

**Heated seat covers in North Lincolnshire and North
East Lincolnshire**

YES Energy Solutions

Technical Evaluation Report

Background

About National Energy Action

National Energy Action is the national fuel poverty charity working across England, Wales and Northern Ireland, and with sister charity Energy Action Scotland (EAS), 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, it undertakes a range of activities to address the causes and treat the symptoms of fuel poverty. Its work encompasses all aspects of fuel poverty, but in particular emphasises the importance of greater investment in domestic energy efficiency.

About the Technical Innovation Fund

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.

The Technical Innovation Fund (TIF) which was designed and administered by NEA, formed part of the larger £26.2m Health and Innovation Programme along with the Warm Zone Fund and Warm and Healthy Homes Fund.

TIF facilitated a number of trials to identify the suitability of a range of technologies in different household and property types and had two strands: a large measures programme to fund the installation and evaluation of technologies costing up to a maximum £7,400 per household, and a smaller measures programme with up to the value of £1,000 per household. It launched in May 2015, with expressions of interest sought from local authorities, housing associations, community organisations and charities wishing to deliver projects in England and Wales.

Technical monitoring and evaluation

NEA has been working with grant recipients to monitor the application of these technologies and assess performance, as well as understand householder experiences and impacts.

Some residents were asked to take regular meter readings. In some instances, a control group of properties that had not received interventions under TIF were also recruited and monitored.

The technical product evaluation was conducted alongside a social impact evaluation to inform our understanding of actual energy behaviour changes, perceived comfort levels and energy bill savings, as well as any other reported benefits. Householders were asked to complete a questionnaire both before and after the installation of the measures which captured resident demographic data including any health conditions. Small incentives in the form of shopping vouchers were offered to maintain engagement over the course of the evaluation period.

The research was conducted according to NEA's ethics policy, which adopts best practice as recommended by the Social Research Association (SRA) Ethical Guidelines 2002.

An accompanying programme of training and outreach work was also delivered to 292 frontline workers to increase local skills and capacity.

Individual project reports are being compiled and will be made available publicly on NEA's website from September 2017, along with a full Technical Innovation Fund Impact Report.

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With grateful thanks to our project partners:

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Table of contents

Background	2
Acknowledgements.....	4
Table of contents	5
Executive summary	6
1. Project overview.....	9
1.1 Introduction.....	9
1.2 Aims	9
1.3 Context	9
1.4 Project timeline	10
1.5 Attracting beneficiaries and establishing the monitored group.....	10
2. Social impacts	11
2.1 Householder demographic details	11
2.2 Qualitative feedback given pre-installation of the heated seat pads.....	11
2.3 Qualitative feedback given post-installation of the heated seat pads	12
2.4 Householder acceptance and satisfaction.....	12
2.5 Perceived cost	13
2.6 Perceived comfort and benefits	13
3. Technical evaluation	15
3.1 Monitoring equipment	17
3.2 Evaluation methodology	17
3.3 Factors affecting the evaluation methodology	17
3.4 Monitoring results	17
4. Conclusions and recommendations	21
4.1 Conclusions.....	21
4.2 Potential impact on fuel poverty	22
Appendix 1: Glossary of terms	23
Appendix 2: Case studies	24
Appendix 3: Health and Innovation Programme 2015 - 2017	25

Executive summary

Project overview

This project was delivered by YES Energy Solutions in collaboration with North Lincolnshire Council and North East Lincolnshire Council. Its aim was to determine if B-Warm heated seat covers could prove a low-cost solution to improving health and well-being and reducing energy usage in vulnerable and older households in North and North East Lincolnshire.

Context

Keeping warm and well at an affordable cost is a challenge for the over 65s and for those with a more sedentary lifestyle due to ill health. There are 210 Excess Winter Deaths (EWD) in North Lincolnshire and 150 EWD in North East Lincolnshire every year. Many of the target group for this project were living in older, difficult to heat homes such as solid walled properties or those with little or no insulation, especially in the private sector. It was hoped that using the heated seat pad would allow the householders to maintain a consistent, comfortable temperature (18-21°C) during long periods of immobility without having to turn up the heating, thereby avoiding large energy bills. The running costs of the heated seat pad are estimated at approximately 0.5p per hour, according to the manufacturer.

B-Warm

Operates with a single control button, producing low level controlled heat with 4 adjustable settings from 10w to 45w. It is relatively simple to install, removable and machine washable.

