this committee on a quarterly basis. Funds were released once the FCC was satisfied that agreed milestones had been met.

## Due diligence process

Before contracts were signed all successful applicants were requested to complete a rigorous due diligence process providing evidence of compliance and certification with industry standards.

## A successful independent audit

To provide additional assurance and accountability of decisions made within the wider HIP programme, PricewaterhouseCoopers (PwC) were contracted to conduct an interim independent audit. The audit was passed successfully with no concerns raised.



# Monitoring and evaluation

## Technical

Monitoring and evaluating the performance of each technology was central to the programme. **23 different models** of monitoring equipment (see appendix A) were used and **2,383** individual pieces of equipment were deployed by our Project Development Coordinators (PDCs) and partners in approximately **700 households**. The images below illustrate the type of equipment used to monitor:

- Indoor environmental and thermal performance
- Electrical consumption
- Gas consumption
- Heat and flow



Environmental/ Thermal	
Electrical	
Gas	
Heat and flow	

### Our Project Development Coordinators

Each Project Development Coordinator (PDC) played an integral role in TIF, liaising with the project partners to support their vulnerable residents through the installation process, conducting questionnaires before and after measures were installed, deploying and collecting monitoring equipment and issuing incentives.

To date they have engaged with **946 households**. Where problems arose, PDCs were able to liaise with the partners to help resolve any concerns and relay information back to householders.

PDCs are also trained to support householders in relation to general energy efficiency advice, fuel debt and switching energy supplier. Where appropriate, they were able to refer beneficiaries onto other areas of assistance such as the Warm Home Discount or general benefits advice, providing significant added value at a time when resources to deal with such issues are difficult to find.

The PDCs and supporting teams have been integral to the success of TIF and the wider HIP programme.





## TIF reporting

Evaluation reports of the products used in each of the projects where sufficient monitoring has taken place are currently being written and will be made available during the autumn on NEA's website. This impact report provides our headline impacts whilst sharing some insights and lessons learnt whilst delivering this programme.

### Extended TIF programmes 2017-2018

NEA will extend the monitoring and evaluation of fourteen TIF programmes over the winter of 2017-2018. Doing so will enhance the quality of data and enable a comprehensive evaluation to take place. Further information about these programmes can be found on NEA's website.

## Social evaluation

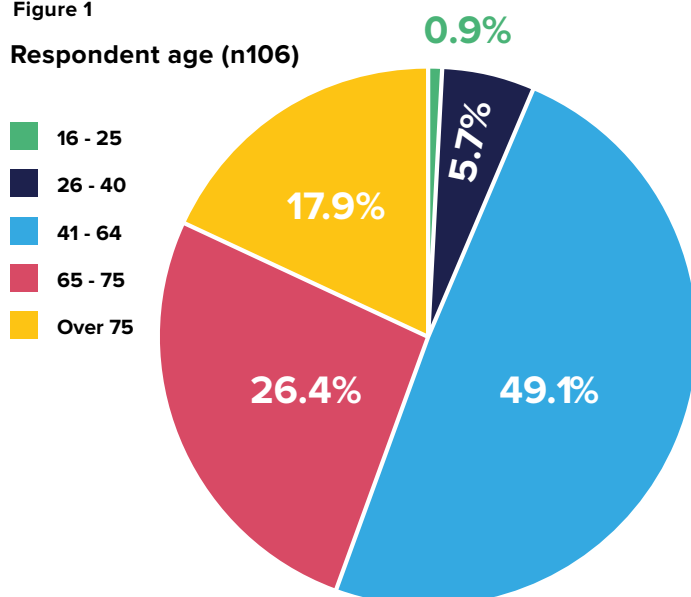
As well as evaluating the product performance we also evaluated the social impact on the residents. The impact results from phase 1 of the fieldwork (quantitative survey and qualitative follow-up) are highlighted below but a fuller report will be available in autumn 2017.

### Our beneficiaries

**2,166 households** received at least 1 intervention from the TIF programme which is forecast to **increase to 2,204** during 2017/18. Feedback from an interim sample of households in receipt of **large measures** suggests some very positive impacts.

Figure 1

Respondent age (n106)



## HIP social evaluation: Technical Innovation Fund – High cost measures

### Age

#### Beneficiary households were slightly more likely to be households of working age (under 65)

- Almost half (49.1%) of all respondents were aged 41-65 while a further 5.7% were aged 26-40 years.
- The average age of the oldest occupant of beneficiary households was 61.7 years while the average age of the youngest occupant was 47.5 years.
- The age of the youngest occupant ranged from 2 to 91 years, while the age of the oldest occupant ranged from 25 to 91 years.

### OUR SAMPLE

Results presented in this section are based on 110 households that had received at least one measure under the TIF high cost measures stream up to 31 March<sup>1</sup>. The total number of beneficiary (TIF large) households was 880. NB: sample does not include households that received measures through match funding. The results here therefore are based on a 12.5% sample of the total population of interest. This sample provides a margin of error of +/- 8.75% at a 95% confidence level (i.e. we can be 95% confident the result presented is accurate and reflective of the population of interest to plus or minus 8.75%).

1. A small number received measures during the first 2 weeks of April 2017



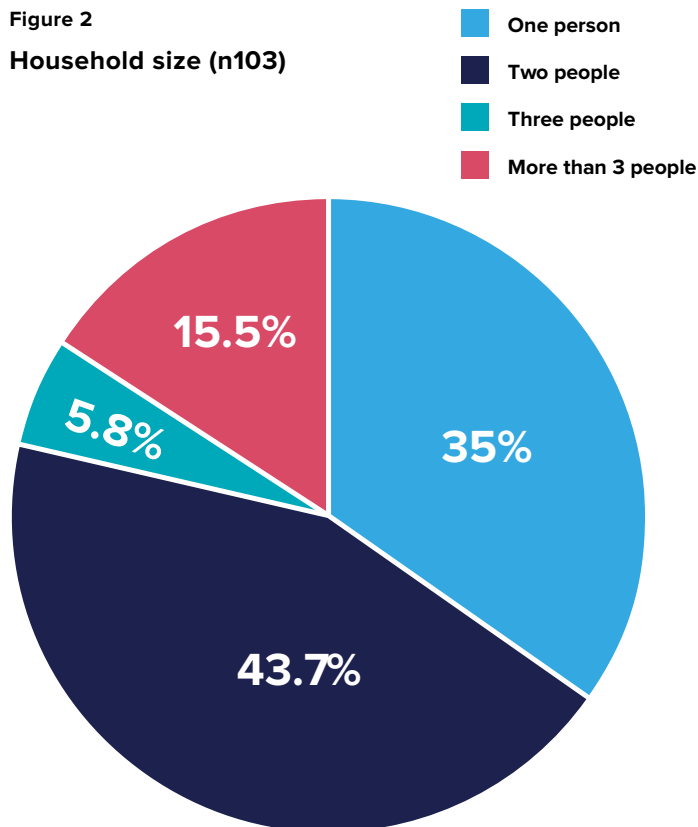
## Occupancy

**Most (78.7%) households contained one or two occupants, but were more likely to be dual person households**

- The minimum household size was one occupant while the maximum was ten. On average beneficiary households who responded to our survey contained 2.2 occupants.
- Just over a third (35%) of all households were single adult households, however more than two fifths (43.7%) contained two people (adult and adult or adult and child).
- Around six in ten households (15.5%) had more than three occupants.

Figure 2

Household size (n103)



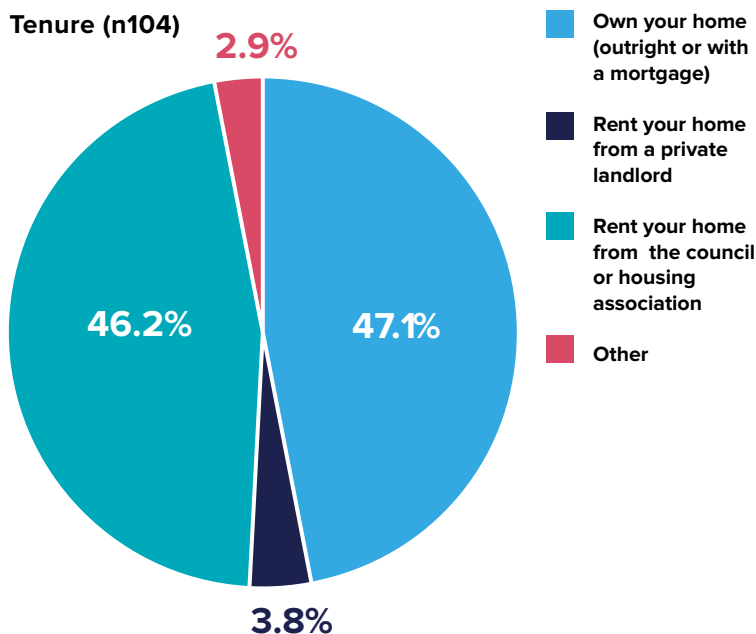
## Tenure

**Respondents to our survey owned their own home (outright or with a mortgage/loan) or rented their home from a social landlord (housing association or local authority)**

- Almost half (47.1%) of respondent households were owner-occupiers. On average the proportion of households that own their own home nationally is 63%. However, a similar proportion (46.2%) of respondents were social tenants.
- Only 3.8% rented from a private landlord.
- 2.9% selected 'other' tenure but were not asked to specify. This could include living with a relative or rent-to-buy.

Figure 3

Tenure (n104)



## Income

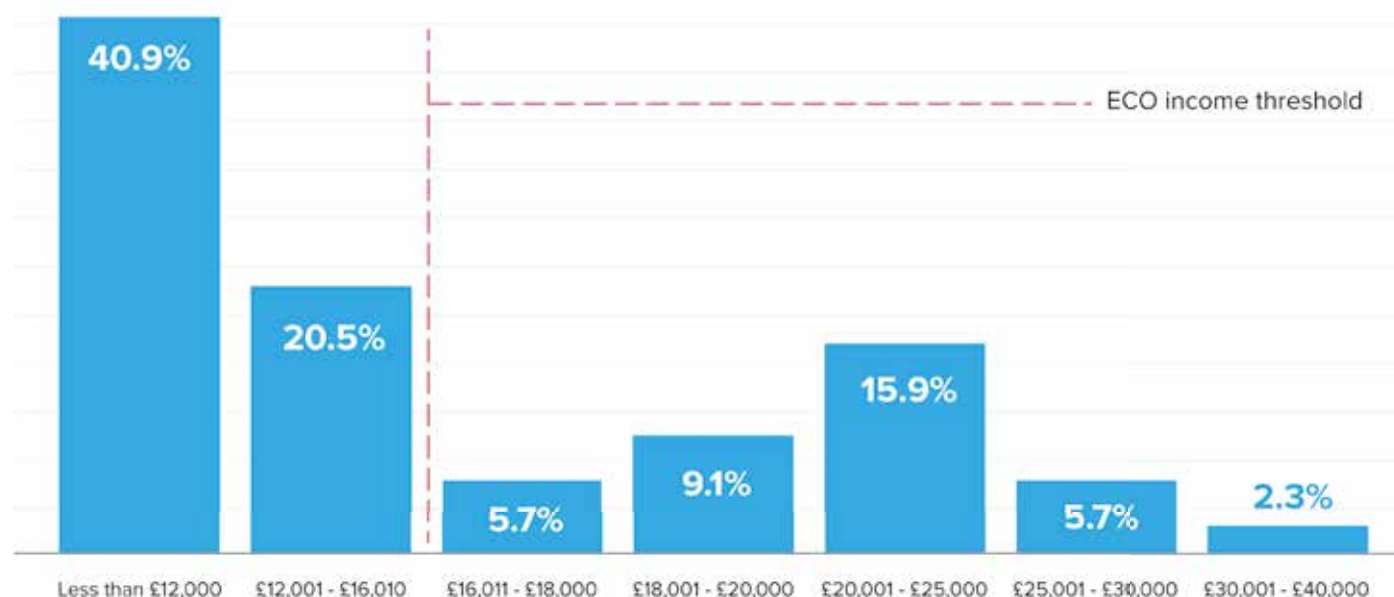
**The majority of beneficiary households who responded to our survey were low to very low-income households**

- A majority (61.4%) of respondent households had a low annual household income (below ECO income threshold of £16,010).
- Two fifths (40.9%) had an annual income below £12,000.

