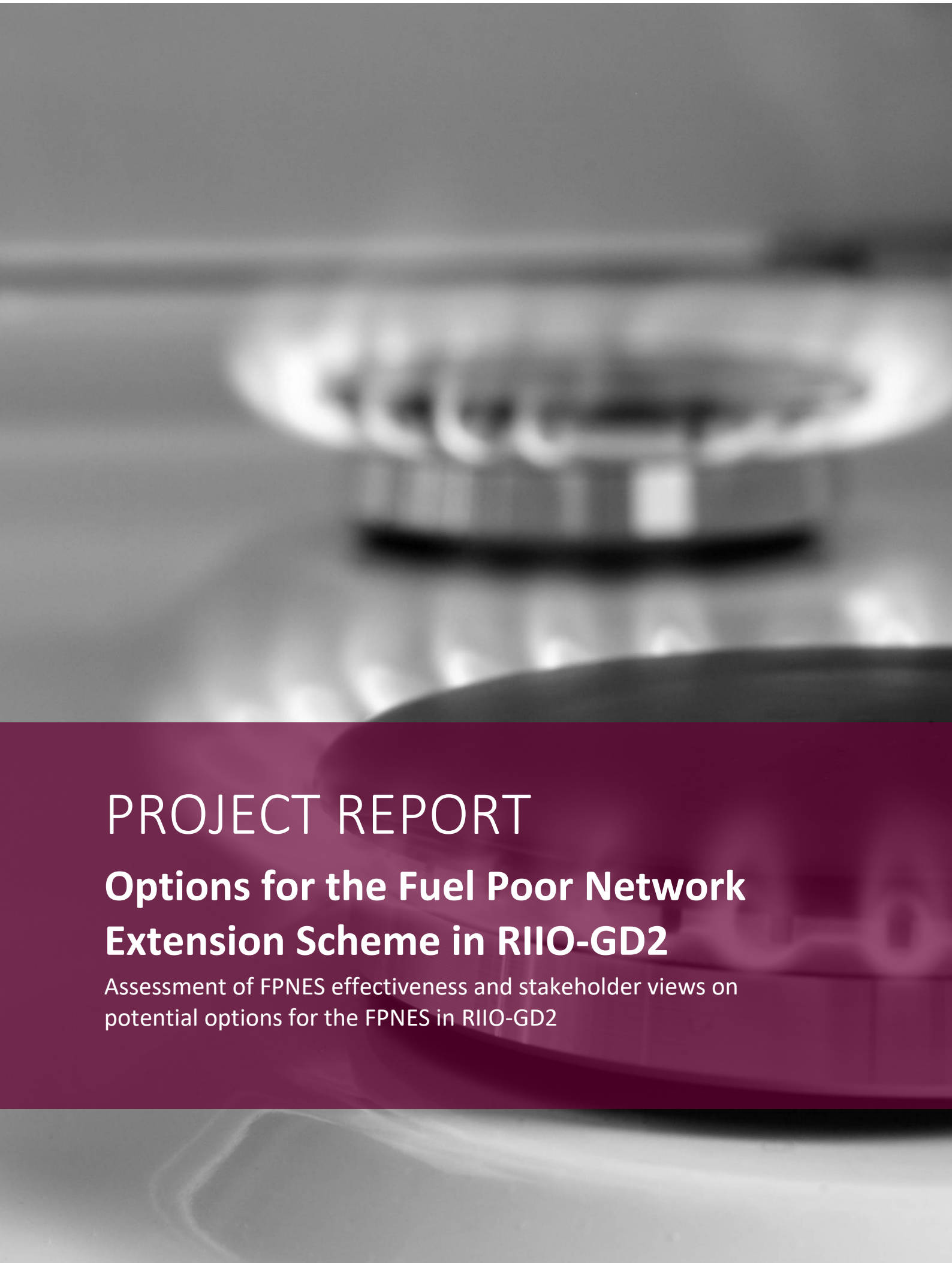

PROJECT REPORT

Options for the Fuel Poor Network Extension Scheme in RIIO-GD2

Assessment of FPNES effectiveness and stakeholder views on potential options for the FPNES in RIIO-GD2

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FUEL POOR NETWORK EXTENSION SCHEME OPTIONS IN RIIO-GD2 FOR OFGEM

EXECUTIVE SUMMARY

In September 2018 Ofgem engaged Sia Partners to carry out a review of the effectiveness of the Fuel Poverty Network Extension Scheme (FPNES) and to develop potential options for the evolution of this scheme in the next price control period, RIIO-GD2.