Amongst the benefits that are claimed for the measure are low running costs (less than 10p per day), providing low cost warmth for householders, in particular for those who for reasons of age or health are more sedentary. It is claimed the product can contribute to reductions in overall heating costs and can help to bring improvements in certain health conditions whilst aiding comfort.

The project

5 households were monitored as part of the project to assess the effectiveness of the B-Warm heated seat covers. Of this group, all were over the age of 70, and 4 out of 5 reported having a long-term health condition of disability. All residents lived in properties which had uninsulated solid walls and were heated by gas central heating. At the start of the project 3 of the 5 householders used at least one supplementary heating device.

Conclusions and recommendations

- 4 of the 5 householders monitored made a saving on their electricity bills. It should be noted that, as a matter of good practice, in all instances householders participating in the monitoring received comprehensive energy advice following installation of the measure. Therefore behavioural change must be factored in as a contributory factor in this saving. However it should also be noted that there was a high take up for provision of this low cost measure and the monitored group expressed high levels of satisfaction. The project has demonstrated that provision of such low cost measures enables effective engagement with more vulnerable households on energy issues in order to influence beneficial behavioural change
- Householders must maintain a recommended ambient room temperature whilst using the heated seat pad and not to reduce ambient heat as a consequence of feeling warmer whilst sitting on the heat pad. Our study shows that room temperatures recorded amongst the monitored group did not drop significantly lower than 18°C. and so this did not prove to be a concern during this study. However it is recommended that householders using the measure be clearly advised to maintain recommended ambient temperatures so as to avoid any risk of cold related illness, or increased risk of dampness should they be tempted to reduce room temperature.
- The manufacturer claims that the heated seat pad can be used for less than 0.5p per hour. Our study seems to support this claim, except in the case where the heated seat pad was used on a very high setting over a long period of time costing an average of 0.7p per hour. However, this is still very cost effective and the benefits are likely to outweigh the cost of using this product, even at higher settings.

Potential impact on fuel poverty

This study suggests that using the heated seat pad can provide improved comfort and wellbeing for vulnerable householders with poor mobility. There is evidence to suggest that householders were able to avoid turning up their heating as they were warm and comfortable sitting on the heated seat pad. Providing energy advice along with the B-Warm seat covers has contributed to savings in heating costs. The study has demonstrated that heated seat pads had a high degree of acceptability amongst householders and can be effective in improving comfort and wellbeing. This is not a measure that will have an impact upon fuel poverty in itself but may effectively be used in combination with other measures to reduce fuel poverty and improve comfort.

1. Project overview

1.1 Introduction

B-Warm is a portable heated seat cover manufactured by Homeglow Products Ltd. It is designed to fit most armchairs and sofas. It operates with a single control button, producing low level controlled heat with 4 adjustable settings from 10w to 45w. It is relatively simple to install, removable and machine washable.

Amongst the benefits that are claimed for the measure are low running costs (less than 10p per day), providing low cost warmth for householders, in particular for those who for reasons of age or health are more sedentary. It is claimed the product can contribute to reductions in overall heating costs and can help to bring improvements in certain health conditions whilst aiding comfort.

1.2 Aims

- The project aimed to evaluate the effectiveness of the B-Warm heat seat covers in improving the comfort, health and wellbeing of vulnerable and older people in North Lincolnshire and North East Lincolnshire. The project also sought to evaluate impact on energy usage and running costs.
- The recipients of the heated seat covers were selected via North Lincolnshire and North East Lincolnshire Council's established network of referral organisations, including their own housing team, Citizens Advice and Age Concern. Recipients were allocated on a first-come-first-served basis but had to meet certain criteria as per the requirements of the project (with regard to age, health conditions and vulnerability). Heated seat covers were provided to 94 householders.
- 5 householders from the 94 receiving this measure agreed to participate in NEA's monitoring.

1.3 Context

Keeping warm and well at an affordable cost is a challenge for the over 65s and for those with a more sedentary lifestyle due to ill health. There are 210 Excess Winter Deaths (EWD) in North Lincolnshire and 150 EWD in North East Lincolnshire every year. Many of the target group for this project were living in older, difficult to heat homes such as solid walled properties or those with little or no insulation. It was hoped that using the heated seat pad would allow the more sedentary householders to remain comfortable without having to turn

up the heating, thereby avoiding large energy bills. The running costs of the heated seat pad are estimated at approximately 0.5p per hour, according to the manufacturer.