- 8% of households had an annual household income of more than £25,000.
- Although NEA has installed the majority of measures into households with incomes below the ECO income threshold, some interventions were placed in managed properties where heating upgrades were made to a communal system. In these settings those on higher incomes were not excluded from the programme which is why a small sample of households cited incomes above £25,000.

Figure 4

Annual household income (n88, excludes missing cases and 'rather not say')

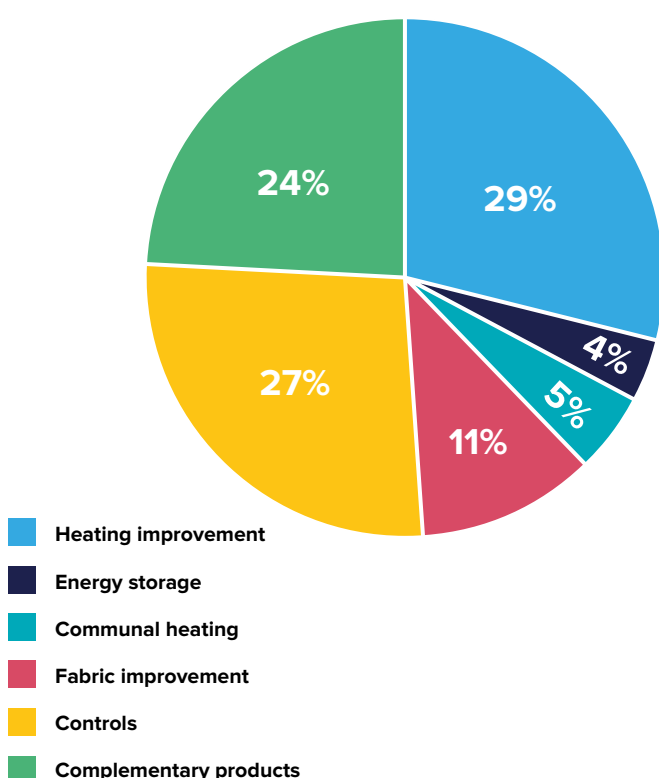


### Type of measure

The chart below shows the types of measures installed across the TIF programme. The majority (80%) of measures were either heating improvements (hybrid heat pumps, electric storage heaters, infra-red heating), controls (smart thermostats, TRVs, zoning controls), or complementary products (heat recovery units, boiler enhancements, Voltage Power Optimisation). The remaining 20% included communal heating, fabric improvement and energy storage.

Figure 5

TIF measure type (n2,681)



### Impacts

**Beneficiaries were asked for feedback on a range of performance indicators including:**

- Keeping warm and comfortable at home
- Achieving affordable warmth
- Cutting back
- Energy bills and affordability
- Advice and energy practices
- Overall satisfaction with the TIF programme

The following section presents the highlights from the initial analysis.

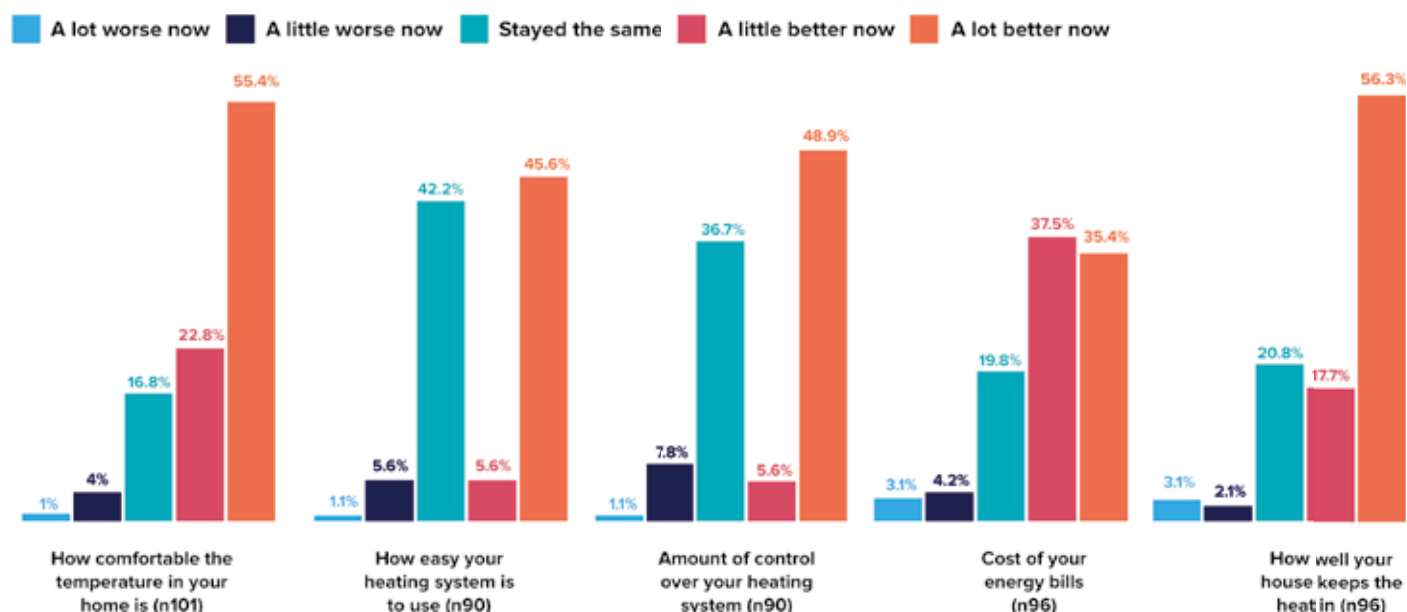
### Impact: Keeping warm and comfortable at home

**A large majority (78.2%) of households have reported increased thermal comfort, and TIF measures brought about considerable improvements to most households' ability to keep warm and comfortable at home.**

As shown in Figure 6 overleaf, more than two-thirds (78.2%) of households surveyed said that comfort levels, in terms of increased temperature, were a lot better (55.4%) or a little better (22.8%) since receiving their heating and/or insulation intervention. Similar levels of improvement post-intervention were observed in relation to how well households thought their house kept the heat in, where more than half (56.3%) thought it was a lot better since installation and a further 17.7% thought it was a little better. Almost three quarters (72.9%) of households thought the cost of their energy bills had improved since receiving their measures, with over a third (35.4%) agreeing that they had improved a lot while a further 37.5% thought they had improved a little.

Figure 6

## Impact on experience of heating system and comfort



Mr M (19): *"It helps because the house is genuinely warmer. Before the heating [was installed] I just got so cold, studying wasn't an option. I am currently studying for a degree in Health and Social Care. With a warm room studying is so much easier; I don't feel rushed, before I got done as quickly as possible as my hands were so cold I couldn't type. We live out of town so there are no library facilities nearby. After travelling an hour on the bus in the cold to arrive at a cold home and then studying in the cold was impossible. I now feel able to take my time over my studies".*

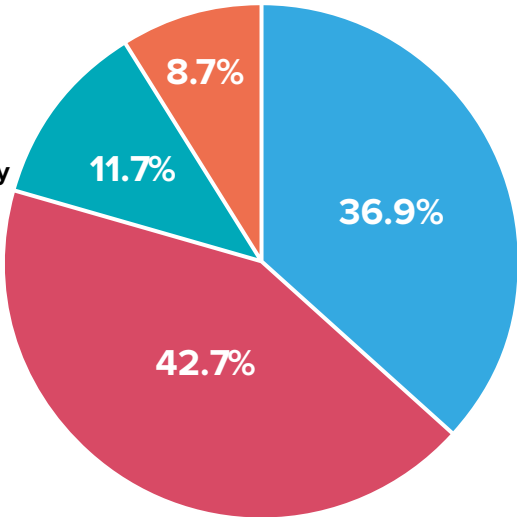


Impact: TIF measures significantly helped people to achieve affordable warmth

Before receiving an intervention through the TIF programme 36.9% of households supported by TIF (high cost) measures projects reported that they managed to achieve adequate levels of thermal comfort in winter. Following intervention the proportion doubled to 73.1%. A further 37.5% thought they had improved a little.

Figure 7

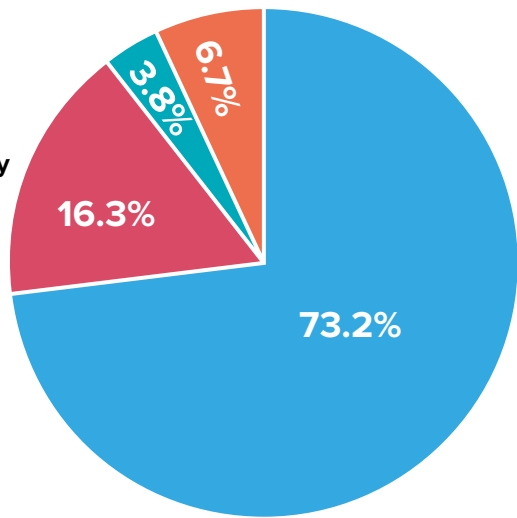
Pre-intervention:  
Can you normally keep your whole house comfortably warm in winter/when it is cold?  
(Subjective FP)  
(n103)



- Yes
- No, your heating costs too much to keep on for as long/as high as needed
- No, it is not possible to heat your home to a comfortable standard for non-financial reasons (e.g. no/not adequate heating or insulation)
- No, it both costs you too much and it is not possible to heat home

Figure 8

Post-intervention:  
Can you normally keep your whole house comfortably warm in winter/when it is cold?  
(Subjective FP)  
(n86)



- Yes
- No, your heating costs too much to keep on for as long/as high as needed
- No, it is not possible to heat your home to a comfortable standard for non-financial reasons (e.g. no/not adequate heating or insulation)
- No, it both costs you too much and it is not possible to heat home

Cheshire West and Chester Borough Council

Mr and Mrs W: “The insulation definitely did its job, we are now spending half of what we used to on LPG and during the summer months it was a lot more comfortable too. The insulation helped to improve overall energy efficiency of our park home which is great.”



Heating your home the smart way, South Holland District Council.

Mrs D: “NEA helped us to change from an Economy 7 to a single rate electric tariff which has resulted in the electric bill being halved from approximately £40 per week down to £20 per week which is really helpful for our family budget; we no longer have to cut back in the same way.”

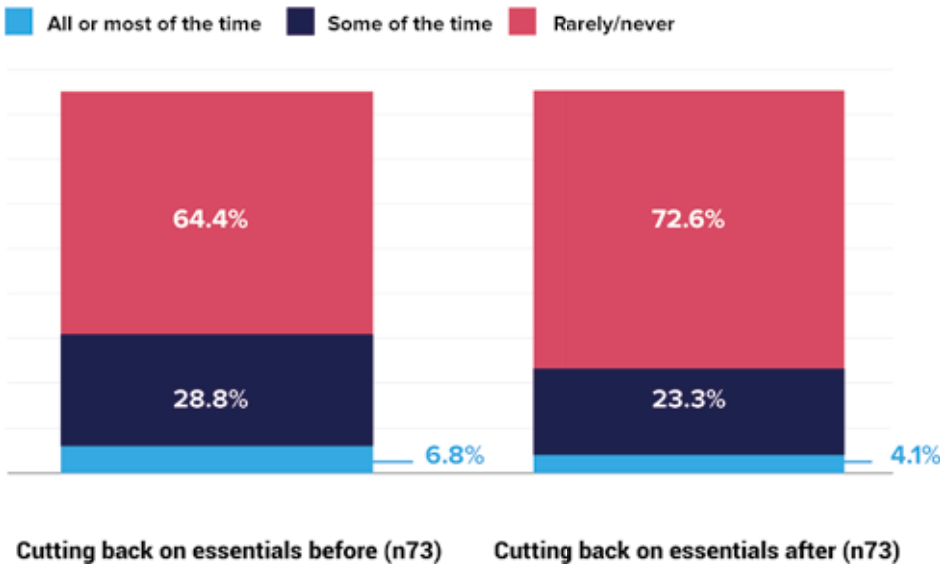




Impact: Households cutting back less often

The small number of households that were cutting back on other essentials before the intervention are doing so less often.