1.4 Project timeline

The agreed timeline for the project was:

Installation period	August 2016 – January 2017
Monitoring period	September 2016 - June 2017
Evaluation period	August 2015– April 2017
Final Report period	July 2017

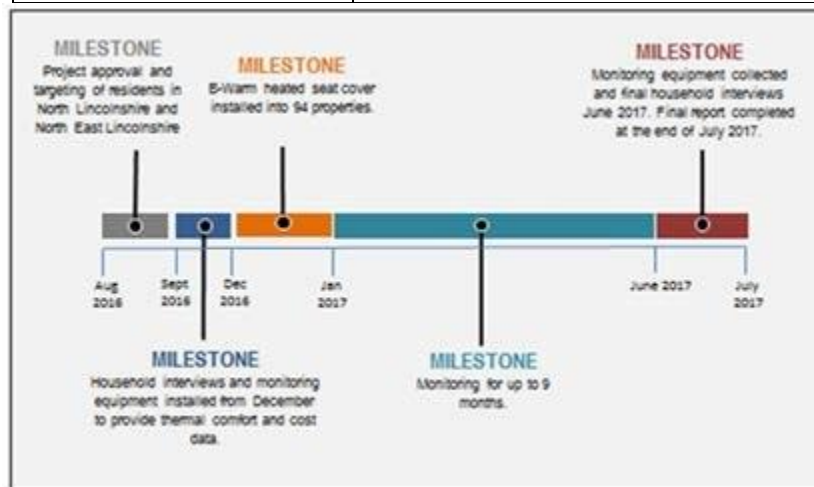


Figure 1.1 Project timeline

2. Social impacts

2.1 Householder demographic details

Local referral organisations in North Lincolnshire and North East Lincolnshire identified 94 householders who they felt would benefit from this measure on account of their age, health conditions and/or vulnerability.

5 of these households agreed to participate in NEA's monitoring activity to assess the effectiveness of the B-Warm heated seat covers in providing a low cost, low energy solution to improve the warmth and comfort of sedentary householders in the UK. Questionnaire responses were received from all 5 households. Of the households who submitted questionnaire responses, all were over 70; 4 were between 70-84 and 1 was over 85. All 5 of the monitored householders were retired. 4 out of the 5 monitored householders reported having a long-term health condition or disability. All 4 of these householders reported that their conditions were worsened by the cold. 3 of the 5 householders in this study stated that their health conditions are worsened by the cold.

All 5 of the dwellings monitored had uninsulated solid walls. The lofts in 4 monitored dwellings were insulated. Respondents to the questionnaires revealed that 2 lofts were insulated a further 2 properties are owned by a local housing association who confirmed loft insulation is present. All have only 50-150mm of insulation. 4 of the 5 monitored dwellings were fully double glazed, 1 has single glazing and wooden doors which are draughty and ill-fitting with uninsulated letter box. All 5 monitored householders had gas central heating and hot water. At the start of the project 3 of the 5 householders used at least one supplementary heating product in addition to their gas central heating

All the properties in the sample were gas centrally heated.

2.2 Qualitative feedback given pre-installation of the heated seat pads

Householders were asked which periods of the day they felt it was most important to have a warm home. Figure 2.1 shows the responses prior to installation in blue.

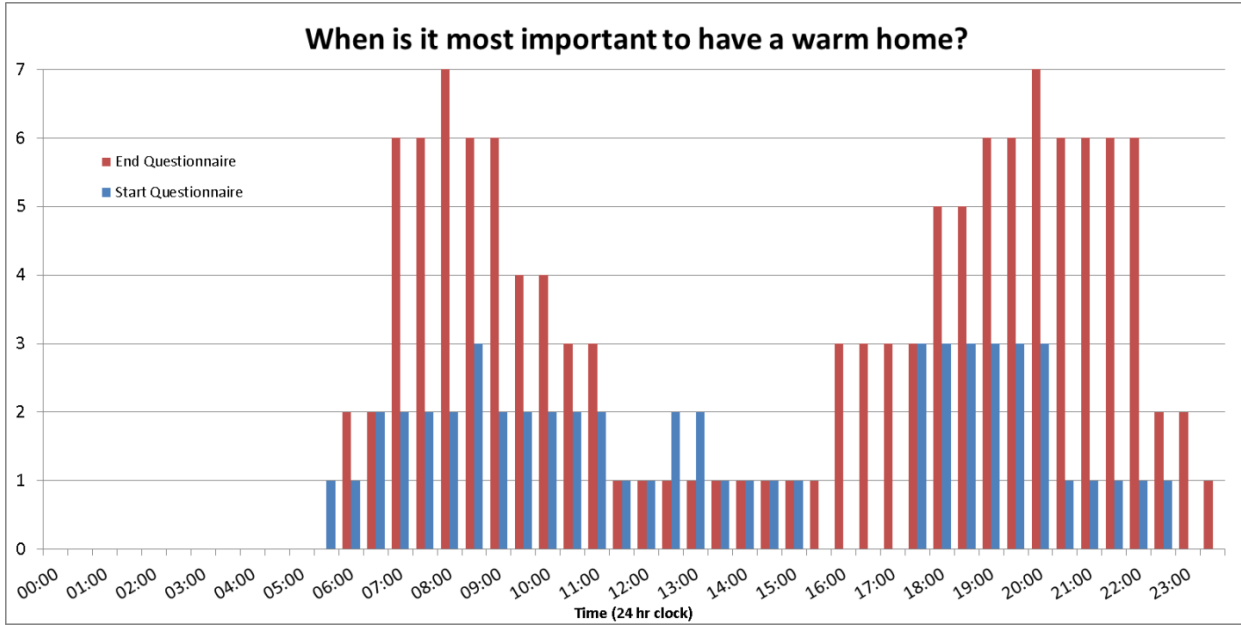


Figure 2.1 Times when it was important for the householders to have a warm home

2.3 Qualitative feedback given post-installation of the heated seat pads

Householders were asked if they were able to keep warm in their homes and 3 of the 5 householders said ‘no’ to this question (see chart below). High costs were cited as the reason for this by all 3 householders experiencing difficulties keeping warm. 4 of the 5 householders said they sometimes wear extra warm clothing in order to keep warm at home.

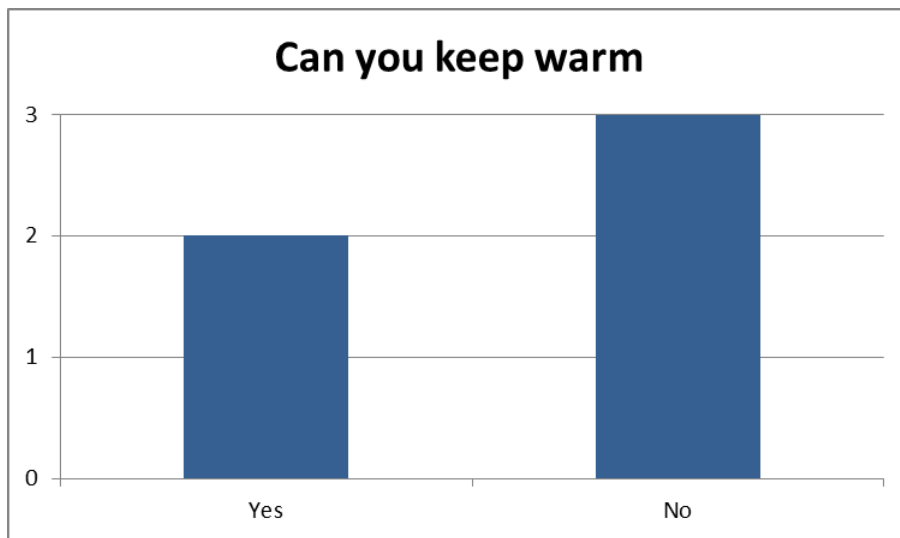


Figure 2.2

2.4 Householder acceptance and satisfaction

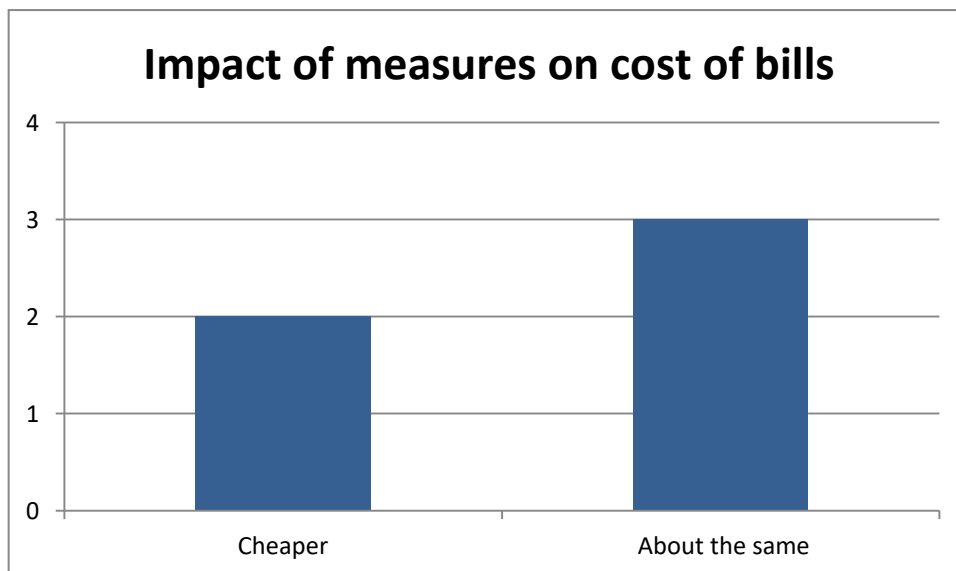
When asked about the benefits of having a heated seat pad installed, 2 householders reported that they had used their central heating less than they otherwise would have done:

“Having the seat cover stopped me being tempted to turn up the heating as I was warm.”

“I’m warmer personally which means I don’t use my heating as much.”

2.5 Perceived cost

When asked about the impact of the heated seat pads on the cost of bills, 2 of the 5 householders said they felt their bills were cheaper post-installation and 3 of the 5 householders said they felt their bills had remained the same.



3. Technical evaluation

Five households were involved in the monitoring of the B-Warm heated seat covers over a 9 month period. In each monitored property, technical monitoring equipment was installed to measure the effectiveness of the B-Warm heated seat covers. Two USB thermal data loggers were installed in each household. 1 data logger was installed in the living room and a second data logger was installed in the main bedroom. Plug in monitoring equipment was also installed in each household to monitor the electrical usage of the heated seat cover. The monitoring equipment was installed to monitor the effectiveness of the new system over a 9 month period including a full winter heating period.

3.1 Monitoring equipment

Thermal data loggers were used to record the temperature and humidity inside the property every hour. 1 thermal logger was installed in each of the monitored homes in either the living room or kitchen areas.



Figure 3.1 Lascar EL-USB-2 temperature and humidity logger

Temperature and humidity in each monitored property was recorded every 30 minutes using a Lascar EL-USB-2 temperature and humidity logger¹. 2 USB thermal data loggers were installed in each household, one the in the living room and one in the bedroom. Table 3.2 summarises the monitoring equipment used in the study.

Property Type	Monitoring Equipment	Number of properties
Monitored	USB thermal data loggers – two for each monitored heated seat cover properties	5
Monitored	Plug in electricity meters to measure heated seat cover consumption	5

Table 3.2 Summary of monitoring equipment

¹ Lascar EL-USB-2 datasheet https://www.lascarelectronics.com/media/2925/easylog-data-logger_el-usb-2.pdf (Accessed 12 May 2017)

3.2 Evaluation methodology

The project was evaluated using the monitoring equipment described in section 3.1, and represented by Figure 3.3.