Figure 9  
Cutting back on essentials

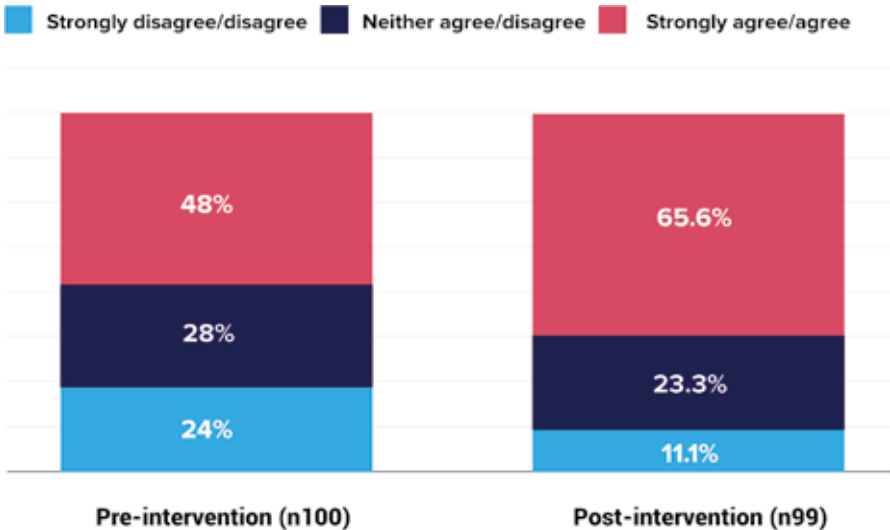


Impact: Energy bills and affordability

Households reported their fuel bills were more manageable following TIF interventions.

While almost half of households (48%) thought their energy bills were manageable before they received measures, this increased to almost two thirds (65.6%) after the intervention. Prior to intervention almost a quarter (24%) of households disagreed that their energy bills were manageable. However, after receiving measures through the TIF programme this was reduced by more than half to 11.1%.

Figure 10  
My energy bills are manageable



Riverside Group tenant Mrs W: “Our electricity usage has reduced from £30 per week to £15-£20 per week and there has been an even bigger impact on our gas costs, which have reduced from £40 per week to as low as £15 on average.”





Impact: Advice and energy practices

The majority of households recall having received at least some advice at or around the time they received their intervention. As a result, most households are more engaged and confident about how to use and save energy in the home.

As shown in Figure 11 below more than two thirds (69%) of households agreed to some extent that they were more interested in how energy is used in the home and can be saved since receiving measures and support. However, not only were households more interested in how energy is used and could be saved in the home, 61.8% also agreed that they were more knowledgeable and confident about how they could save energy while keeping warm; more than two fifths (44.3%) agreed that this was true for them while a further 17.5% strongly agreed.



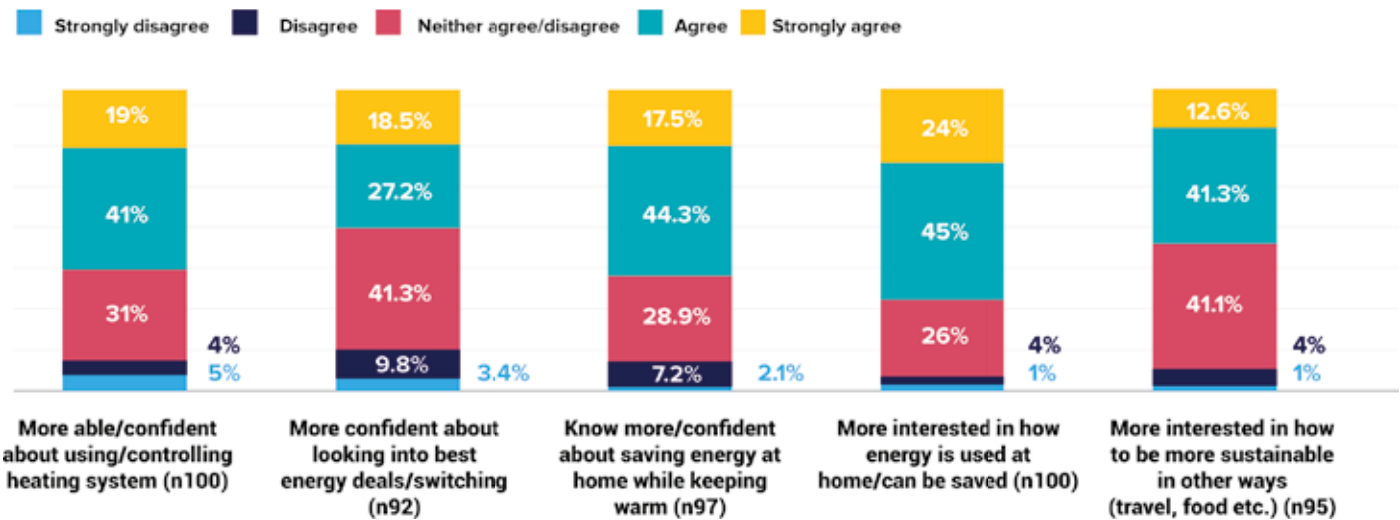
Heating your home  
the smart way,  
South Holland  
District Council.

Mr and Mrs I:

*“The savings we’ve  
made on the current year’s bills have  
enabled us to clear the debt from the  
previous year more quickly.”*

Figure 11

Post-intervention: energy-related capabilities



Impact: Advice and energy practices

Following TIF interventions, households are more engaged in sustainability and how energy is used in the home.

The majority of households (60%) agreed that they felt more able and confident about using and controlling the heating system in their home. Just under half (45.7%) are more confident about looking for the best energy deals.

More than two thirds (69%) of households agreed to some extent that they were more interested in how energy is used in the home and can be saved since receiving measures and support.

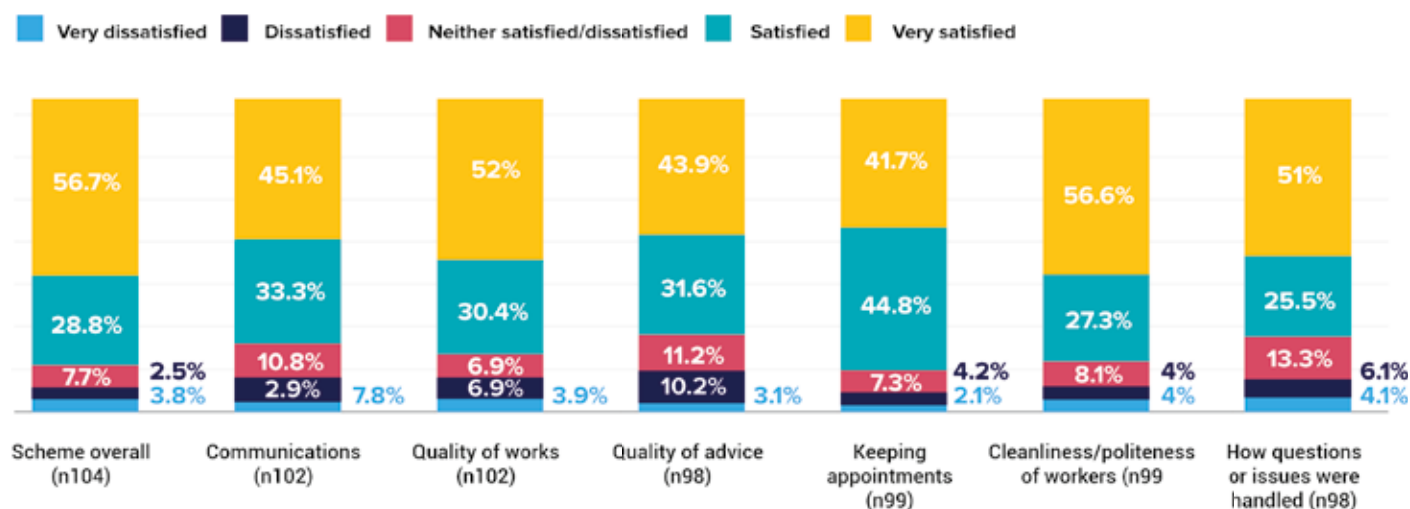
## Impact: Customer satisfaction

The majority (85.5%) of households were satisfied or very satisfied with the TIF scheme overall.

Although the overall level of customer satisfaction across the programme was positive, with 85% either satisfied or very satisfied with the scheme overall. Delivery at this scale with unfamiliar and new products did encounter some levels of dissatisfaction amongst beneficiaries. Communications and the quality of advice about the products were two areas which could have been better. Where the quality of works was not to the standard expected, PDCs were deployed to investigate any issues, reporting back to partners and following up to ensure any issues were resolved.

Figure 12

### Client satisfaction



Park Home Insulation, North Lincolnshire – YES Energy Solutions. Mrs P: *“The whole experience has been better than a lottery win for me, thank you.”*

Further analysis and the full social impact evaluation will be published in the autumn and will be available on the NEA website, [www.nea.org.uk/hip/](http://www.nea.org.uk/hip/)

## Impact: TIF recipients claim interventions improved physical and mental health

*“Having a new heating system has improved my levels of anxiety and depression and in turn my physical health. My children are no longer freezing cold in bed and find home a much more comfortable place to be.”*

*“In the summer the free hot water means I get a bath more often than I usually would (because of cost) and I find this relaxing. Because it’s not using electricity I also feel better about my carbon*

*footprint (although my provider is a renewable energy one).”*

*“My bills have reduced what I have to put in the meters. I don’t tend to run out now, [that] was not good for my depression.”*

*“My husband’s health has improved. I put it down to not being so worried about the heating bills.”*

*“Not getting as many chest problems, I am not in as much pain as I was with arthritis.”*

*“Not so anxious as know heating bills are better since getting insulation to walls of park home.”*

# Technical Innovation Fund: SAP assessments

## Impact: Improvements to the energy efficiency of our housing stock

Not only did the TIF programme bring about tangible benefits for householders, many beneficiaries also experienced an improvement in the energy efficiency rating of their home. Where applicable\*, SAP assessments were carried out before and after interventions to assess what impact the measure(s) had on the energy efficiency rating of a dwelling.

## Impact: 90% of properties assessed\* following TIF interventions had improved SAP ratings.

As figure 13 shows, the majority (85%) of positive SAP movement was between 1 and 25 SAP points. Approximately one fifth of households had increased their SAP rating by more than 20 points.