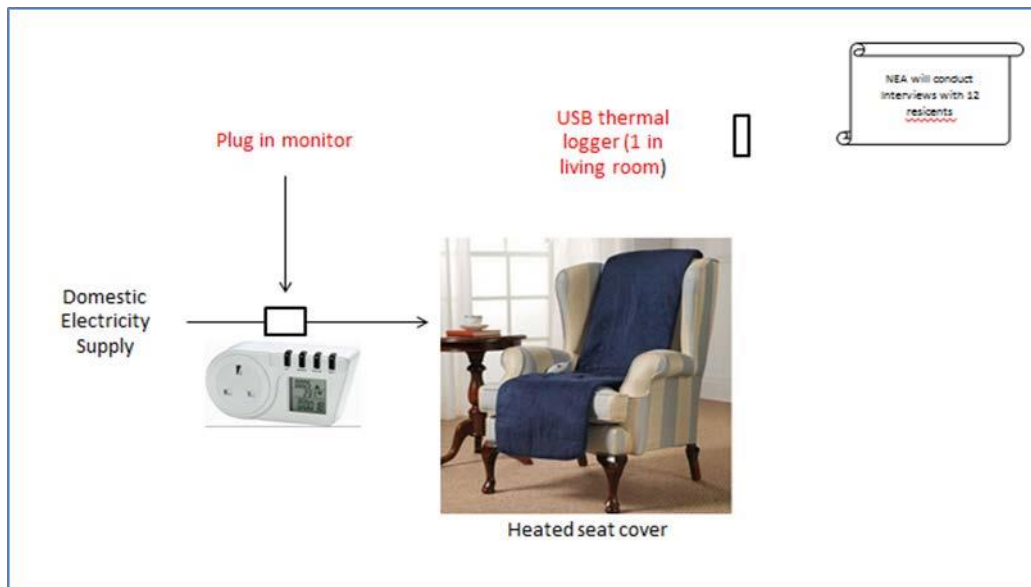


Figure 3.3 – Diagram illustrating the evaluation plan

3.3 Factors affecting the evaluation methodology

Issue	Description and mitigation
Size of monitoring group	Given the particular vulnerabilities of those householders referred by local partners to benefit from this measure, there are understandable challenges in recruiting a group of householders willing to participate in ongoing monitoring. 5 householders from amongst the 94 beneficiaries were willing and able to collect regular meter readings.
Start of monitoring	Installations were phased between September and November 2016.
Collecting data	At the end of the project the NEA Project Development Coordinator made appointments to visit all households to complete questionnaires, collect monitoring equipment and take final meter readings.
Meter readings	Meter readings were gathered by householders and from energy companies both for the monitored period and pre-install period.
B-Warm heated seat cover usage and energy consumption	The plug in energy monitors collected data on energy consumption in terms of hours of use and KWH used in those hours.

3.4 Monitoring results

Cost

20 year average degree-day comparison of savings								Region	East Pennines		20 year average		2145					
"Before" period								"After" period								Comparison		
Tech Ref	Period	Days	Total Period (kWh)	Cost per 30 days	Degree days	kWh per Degree Day	Estimated annual cost*	Period	Days	Total Period (kWh)	Cost per 30 days	Degree days	kWh per Degree Day	Estimated annual cost*	Estimated Saving #			
T-04	5th Aug 2015 - 6th May 2016	275	1,212.0	£21.15	1,787.00	0.678	£232.73	17th Sept 2016 - 2nd May 2017	227	965.0	£20.41	1,717.40	0.562	£192.81	17.15%			
T-03	16th Oct 2015 - 19th April 2016	186	1,233.0	£31.82	1,487.30	0.829	£284.48	14th Sept 2016 - 6th April 2017	204	1,635.0	£38.47	1,540.80	1.061	£364.13	-28.00%			
T-01	12th Dec 2013 - 14th April 2016	854	3,563.0	£20.03	3,738.40	0.953	£327.05	17th Oct 2016 - 5th June 2017	231	1,017.0	£21.13	1,756.10	0.579	£198.72	39.24%			
T-09	11th Sept 2015 - 14th Sept 2016	369	2,468.0	£32.10	1,977.90	1.248	£428.17	14th Sept 2016 - 2nd April 2017	271	1,519.0	£26.90	1,838.80	0.826	£283.47	33.80%			
T-06	20th Oct 2014 - 29th April 2016	557	3,014.0	£25.97	3,720.10	0.810	£278.02	23rd Nov 2016 - 26th May 2017	184	1,116.0	£29.11	1,485.60	0.751	£257.78	7.28%			
Average							0.904	310.089								0.756	259.381	13.89%
# 12 month estimated costs based on 20 year degree-day value for the region stated																		

Table 3.4 Influence of B-Warm seat cover on overall household energy consumption

Meter reading data recorded both before and after installation of the heated seat pads is shown in the table above. This data shows that 4 of the 5 households made a saving on their electricity bills following installation of the heated seat pad, whilst 1 household experienced higher electricity bills.

The householders were given comprehensive energy efficiency advice by NEA staff as part of this project and this may have influenced the energy behaviour of the householders in their homes. For example, they may have left fewer appliances on standby, used the washing machine only when full or boiled only the required amount of water in the kettle. These small behaviour changes may have been prompted by the energy efficiency advice provided and may have resulted in the reductions in electricity consumption shown. It is also possible that householders were using electricity for secondary heating prior to the installation of the heated seat pads and that this secondary heating was required for less time following the installation due to improved comfort. The number of variables makes it difficult to isolate the effect of just the heated seat pads on the electricity bills of the householders.

Analysis of the electricity consumption by the heated seat pad

Consumption data recorded using electricity consumption loggers give some further insight into the impact of heated seat pad usage on electricity bills. We have excluded T-09 from this analysis as the householder only used the heated seat pad for an extremely short period of time. Data recorded in the other 4 properties shows varying levels of usage and consumption.

Using the information from the data loggers we calculated the average hourly consumption rate of each heat pad. From this we can conclude that householders in T04 and T03 used their heat pads frequently on a low setting, the householder in T01 used the heat pad frequently on a medium setting and that the householder in T06 used the heat pad frequently on a very high setting.

Temperature and thermal comfort

The tables below show the temperatures recorded by the thermal data loggers which were installed in each of the properties. Loggers were placed in the living room and main bedroom of each property and temperatures were recorded every hour. The tables below show a 24 hour average temperature and the temperature during the peak desired heating period of 6-10pm.

	Property	24hr avg	6-10pm	Difference
Living rooms	T-01L	16.44	16.61	0.18
	T-03L	18.88	20.03	1.15
	T-09L	17.88	18.46	0.57
	T-04L	20.03	20.51	0.48
	Average	18.31	18.90	0.59
		18.93	19.67	
Bedrooms	T-01B	18.79	18.94	0.15
	T-03B	18.30	19.02	0.71
	T-09B	17.77	17.48	-0.29
	T-04B	19.15	19.54	0.39
	Average	18.50	18.74	0.24

Table 3.5

The data logger in property T-06 failed and so this property is excluded from this analysis. There is anecdotal evidence that the logger in the living room of property T-01 (L only) was placed near a window and so recorded temperatures which were not indicative of the room temperature. For this reason, recordings from T-01L have been excluded.

The thermal data loggers were installed at the same time as the heated seat pads and therefore no data is available on temperatures prior to installation. However, the data illustrated above shows that, with the exception of T-09, the temperatures in the living rooms and bedrooms in each property were within the recommended range for health and comfort (18-21°C). Temperatures in property T-09 were very slightly lower.

Humidity

The tables below show the humidity levels recorded by the data loggers which were installed in each of the properties. Loggers were placed in the living room and main bedroom of each property and humidity levels were recorded every hour. The tables below show a 24 hour average humidity and the humidity during the peak desired heating period of 6-10pm.

Property	24hr avg	6-10pm	Difference
T-01L	52.43	52.50	0.07
T-03L	46.71	45.91	-0.80
T-09L	45.61	46.34	0.73
T-04L	46.63	46.87	0.24
Average	47.84	47.90	0.06

T-01B	45.91	45.76	-0.14
T-03B	48.78	48.31	-0.47
T-09B	48.70	48.75	0.05
T-04B	49.45	49.32	-0.13
Average	48.21	48.04	-0.17

Table 3.6 – Relative Humidity (RH) recorded in the monitored properties

The data illustrated above shows that there was very little change in humidity levels during the monitoring period. This suggests that, as expected, the installation of heated seat pads did not have an effect on humidity. It is worth noting however that all of the properties where humidity levels were recorded showed levels which fall within the recommended levels for health and comfort, as shown in the chart below.

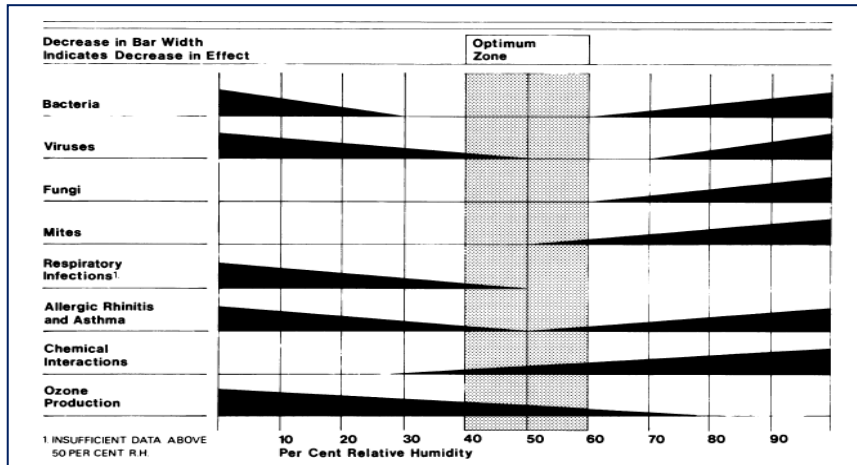


Figure 3.7 Diagram to illustrate the relationship between relative Humidity and pathogens / chemicals in the home

Performance comparison against manufacturer’s claims

The B-Warm heated armchair cover has been developed by Homeglow Products Ltd for those who suffer with the cold – the frail and elderly, discharged patients from hospital, or those with mobility problems and suffering from rheumatism. It is described as a simple, intuitive means of keeping people warm at relatively low cost. Using a single control button, the heat control can be adjusted, with a switch off safety feature set at 4 hours in case the person falls asleep. The seat cover is washing machine washable and has additional safety features. It is also simple and easy to fit to any home chair.

The manufacturer claims that the additional benefits of using the B-Warm heated seat cover, besides the sense of comfort and wellbeing it promotes, is the amount of energy saving (Referencing a three year trial where lower room temperatures led to substantial savings on heating bills) .