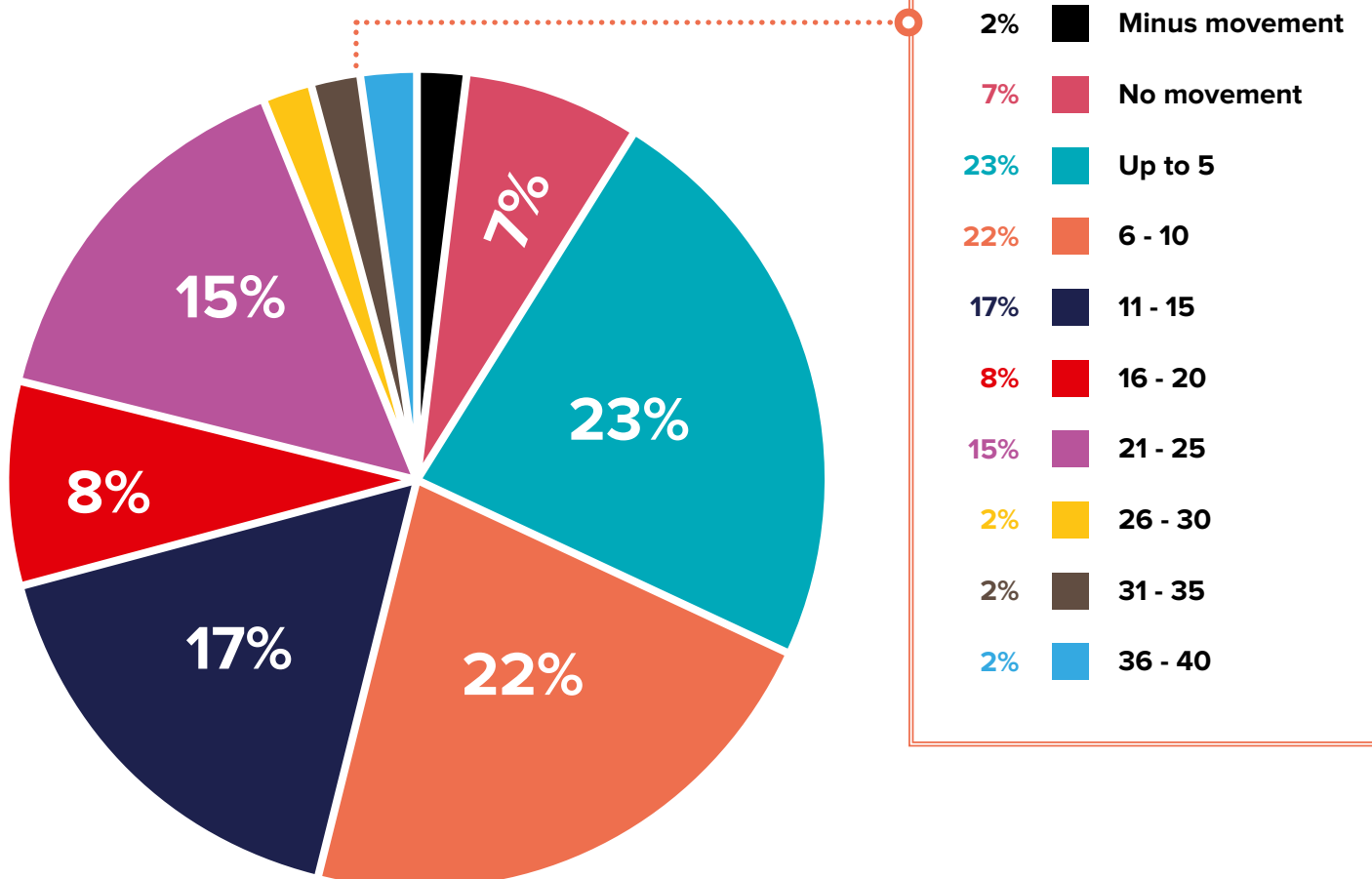
### Our SAP assessments

The Standard Assessment Procedure [SAP] is the UK Government's recommended method system for measuring the energy rating of residential dwellings.

\*SAP assessments were conducted only where necessary. Not all TIF households were assessed pre and post intervention either because RdSAP methodology didn't recognise the innovative intervention installed, or the impact on SAP was expected to be very minor. As a result, 451 SAP assessments were conducted where larger measures were installed under the programme, the results of which are shown below.

Figure 13

TIF 1 & 2 combined SAP points movements (GB)  
(n451, number of reported properties)



# Impact: Approximately one third of households moved from band D to C

The chart opposite shows SAP band movement following TIF intervention. Over one third of households moved from band D to C, three households moved from band F to C. 12% moved from band F to D. Although approximately one third improved their overall SAP rating, they did not move SAP band. Less than one per cent had a reduced SAP rating as a result of TIF measures.

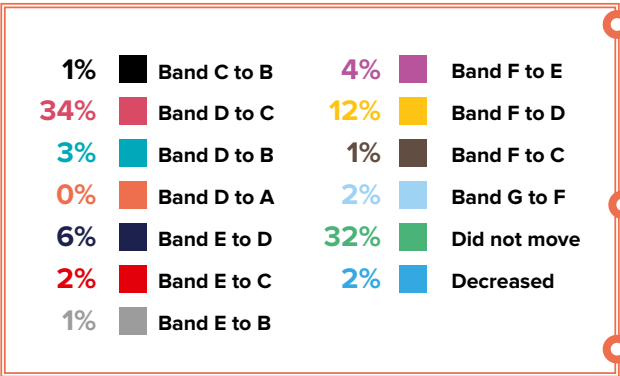
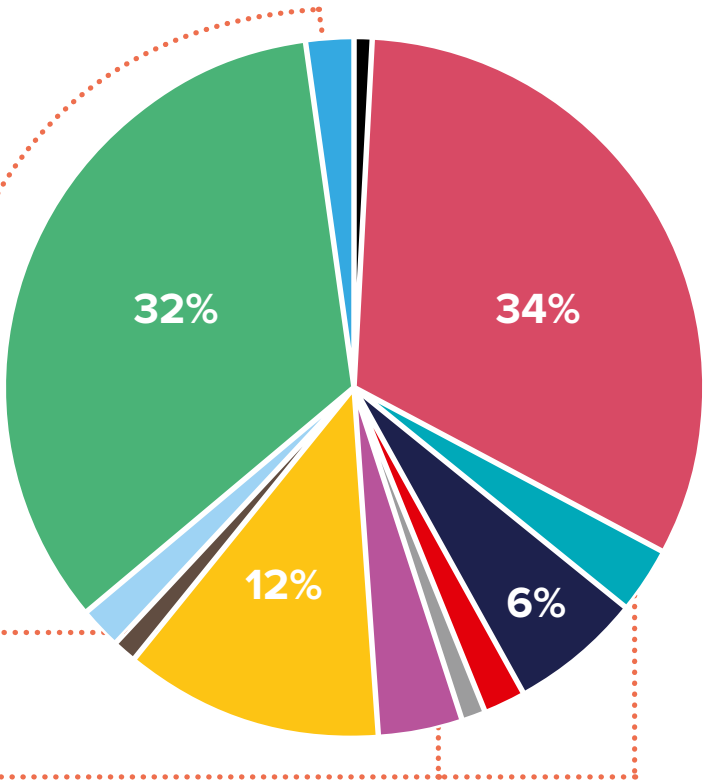


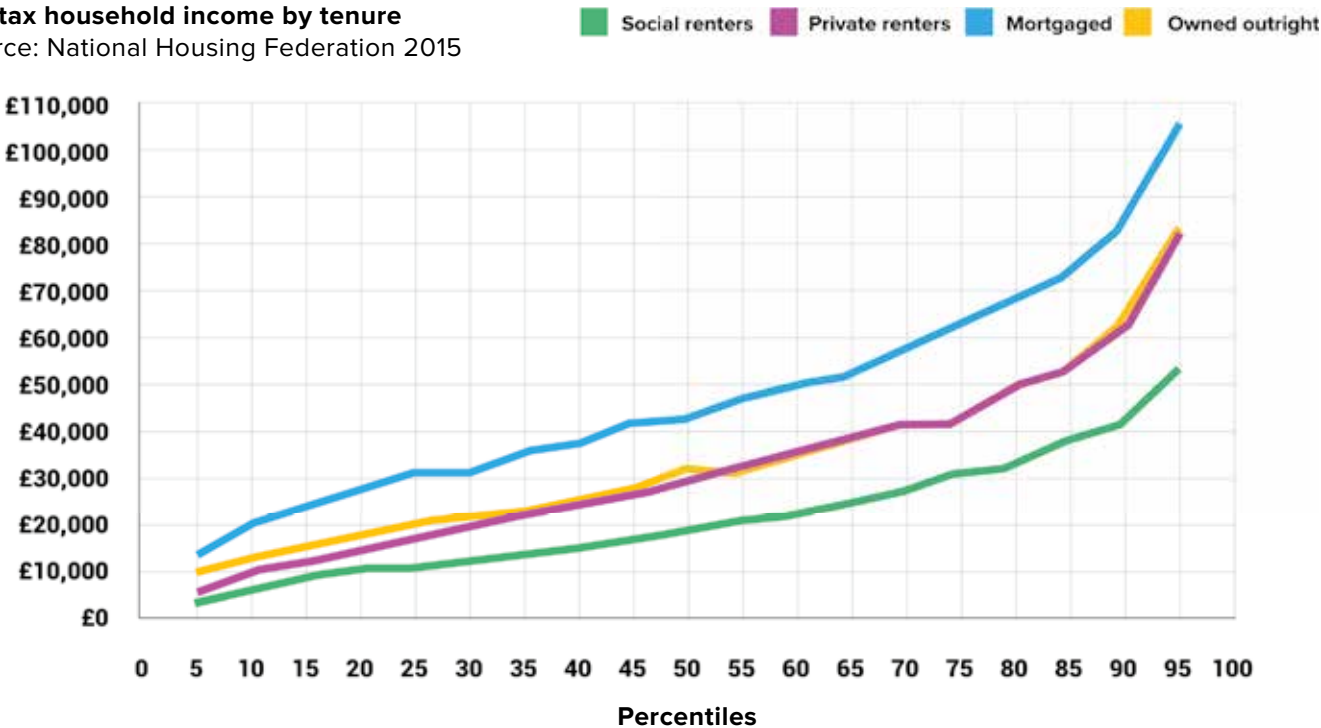
Figure 14  
SAP movement following TIF interventions (n451)



The Government’s fuel poverty strategy made the legal commitment to improving the energy efficiency of fuel poor homes to band E by 2020, band D by 2025, and then band C by 2030. This is a mammoth task as the most recent official fuel poverty statistics show. Whilst progress towards the interim target has been made with band E or above rated properties, only 6% of fuel poor households were living in a band C or above rated property in 2015, according to BEIS Fuel Poverty Statistics 2017.

On the whole, properties owned by housing associations have higher energy efficiency ratings (SAP 66), than their owner-occupied and private rented counterparts (both with average SAP of 60). Although 82% of households in receipt of at least 1 TIF intervention were living in social housing, as figure 15 below illustrates, those in social housing are generally occupied by those living on the lowest incomes and facing the day-to-day challenges of energy affordability.

Figure 15  
Pre-tax household income by tenure  
Source: National Housing Federation 2015



# Enhancing skills and building capacity on the frontline

An important strand of HIP was the delivery of training sessions to key third party agencies employing frontline workers active in the programme's delivery locations. These frontline workers include community and voluntary sector agencies, statutory bodies such as local authorities and housing associations and others supporting or interfacing with households at risk of fuel poverty. Approximately 1,500 frontline workers and trusted intermediaries have been trained and they expect to reach 546,000 of their clients per year sharing their new knowledge with people who may not respond to messages from other sources.

**Impact: Across the TIF 2 programme covering seven distinct local authority areas, 292 frontline workers and trusted intermediaries were trained and they expect to reach approximately 98,000 clients per year.**

Figure 16

## Training outcomes and indicators



Population	Intended outcome	Measurement
Frontline workers/ professionals	<ul style="list-style-type: none"><li>Knowledge and awareness of issues covered by training is improved</li><li>Frontline workers' capacity to deliver or enhance existing fuel poverty/energy efficiency programmes or services is increased</li></ul>	<ul style="list-style-type: none"><li>Extent to which knowledge is improved · Extent to which awareness is improved</li><li>Extent to which advice can be given on a range of subjects</li><li>Range of ways information provided can be used to develop new services or build on existing services</li></ul>

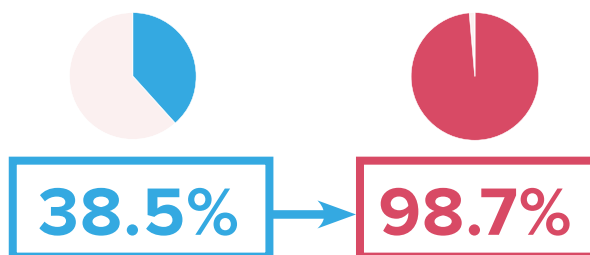
Participants were asked to complete questionnaires to gain feedback against the outcomes in the table above. 623 frontline workers responded across the wider HIP programme.

The results overleaf principally concern outcomes relating to respondents' knowledge, awareness and capability, individually or collectively, to take action on matters relating to fuel poverty and energy that have resulted from their participation.



## Impact: Improved knowledge and awareness of fuel poverty

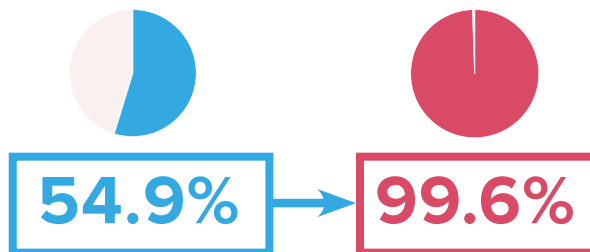
Rated their knowledge of fuel poverty “fairly good” or “excellent” before their training



Rated their knowledge of fuel poverty “fairly good” or “excellent” after their training

73.3% that rated their knowledge of fuel poverty as ‘fairly good’ before their training session went on to describe it as “excellent” afterwards.

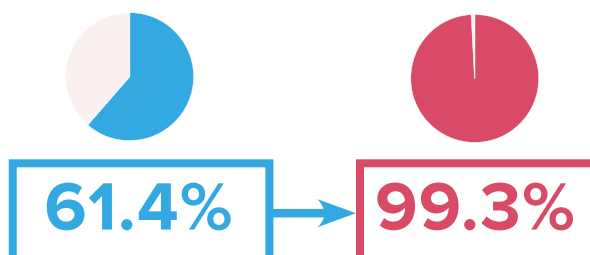
Rated their knowledge of fuel poverty & health as “fairly good” or “excellent” before their training



Rated their knowledge of fuel poverty & health as “fairly good” or “excellent” after their training

More than two-thirds (68.6%) that described their knowledge of the relationship between fuel poverty and health as “fairly good” before went on to rate it as “excellent” afterwards.

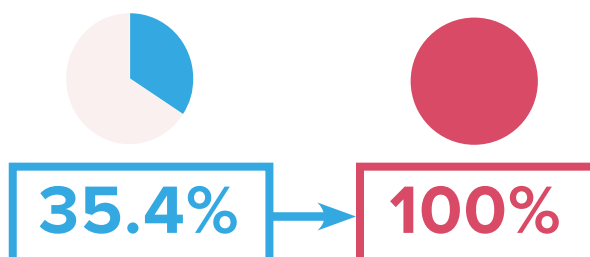
Rated their ability to identify vulnerable households as “fairly good” or “excellent” before training



Rated their ability to identify vulnerable households as “fairly good” or “excellent” after training

Similarly, (67.5%) did the same when describing their ability to identify vulnerable households.

Rated their knowledge of the causes of fuel debt as “fairly good” or “excellent” before training



Rated their knowledge of the causes of fuel debt as “fairly good” or “excellent” after training

## Impact: Improved knowledge of fuel poverty and energy efficiency policies and programmes, even among those with good levels of knowledge before the training

Feedback from questionnaires showed that respondents' knowledge of each of the following fuel poverty and/or energy efficiency-related programmes was improved considerably as a result of training sessions.

Percentage of frontline workers rating their improvement in knowledge as 4 or 5 out of 5 after their training session:

- **Home Heating Cost Reduction Obligation of Energy Company Obligation (ECO) 77%**
- **Priority Services Register (PSR) 76%**
- **NEST – national fuel poverty scheme operating in Wales 75%**
- **Warm Home Discount Scheme (WHDS) 74%**
- **Cold Weather Payment (CWP) 64%**
- **Winter Fuel Payment (WFP) 61.9%**

## Impact: Sessions helped to build and grow capability to advise others on fuel poverty issues

**99.2%**

Were enabled  
“fairly or very well”  
to better advise  
others

**99%**

Were enabled  
“fairly or very  
well” to support  
colleagues on fuel  
poverty

**98.8%**

Were enabled  
“fairly or very well”  
to update service/  
products with up-  
to-date content

**98.1%**

Were enabled  
“fairly or very  
well” to identify  
ways that fuel  
poverty & energy  
efficiency could be  
built into services

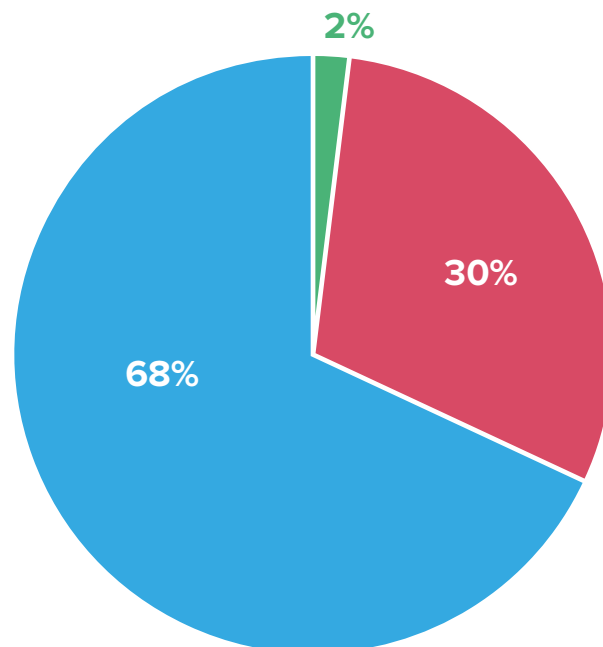
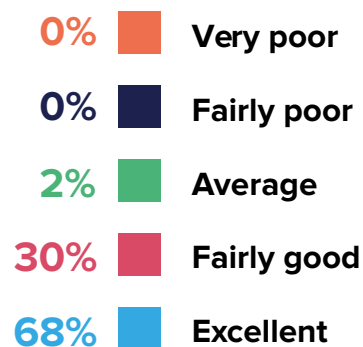
## Impact: Improved understanding of practical and advice-based remedies

- **Had a better understanding of how heat is lost in the home 91%**
- **Knew more/could recommend a range of low cost measures to save energy 90%**
- **Knowledge of recommended indoor temperatures had improved 89%**
- **Knew more about the impacts of low temperatures on the body 88%**
- **Knowledge of how damp/condensation is caused/tackled had improved 86%**



Figure 15

Overall rating of HIP training or awareness sessions  
(n614, excludes missing cases)



98% of frontline workers who completed our survey rated the training session overall as excellent or fairly good.

A selection of brief comments provided by respondents to explain their overall rating of the sessions they attended, and the advice they received, is presented below:

*"All [of] the information was very helpful and gave an insight to how much energy we are wasting..."*

*"The presentation was excellent, informative and in a simple format. Handouts were useful to read at home. Questions encouraged, answers clearly explained. Thank you."*

*"The information was given in an interesting and informative way."*





# TIF delivery partners

## Our partners: Key outcomes and insights

Partner feedback was a key aspect of delivering and evaluating the programme. We particularly wanted to examine the wider implications beyond the benefits to the individual households assisted and understand partners' views on the legacy of the programme. To capture this feedback, partners were invited to complete an online survey.

### Through this insight we have seen three key themes emerging:

- **The impact of TIF on reducing fuel poverty, cold-related morbidity and carbon reduction**
- **The way that TIF has enabled existing relationships to develop and new ones to be forged**
- **The significance of TIF in enabling partners to secure additional funding for fuel poverty work**

### Impact: TIF programme delivery partners [large and small measures] believed involvement in TIF helped to reduce fuel poverty, cold-related morbidity and carbon.

Of the nine partners who answered this question, all reported that TIF funding had helped to alleviate fuel poverty. Eight reported that TIF has helped with carbon reduction targets; seven reported that TIF has helped cold homes/fuel poverty-related targets; two reported that TIF has helped with cold-related morbidity; one with cold-related mortality and one noted that TIF funding had helped with something 'other'.

The in-depth responses suggested some positive impacts on energy expenditure of households, households' well-being and SAP ratings.





Figure 17

Has the Technical Innovation Fund (TIF) funding helped with any of the following (large measures)?

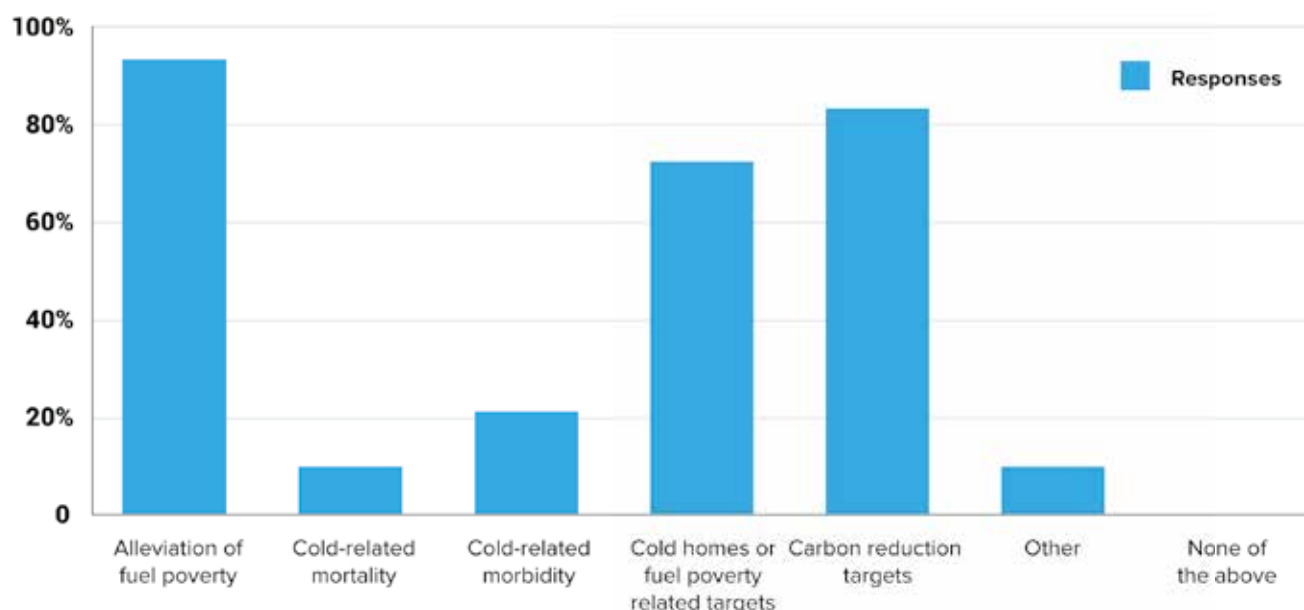
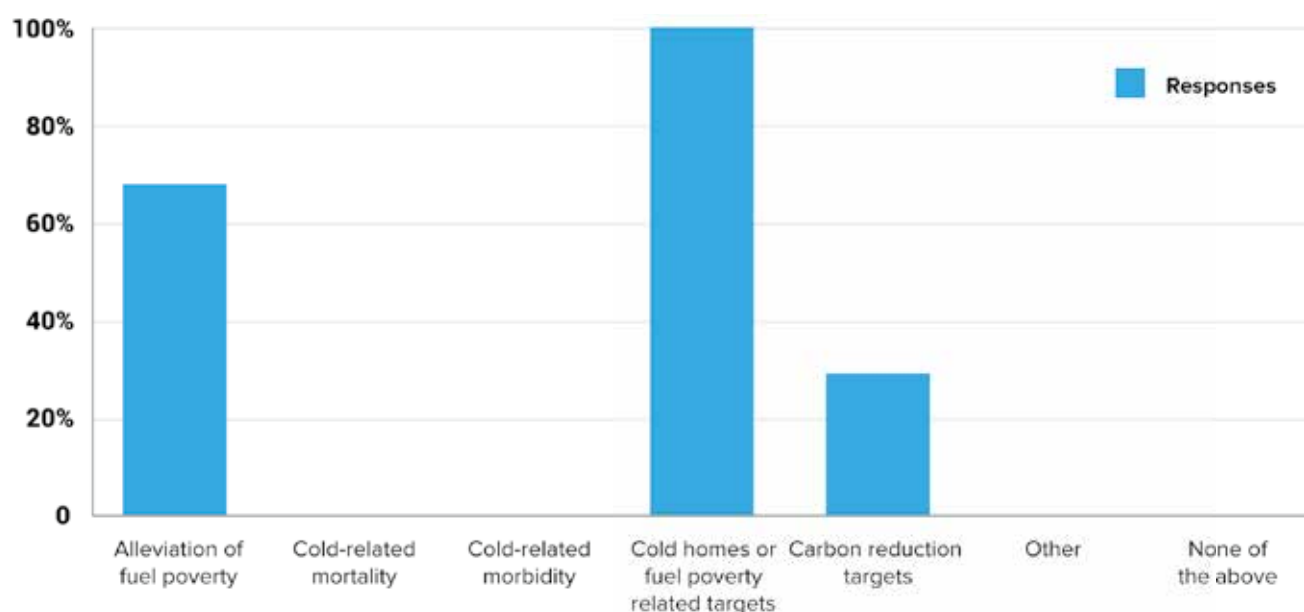