It is generally estimated that a reduction of the background heating will save approximately 10% of heating costs (year round) per degree Celsius. This figure will vary from building to building due to construction standards and environmental influences, but in essence it is a fair yardstick.

The manufacturer claims that the heated seat pad can be used for less than 0.5p per hour. Our study seems to support this claim, except in the case where the heated seat pad was used on a very high setting over a long period of time costing an average of 0.7p per hour. However, this is still very cost effective and the benefits are likely to outweigh the cost of using this product, even at higher settings.

4. Conclusions and recommendations

4.1 Conclusions

There is evidence from this study that when used on a low setting, the heated seat pad may provide improved comfort to those with limited mobility. In some cases, this improvement in comfort avoids the need for vulnerable low income householders to turn their heating up in order to achieve the required level of comfort, or use a supplementary heating source. This allows consistent levels of warmth but avoids high fuel bills.

4 of the 5 householders monitored made a saving on their electricity bills. It should be noted that, as a matter of good practice, in all instances householders participating in the monitoring received comprehensive energy advice following installation of the measure. Therefore behavioural changes must be factored in as contributory factor in this saving. However it should also be noted that there was a high take up for provision of this low cost measure and the monitoring group expressed high levels of satisfaction. The project has demonstrated that provision of such low cost measures enables effective engagement with more vulnerable households on energy issues in order to influence beneficial behavioural change

The manufacturer claims that the heated seat pad can be used for less than 0.5p per hour. Our study seems to support this claim, except in the case where the heated seat pad was used on a very high setting over a long period of time costing an average of 0.7p per hour. However, this is still very cost effective and the benefits are likely to outweigh the cost of using this product, even at higher settings.

4.2 Potential impact on fuel poverty

This study suggests that using the heated seat pad can provide improved comfort and wellbeing for vulnerable householders with poor mobility. There is evidence to suggest that householders were able to avoid turning up their heating as they were warm and comfortable sitting on the heated seat pad. This, along with the energy advice given to householders as part of this project, may be assumed to have contributed to savings in heating costs. The study has demonstrated that heated seat pads had a high degree of acceptability amongst householders and can be effective in improving comfort and well - being. This is not a measure that will have an impact upon fuel poverty in itself but may effectively be used in combination with other measures to reduce fuel poverty, and improve comfort.

Appendix 1: Glossary of terms

EWD	Excess Winter Deaths
HIP	Health and Innovation Programme
NEA	National Energy Action – the National Fuel Poverty Charity
RH	Relative Humidity
TIF	Technical Innovation Fund

Appendix 2: Case Studies

Case Study 1

Mr T, 75, received energy advice about his bills, and a heated seat cover via YES Energy Solutions. He believed he hadn't been sent gas bills for several years. However upon investigation it was discovered he'd requested large print bills; these are sent out in a plastic wallet with a letter. Mr T didn't realise the bill/statement was in the wallet. Although he'd saved the wallets he hadn't opened any. When they were opened it was found that he had an energy debt.

An NEA advisor applied for an energy trust fund grant to clear the energy (and water) debts. The advisor also assisted Mr T to change to a cheaper tariff. Mr T enjoyed using his heated seat cover. It kept him warm and also allowed him to keep the heat on at 18°C or 20°C all winter, lower than usual. This also meant his gas bill was cheaper this winter.

Case Study 2

Mrs H, 'I have reduced my energy bill as I was able to keep the thermostat at 20°C during the night and 18°C at night. I did not feel the need to turn up the heating on colder days as in previous years, as I was warmer when sat in my chair.'

Case Study 3

Mrs E, 73, 'I love my heated seat cover as I like being warmer. As I'm warmer this means I don't use my heating as much saving energy and money on bills'.

Case Study 4

Statement supplied by Housing Advice Officer, Housing Support Team, North Lincolnshire Council

Mrs H has sent you many thanks via her support worker, she loves her warmer chair.

Appendix 3: Health and Innovation Programme 2015 – 2017

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 fuel poverty charity National Energy Action 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 programme comprised 3 funds

- **Warm and Healthy Homes Fund (WHHF):** to provide heating, insulation and energy efficiency measures for households most at risk of fuel poverty or cold-related illness through health and housing partnerships and home improvement agencies
- **Technical Innovation Fund (TIF):** to fund and investigate the impact on fuel poverty of a range of new technologies
- **Warm Zones Fund (WZF):** to install heating and insulation and provide an income maximisation service to households in or at risk of fuel poverty, delivered cost-effectively through partnership arrangements managed by NEA's not-for-profit subsidiary Warm Zones Community Interest Company