Figure 18

Has the Technical Innovation Fund (TIF) funding helped with any of the following (small measures)?



*"With the help of NEA there are now 75 properties [where residents] have reduced their energy bills and increased the standard of living for the tenants living there. Many of the tenants that benefited from the scheme have saved £100s on their annual bills, and do not now dread the onset of winter as they did previously. If it wasn't for the foresight of NEA to embark on this scheme, many of these people would still be choosing between heating and eating during the colder months of the year. We now have both happier tenants and a more sustainable tenancy for NCHA, with less complaints and a SAP rating in line with their targets."*

**Jon Kilburn (Operations Manager, Greenvision Energy Ltd)**

*"Nottingham Community Housing Association (NCHA) is committed to upgrading existing homes to improve the energy efficiency and help reduce fuel bills for our residents. The scheme benefited tenants in fuel poor households to a great degree, and thanks to NEA guidance and assistance this was given to people who need the help most but sometimes slip between the cracks of conventional funding streams due to eligibility. NEA were indispensable in helping NCHA to deliver an innovative and very successful energy project which helped tackle fuel poverty in households across Nottinghamshire".*

**Andrea Griffiths-James (Energy Services Co-ordinator, Nottingham Community Housing Association)**

## Impact: TIF programme delivery partners [installing both large and small measures] believed their involvement in TIF helped to develop existing relationships and forge new ones.

The majority of respondents from the large measures programme felt projects had strengthened existing relationships (six respondents). Three respondents felt the project had helped them to develop new relationships.

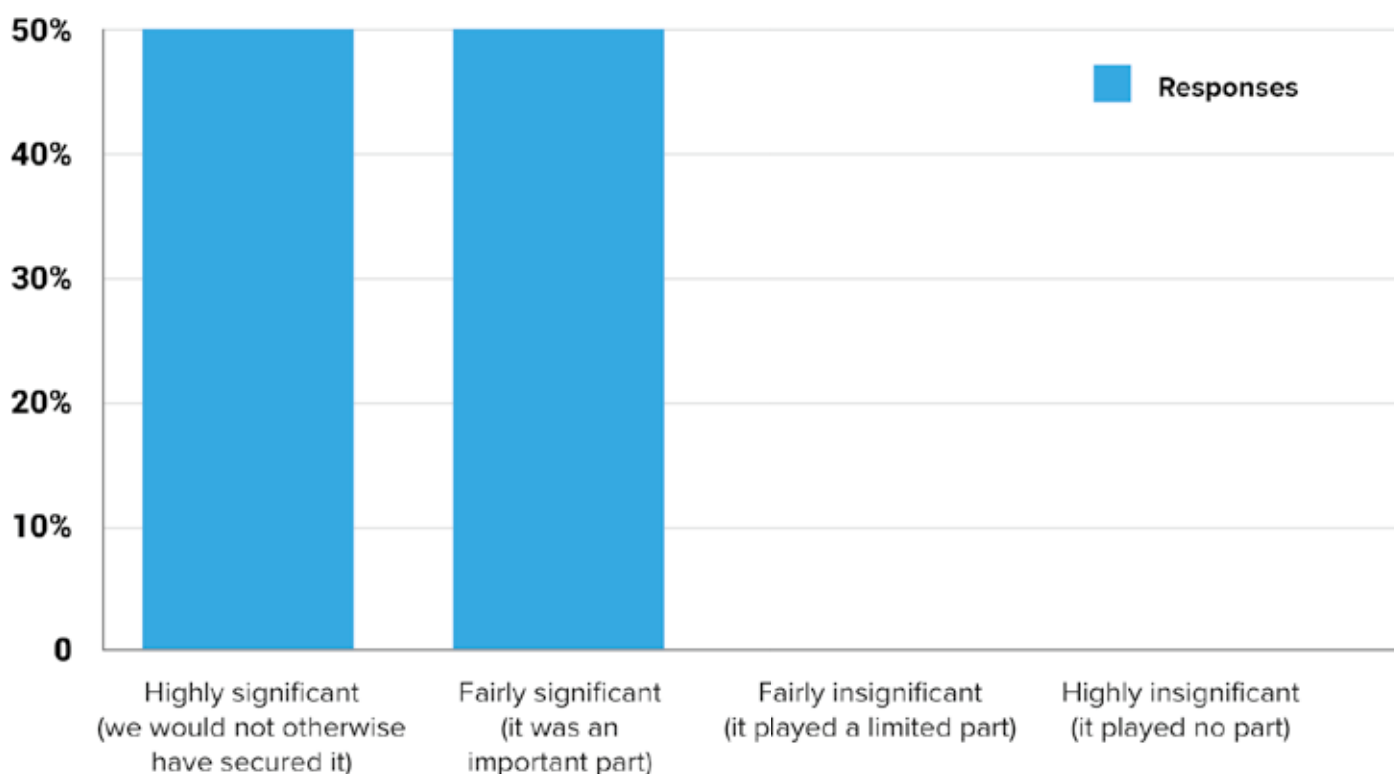
In the small measures programme, half of respondents felt that the project had helped them to either strengthen an existing relationship (37.5%) or enabled them to develop a new delivery partner or contractor relationship (12.5%).

## Impact: For some partners, involvement in TIF helped to secure additional income

Where partners had been able to secure additional funding for their fuel poverty work, all respondents felt that their involvement in TIF had been highly significant (50%) or fairly significant (50%).

Figure 19

How significant do you think your involvement in the TIF was to you securing additional funding?



*"TIF has been an aspirational programme delivering real insight into the next generation of heating technologies; supporting future uptake, whilst making a tangible difference to a vulnerable customer demographic. It has been a pleasure to work with a like-minded organisation with a social impact agenda and refreshing to see funding linked to a monitoring requirement, serving to enhance value for money with knowledge attained and shared".*

**Craig Kaminsky (Sustainable Properties Manager)**  
Home Group

## Delivery insights and lessons learnt

The Technical Innovation Fund is a large-scale multifaceted programme involving many partners. Delivery at scale invariably comes with challenges and lessons learnt along the way. NEA and partners have reflected on some of these to help inform future programme delivery. In framing this section, we are sharing delivery insights and lessons learnt at three levels:

- **Programme development**
- **Programme delivery**
- **Overarching insights**

The detailed performance of each of the technologies is reported in the individual project reports which will be available from NEA's website.

[www.nea.org.uk/hip/technical-innovation-fund/](http://www.nea.org.uk/hip/technical-innovation-fund/)



Programme development	Insights	Lessons learnt
	Social housing provider's attitude to risk and innovation.	There is wide variance in and attitudes to innovation amongst social housing providers. Further investment in programmes like TIF would seek to distil concerns and better inform the deployment of innovative technologies across the UK housing stock.
	SAP can suppress innovation.	Very few innovative technologies have been tested and included in the 'Product Characteristics Database' which is used by RdSAP software, so cannot be assessed through current SAP methodology. If improving SAP remains a key driving factor in improving energy efficiency of housing it can prohibit innovation amongst social housing providers where achieving a carbon improvement may be a fundamental driver. The accreditation process needs to be streamlined.
	Allow additional time for the due diligence.	Watertight due diligence on delivery partners is vitally important to protect partners and programme beneficiaries. To avoid delays in programme delivery, factor in additional time and guide partners through this process using workshops.
Programme delivery	Insights	Lessons learnt
	Maintaining momentum with delivery partners.	Due to current economic challenges, social housing resourcing is fluid and subject to change. Where resourcing is reduced, it may be necessary to reduce the size of a trial and redistribute funding elsewhere. Identifying which existing trials can be scaled up and having other reserve trials ready can help to redistribute funding should this issue be encountered.
	Installation of monitoring equipment.	<p>Installation of monitoring equipment requires detailed knowledge and skills. To reduce human error, limit unnecessary disturbance to vulnerable groups and maintain quality, dedicated trained people should be used to install monitoring.</p> <p>Where NEA staff cannot be used, training should be provided to third parties including installer partners.</p>
	Automated and analogue monitoring equipment.	Automated monitoring is expensive and can fail due to inappropriate handling, battery or technical issues. Where monitoring is not viewable on a web portal, time should be built into a project to visually check equipment at various points during the monitoring period. Consideration should be given to purchasing monitoring which allows remote data access – generally more expensive than locally-stored data systems.
	Monitoring vulnerable groups.	Working with vulnerable groups raises probability of losing equipment and access issues during follow-up visits. Incentives and well-trained frontline workers reduce such risks.
	Gaining historical meter readings from energy suppliers.	Although it is possible to obtain historical meter readings from suppliers, it can take some time and there is lack of consistency between suppliers as to how this information is provided. Automated monitoring should be deployed wherever possible to remove the need to obtain supplier data, or rely on householders retaining energy bills or periodically reading their utility meters.



## Overarching insights

Insights	Lessons learnt
Encourage gap and/or match funding.	Gap and/or match funding helped to widen the scale of the programme. It also helped address some of the additional unforeseen costs that can be incurred when installing measures into vulnerable households.
Envisage issues before they arise, plan ahead to proactively respond to challenges during technical trials.	When deploying innovation there is an increased risk of technical failure or nature of the installation being unsuitable for the end user. Produce back-up plans to enable swift response to householder needs.
Always keep the resident at the core of the programme. Poor delivery and engagement should not be tolerated.	Poor delivery and engagement with the residents should not be tolerated. Incentivise and manage engagement effectively. Vulnerable householders require tailored engagement methods. To help improve understanding of new technologies, written materials supplied by manufacturers may need to be rewritten and delivered in alternative formats to suit capabilities and needs of vulnerable beneficiaries.
Do not fit and forget. Fit, engage and support.	Check engagement before, during and after installation of intervention to check householders can use the measures effectively.



# Recommendations

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Our TIF programme has provided real insight into the challenges and opportunities when deploying innovative technologies in vulnerable households. It is important we clearly set out some recommendations for policy practitioners, manufacturers, local authorities and social landlords to help inform future programme delivery.

## Policy practitioners

- At a policy level, NEA calls for further support by way of incentives for social and private housing to stimulate innovation and the application of new technologies with potential to reduce fuel bills whilst improving thermal comfort.
- Many of the technologies installed under TIF had not gone through the testing process required for inclusion in RdSAP methodology (the product characteristics database). This can prevent local authorities and social landlords from investing in innovation where no SAP improvement is possible.
- Across the private sector, the pace of innovation in home energy technologies is increasing. Many technologies are currently targeted towards more affluent able-to-pay consumers. It is essential that innovation can bring about equitable opportunities for all consumers regardless of circumstances. Policy makers should help to create and stimulate the right market conditions to encourage private and social landlords to deploy innovative domestic energy technologies.

## Manufacturers

- NEA believes that there is huge potential for new technologies to provide solutions for some of the 4 million UK households currently living in fuel poverty, particularly those residing in properties which have traditionally been considered too difficult or expensive to include in mandated fuel poverty and energy efficiency schemes. However, more robust monitoring and evaluation is needed to understand the application of these technologies and assess their suitability for inclusion in future schemes. Further trials would help to inform future product development and improve end user experience.
- Guidance materials issued with innovative technologies need to be tailored to the needs of vulnerable consumers.
- Manufacturers should widen communication channels and formats beyond the standard instruction manuals which are often not appropriate. NEA would welcome further innovation in this area.
- Manufacturers should provide more hands-on support to social landlords and their contractors when technologies are installed. Doing so would improve the quality of installations, support to householders and improve the overall satisfaction from householders.



## Local authorities and social housing providers

- The pace of technological development is creating real opportunities to improve domestic energy efficiency. Innovation should be embraced but deployed with caution. Trials provide an opportunity to learn about the right environments and conditions for each technology. They also help to instil further confidence in the technology before investing in wider deployment.
- Additional time and resource should be factored in to support vulnerable consumers through the installation process and beyond. Dedicated 1-1 support by trained personnel is particularly important when unfamiliar technologies are deployed in vulnerable households. Do not fit and forget.
- Ensure a dedicated point of contact is applied between delivery partners and contractors. Doing so helps to improve the flow of information and overall end user experience.
- Local authorities and social housing providers should actively share and disseminate the outcomes of trials. Go-to housing bodies such as National Housing Federation should encourage this practice to help inform future deployment and engagement when deploying innovative technologies.



## Looking forward

**Our TIF programme continues to deliver real insight into the opportunities and challenges met when deploying innovative technologies into vulnerable households. During the remainder of 2017 and into 2018, we will undertake a programme of dissemination of the individual and product and project results to ensure all programme insights and lessons are shared to help improve future programme delivery.**

**NEA has been granted approval by the Fund Control Committee (FCC) to extend the monitoring of fourteen TIF projects to improve on the data collected. Data loggers will be replaced to continue monitoring TIF measures over the winter of 2017-2018, with analysis and reports expected during June 2018. Efficiency savings and interest generated from proper investment of advanced payments across HIP is also funding a further two trials, one to test a heating control in tower blocks in Walsall and another in North Devon which will test the performance of an innovative battery storage solution for households on Economy 7 tariffs. The results of these trials will be available in summer 2018.**

**Further information about these and all project reports are available on NEA's website [www.nea.org.uk/hip/technical-innovation-fund/](http://www.nea.org.uk/hip/technical-innovation-fund/).**

# Delivering the Technical Innovation Fund

## Delivering TIF required involvement from many teams within NEA

### Technical

NEA's experienced technical team coordinated overall delivery of TIF, including administering the grants, liaising with partners, and undertaking all technical monitoring and evaluation.

### Research and Policy

NEA's Research and Policy team were responsible for social research activities within the TIF programme. They designed and facilitated postal and telephone surveys with beneficiary households and conducted in depth interviews with partners. The results of these surveys are illustrated in this impact report. Further detailed analysis will be available from the autumn.

### Training and Quality Standards

NEA's Training and Quality Standards team played a pivotal role in training frontline workers who advise and support vulnerable households. Under TIF 2, 26 half-day 'Preparing for winter' courses were delivered, training a total of 292 frontline workers. All sessions were delivered on time and at no cost to partners. Evidence from our evaluation shows participants really valued the sessions and are now cascading the information to vulnerable consumers on a daily basis.

NEA would like to thank all partners, installers and referral agencies, who have participated in the Technical Innovation Fund programme, without whom we would not have brought direct benefits to 2,166 low-income households or access to invaluable data and residents' views on the impact the technologies have had. We would also like to extend our thanks to the independent members of our Technical Oversight Group who assisted in the selection of our TIF projects, ensuring an appropriate, independent and impartial assessment process.

### Business Support

NEA's Business Support Team helped to administer various elements of the TIF programme, helping to arrange household interviews, logging monitoring equipment and customer incentives, collating consent forms and cascading information across the TIF programme.

### Finance

NEA's Finance Team reviewed and processed all financial claims from partners supporting them with headline reports and recording details of the measures installed.

### Communications

NEA's communications team supported TIF grant recipients in their communications activities, and assisted in developing a range of resources to promote their projects. In the following months they will be working on dissemination and outreach activities to share the findings and insights from TIF, and raise awareness of the role that new and innovative technologies can play in tackling fuel poverty.





## NEA's Technical team

NEA is the national fuel poverty charity, working to ensure that everyone in England, Wales and Northern Ireland can afford to stay warm and healthy in their homes.

Our technical team provides consultancy services to a wide variety of organisations, including housing associations, manufacturers, network operators and local government on best use of technical solutions to alleviate fuel poverty. Placing low-income and vulnerable householders at the heart of what we do, we work with academic and industrial partners to develop and trial products with the ultimate aim of providing solutions to tackle fuel poverty in homes which are difficult or expensive to heat. The team evaluate a range of interventions including technologies used for heating, insulating and storing and controlling energy in the home.

Findings from all of our work are communicated to those with commercial and political influence and used by others in campaigning to end fuel poverty.

### Our experience

NEA's technical team has gained extensive academic and practical experience within the energy industry. Each of the team members holds a degree, Masters qualification or PhD in energy or environmentally-related disciplines to complement their years working within the sector. Our team's abilities and attributes are illustrated in the skills matrix below.

### SKILLS MATRIX

Project development  
& management

Vast experience of engaging and  
working with vulnerable households

**Building Physics, including air  
movement, thermal performance  
and comfort, control of moisture  
and energy consumption**

Risk management

Data analysis and presentation



### SKILLS MATRIX

Procuring of resources

Stakeholder engagement

**Monitoring and evaluating technical solutions  
for housing associations and local authorities**

Report writing and  
making recommendations

**Awareness of the environmental, social and  
economic problems of deprived areas**

Communicating results



#### Please contact:



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## Appendix A: Our grant recipients

### 30 TIF programmes

Arun District Council  
Aspire Housing  
Ceredigion County Council (x3)  
Cheshire West and Chester (x2)  
Energy Solutions (North West London)  
Hafod Housing Association  
Halton Housing Trust (x2)  
Home Group  
New Charter Group  
North Tyneside Council  
Northwards Housing (x2)  
Nottingham Community Housing Association (x2)  
Royal Borough of Greenwich  
Sandwell Metropolitan Borough Council  
South Holland District Council (x2)  
Sustainable Home Survey  
The Riverside Group (x2)  
Together Housing Group  
Valleys to Coast Housing Ltd  
YES Energy Solutions (x3)

### 14 extended TIF programmes

Amicus Horizon  
Camden Council  
Cheshire East Council  
Colchester Borough Homes  
Home Group  
Moat Homes  
Nottingham Community Housing Association  
Nottingham Energy Partnership  
Ongo Homes  
The Guinness Partnership  
The Riverside Group  
Wakefield Council  
YES Energy Solutions  
Your Homes Newcastle

### 2 additional TIF programmes

Walsall Housing Group  
North Devon Homes



## Appendix B: Eligibility criteria

1. **Fuel poverty status** - Be 'at risk of' or 'living in' fuel poverty (i.e. either qualifying under the 'low income high cost' definition or more generally living in a 'cold' home that they struggle to afford to heat) and in need of heating or insulation measures.
2. Live in a property with an **EPC band D or below**. (Exceptions were approved)
3. Tenure – **private rented, social housing or owner occupier status permitted**, with flexibility to move across tenure subject to NEA approval. Residential care and business properties do not qualify.
4. Income or benefit status - eligible individuals must also:

**Have a gross household income less than or equal to £16,010 per annum**

**OR** be in receipt of one or more of the following **benefits**:

### **Pension credit**

### **Income Support or income-based Jobseeker's Allowance and**

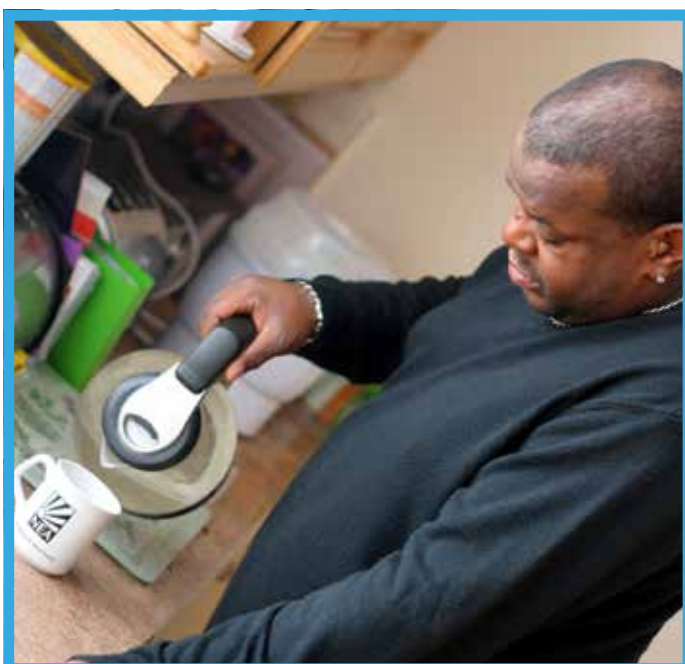
1. A disability or pensioner premium
2. A child who is disabled
3. Child Tax Credit that includes a disability or severe disability element
4. Have responsibility for a child 0-16 years living with them (up to 20 years if in full time education other than higher education)

### **Income-related Employment and Support Allowance (ESA) and**

1. The support or work-related component of ESA
2. A severe or enhanced disability premium
3. A pensioner premium
4. A child who is disabled
5. Child Tax Credit that includes a disability or severe disability element
6. Have responsibility for a child 0-16 years living with them (up to 20 years if in full time education other than higher education)

### **Universal Credit and not be employed or self-employed and**

1. Get a limited capability for work element (with or without a work-related activity element)
2. Get the disabled child element in their claim
3. Have responsibility for child 0-16 living with them (up to 20 years if in full time education other than higher education)





## Appendix C: Monitoring equipment deployed (TIF)






Monitoring equipment deployed under TIF	Measuring
Room temperature/humidity, EL-USB-2	Indoor environmental and thermal performance
Event (pulse), EL-USB-5	Gas consumption and heat flow
Thermal probe, EL-USB-TP-LCD	Indoor environmental and thermal performance
Carbon Monoxide, USB-CO	Indoor environmental and thermal performance
AC and DC current, EL-USB-ACT (no clamp)	Electrical consumption
Mastech AC clamp (only), MS3302 & CP09 clamps	Electrical consumption
TGP4017 external temperature logger	Outdoor temperature
TV-4810 View 2, current clamp logger	Electrical consumption
Current & voltage data loggers, OM-PLCV	Electrical consumption
Event logger OM-CP-Pulse101A	Electrical consumption
Ultrasonic heat meter DN20	Heat and Flow
Qundis Heat 5 heat meters	Heat and Flow
Keromate fuel flow meter LSN39PE-A0	Oil consumption
Aquametro VZ04 Oil heating meter	Oil consumption
Landis & Gyr watt hour meter	Electrical consumption
Landis & Gyr 3 phase generation meter	Electrical consumption
BOBi gas meter	Gas consumption
Installation kit (bracket, unions, flex and stopcock)	Gas consumption
G4 Gas meter with unions and pulse output	Gas consumption
Burntec CO2 data logger	Indoor environmental and thermal performance
Plug-in power meter (13amp socket)	Electrical consumption
Optipulse logger and probe	Electrical consumption
LED pulse sensor	Electrical consumption









# Appendix D: Guide to technologies deployed under the TIF programme

Below are examples of some of the technologies installed under the TIF programme

Technology	Outline	Application	Manufacturers	Manufacturer indicative costs and watts
<b>Far infra-red heating panels</b> 	<p>Effectively these are 'radiators' which work by using infrared technology which rather than heat the air instead heats objects directly. Further, they can provide thermal comfort at lower ambient temperatures.</p> <p>This works using electricity.</p> <p>The heating panels are usually toughened glass fronted with carbon matting inside and an aluminium or wooden frame.</p> <p>They contain no moving parts</p>	<p>All housing.</p> <p>Most commonly put in individual rooms such as living rooms</p>	<p>Logicor Infranomic Prestyl Herchel</p>	<p>250W - 1100W depending on size. Single 400w - £289 for one unit.</p>
<b>Modern storage heaters (quantum heaters/high heat retention storage heaters)</b> 	<p>Works like a normal storage heater but has more insulation which reduces the loss of heat. It is better able to store electricity during times of low demand.</p> <p>It has a self-learning algorithm which learns how much you use and when and reacts to this.</p> <p>It also monitors room temperature and outdoor temperature to keep within the required temperature settings the user sets</p>	<p>All housing but would be useful in rural areas and social housing where gas is not an option</p>	<p>Dimplex</p>	<p>2 bed flat: (1960 building reg) - £745. 2 bed flat: (1990 building reg) - £455. 3 bed semi detached (1960 building reg) - £1124. 3 bed semi detached: (1990 building reg) - £663. Output is: 700W; 1000W; 1250W; 1500W. Max storage: 10.9kWh; 15.4kWh; 19.3kWh; 23.1kWh. Cost of product: £630 - £800.</p>
<b>Boiler optimisation</b> 	<p>Boiler optimisation is designed to overcome the inefficiencies of boilers typically during 'dry cycling'; Dry cycling is when a boiler will unnecessarily fire up despite these already being sufficient heat in the system. When this happens the boiler tries to heat hot water which is already at a high temperature. The excess heat will disappear up the boiler flue. To overcome this boiler optimisation is a simple control which is added to the boilers to measure and regulate the boiler's flow by informing it when it really needs to fire up.</p> <p>Can be retrofitted.</p> <p>The claims are they can improve efficiencies from 10-20%</p>	<p>All homes but most are fitted to commercial properties such as police stations, schools, colleges etc.</p>	<p>Berenco Sabien E-Magine</p>	<p>Cost of installation: Various Predicted savings 10% - 20%.</p>
<b>Boiler flue gas heat recovery</b> 	<p>The flu gas heat recovery system can make boilers more efficient by capturing and reusing heat energy that would otherwise be lost by the flue. Those who have a condensing boiler will not need a FGHR system as these already have one. If people have a standard boiler then a FGHRs will improve the efficiency by forcing the flue gas to turn into liquid water which retains some heat. This heat is then recycled and is also used to preheat water.</p> <p>It is a small device installed at the top of the boiler.</p> <p>They can be fitted quite quickly; often within 30 minutes.</p>	<p>Fuel poor homes and homes without a condensing boiler</p>	<p>Gas Saver Vaillant Energycatcher</p>	<p>Costs £650 - £750. Saves more money if the boiler is older. Installation: approx. £300- £500. Savings: Medium property with modern boiler £40. 80% efficient boiler medium property: £80.</p>
<b>Gas absorption heat pumps</b> 	<p>GAHPs essentially work like an air conditioning unit in reverse, capturing low grade heat from the surrounding environment including; heat from the sun, air, water or soil, and converting it into high grade heat for space heating and domestic hot water. However, while an electric heat pump uses an electric driven compressor, a GAHP uses gas (or LPG) to drive the heat transfer process.</p>	<p>Normally commercial property but can be used in dwellings but not commonly done</p>	<p>Robur (commercial) Baxi Bosch</p>	<p>Due to low level domestic use it was very difficult to find values.</p>

Technology	Outline	Application	Manufacturers	Manufacturer indicative costs and watts
<b>Hybrid heating technologies</b>  <b>1. Gas combi boiler and air to water heat pump</b>  <b>2. Calor Gas supply and air water heat pump</b>	<p>These work like traditional heating systems but use two different technologies/fuels such as gas and heat pumps</p> 	<p>Tends to be suitable for terraced and semi detached.</p> <p>Can be used for off-gas properties</p>	<p>Mitsubishi Electric Daikin Glow worm</p>	<p>On-gas 3 bed detached property (hybrid – 5KW heat pump and combi boiler): Capital: £3,600; Additional Investment: £1,600; Running cost reduction: 2.9%; RHI benefit: £3,586; Pay back 3.1 years.</p> <p>Off-gas 3 bed detached property (hybrid – 8.5KW heat pump and combi boiler): Capital: £4,300; Additional Investment: £4,300; Running cost reduction: 21.4%; RHI benefit: £7,202; Pay back 4.2 years.</p>
<b>Heating controls and zoning</b>  	<p>There is a wealth of different heating controls available on the market, but there are principally two types:</p> <p>1- Remote Heating Controls 2- Smart Heating Controls</p> <p>Remote heating controls allow households to control their heating via their laptop, mobile or tablet. Commonly you can control rooms individually.</p> <p>They can even detect when windows are open and turn the heat off. The app allows you to control heating schedules and heating zones. Other smart technologies include: smart room thermostats which can be controlled by mobile phone. Smart controller on a boiler which can be controlled by a phone, some apps turn off the heating when you are a certain distance from your home (using GPS) and then start to turn it on again when you approach a certain distance to your home.</p>	<p>All housing types and can be used for standard central heating, and biomass boilers</p>	<p>Various Honeywell Tado HeatGenius Hive NEST CoConnect</p>	<p>Smart thermostat - approx £150-£200 per unit. Smart app with devices - £150 per unit. Heat genius - £800 per unit.</p>
<b>Air to air heat pumps</b>  	<p>The heat pump comprises an outdoor and an indoor unit which convert latent energy in the air (even on the coldest days) into heat for your home. The outdoor unit extracts the energy in air outside the property. This heat, absorbed by refrigerant solution within the unit, is turned into hot air by the indoor unit and distributed within the property.</p> <p>Air source heat pumps are suitable for a wide range of installations including apartments, smaller homes and conservatories. It's operated using a remote control.</p> <p>They tend to be smaller properties and areas rather than large homes.</p>	<p>Smaller properties</p>	<p>Bosch Daikin</p>	<p>Costs £3000 - £7000</p>
<b>Domestic biomass</b>  	<p>Wood-fuelled heating systems, also called biomass systems, burn wood pellets, chips or logs to provide warmth in a single room or to power central heating and hot water boilers.</p> <p>A stove burns logs or pellets to heat a single room - and may be fitted with a back boiler to provide water heating as well. A boiler burns logs, pellets or chips, and is connected to a central heating and hot water system.</p>	<p>Domestic and commercial homes.</p>	<p>Baxi Viessmann various</p>	<p>RHI eligible. Cost: £5000+ (will be more if automatic) Installation: varies Savings EST estimates: Replacement of electric storage heaters - £490-£800 a year savings with RHI of £1,385 to £2,090 Savings EST estimates: Replacement of gas non condensing boiler - £10 - £70 savings plus £1,385 to £2,090 Pellets £210 per tonne</p>
<b>Micro CHP (conventional)</b>  	<p>Micro-CHP or micro combined heat and power is a technology which generates heat and electricity simultaneously, from the same energy source, in individual homes or buildings. The main output of a micro-CHP system is heat, with some electricity generation, at a typical ratio of about 6:1 for domestic appliances.</p> <p>A CHP boiler will produce your heating requirements just like a normal boiler, but in the process collects the gases to drive an internal generator to create electricity. The electricity created is then fed back into your property and can power lights and appliances for free as long as enough energy is produced.</p> <p>Can benefit from the feed in tariff.</p>	<p>Domestic and commercial property</p>	<p>Baxi Whisper-Gen Ceres Power Flow Energy</p>	<p>Gas CHP costs £6000-£7,400. LPG costs £8,000. Pay-back believed to be closer to 10 years rather than the 5-6 years stated. Some companies offer monthly payments if you allow them to have FIT for 5 years. Flow energy will install and purchase of boiler for £6000.</p>
<b>Hot water solar Thermal</b>  	<p>Solar water heating systems use solar panels, called collectors, fitted to your roof. These collect heat from the sun and use it to heat up water which is stored in a hot water cylinder. A boiler or immersion heater can be used as a back-up to heat the water further to reach the temperature you want.</p>	<p>All homes but would really benefit rural and fuel poor homes</p>	<p>Genersys-solar Solar UK Viridan Solar Viessman AES Ltd various</p>	<p>Typical costs: £3,000 - £5,000. Ongoing maintenance costs such as replacing the anti-freeze. Can get RHI (2 person hh could get £195; 3 person hh £265). EST fuel saving estimates: (existing system gas: £65 per year; electric: £75 per year; LPG: £125 per year). Nothing specific for fuel poor homes.</p>

Technology	Outline	Application	Manufacturers	Manufacturer indicative costs and watts
<b>Electrical storage and heat energy storage</b> 	<p>Solar storage battery systems allow you to store your excess energy and use in the night. This is used with solar thermal. There are some smart systems which can be attached to wifi and managed by phone app etc.</p>	All homes but would really benefit rural and fuel poor homes	Bosch Solax Tesla Powervault	<p>Storage capacity varies but can be between 4.4 to 13.2 kWh.            Installation can be done in a day.            Depending on size but average is £2,500+.            Replacing the batteries every 5 years can cost £500.</p>
<b>Heat recovery ventilation (mechanical heat recovery ventilation)</b>	<p>Fresh air is fed directly from outside into the ventilation system initially through a filter, then the heat taken from the extracted air is used to warm the fresh filtered air in the heat exchanger and then enters the ducting system.</p> <p>This creates a whole-house ventilation system by supplying preheated air. Air is ventilated into other rooms by undercuts on the doors and by use of transfer grills.</p>	All homes but suggestion that work best in airtight dwellings	Airflow Nuaire Greenwood Vent Axia 	<p>Cost: £1500 - £3000.            Potential savings £200.            Heat exchange efficiency 88%.            Smallest unit 90kWh/per year costs £10.82 to run and could recover £94.40 per year (supplier provided data)</p>
<b>Radiator fan (radiator booster)</b> 	<p>A radiator booster is a small fan which sits on top of a radiator and blows hot air around the room. They come in different sizes and have a different number of fans from 2 to 6.</p>	All households but disclaimer not to use with oil boilers, electric storage or electric convectors	Radfan MK3	<p>mall (2 fans) - 1.5W power and £2 a year running costs. Costs: £39.99.            4 fans - 3 W power and £4 a year running cost. £69.99 to use.            6 fans - 4.5W power. £6 a year running costs. Approx £100.            Other brands are as cheap as £25</p>
<b>Voltage optimisation</b> 	<p>Voltage optimisation is where the incoming voltage to the home is reduced within the European tolerances which are 208v to 253v. Typically the UK grid provides voltages at 240v and although appliances will work between the tolerances the higher the voltage the more work they need to do, and the reduced efficiency and long-term life span of the appliance.</p> <p>This works by connecting a unit between the meter and the distribution board.</p>	In all households. Tends to be in commercial properties but this is being done domestically. Voltage optimisation is also being done at the same time as renewable technology suitable under FIT.	Apex Energy EMSc Protek	Unit costs between £200 - £600.





*Action for Warm Homes*

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