The FPNES plays a role in tackling fuel poverty by providing subsidised connections to the gas grid for eligible households which would not be able to incur the costs of this connection. Gas Distribution Networks have been given a target of connections to complete under this scheme by 2021.

Since the introduction of the scheme, Ofgem has taken steps to ensure that the scheme benefits primarily those households experiencing fuel poverty. However, it has emerged that some consumers receiving a subsidised connection under FPNES may not be experiencing fuel poverty.

The aim of this report is to provide evidence-based analysis of the effectiveness of the scheme and assess alternative delivery options or amendments for further consultation in the RII0GD2 period.

Sia Partners undertook two streams of work as part of this engagement:

- We assessed the effectiveness of the FPNES. This included a review of its value for money profile, both in terms of direct financial benefits to households involved and the positive externalities that stem from the delivery of this scheme. As part of this stream we also reviewed the existing government and private schemes aimed at tackling fuel poverty as well as the strategies and targets that the national and devolved governments have put in place to address this issue.
- We developed 5 high-level options for the evolution of the FPNES in RIIO-2. To gather views on these, we engaged a wide range of stakeholders including Gas Distribution Networks, charities, government, housing associations among others. As part of this stream we studied the value for money profile of those options that were deemed desirable by stakeholders.

A summary of our conclusions follows:

- Stakeholders consider the Fuel Poverty Network Extension Scheme valuable and believe that removing it at the end of the current price control period is not desirable.
- The FPNES plays a well-defined, non-overlapping role within the portfolio of government and private schemes aimed at tackling fuel poverty. Fuel poverty is effectively tackled when households are exposed to support that addresses all drivers of the issue: energy efficiency, energy costs and income levels. However, we find that the delivery of these schemes is often uncoordinated. This limits the ability of each individual scheme to tackle fuel poverty.

- The FPNES should not include the delivery of other types of fuel poverty support (e.g. in-home energy efficiency measures), rather there is scope to build closer links to other schemes that offer analogous types of support via Gas Distribution Networks and their partners.
- The FPNES is broadly in line with fuel poverty strategies, policies and targets on a national and devolved government level. There are both tensions and synergies with respect to decarbonisation policies – while on one hand, the scheme is incentivising the use of more carbon fossil fuels, on the other, it is providing access to a comparatively cleaner fuel type. The future role of the gas network can impact the desirability of extending the gas network.
- Our analysis suggests that in its current form, the FPNES offers value for money. However, we believe that the value for money profile of the scheme can be substantially improved by better targeting fuel poor homes.
- There is scope to better target those in fuel poverty. This can be done through tools and processes that have already been adopted by others in the energy industry. These tools include data mapping tools and networks of local partners among others. Gas Distribution Networks have indicated that they already employ these in the context of the FPNES, however, we believe their use can be expanded.
- There is scope to lower the cost of delivering the FPNES scheme. In particular, the cost of identifying fuel poor stakeholders and the cost to ensure that they are eligible to access the scheme could be lowered substantially. This is also tied to more rigorous use of mapping tools and local partnership networks.
- Two policy options for the development of the FPNES can be singled out as the most beneficial to both fuel poor customers and society as a whole:
    - Increasing the targeting accuracy of the FPNES in favour of fuel poor households, and
    - Measuring the efficiency with which Gas Distribution Network deliver on their connection targets.

The report also provides a list of recommendations for further consideration as well as case studies presenting examples of the successful use of the tools and processes introduced in the report.

Scott FLAVELL

1. Introduction

1.1 Fuel Poverty in the UK

Fuel poverty remains a significant problem in Great Britain and both national and devolved governments have implemented a range of policies to address it. NEA (National Energy Action) estimates that 4 million households are affected by fuel poverty across the entire UK (2015 data). These households are at greater risk of suffering from cold-related health problems, of not being able to heat their homes or cook hot meals, as well as isolation and mental health issues.

In the devolved nations of Scotland[1] and Wales, fuel poverty is defined by the 10% threshold, meaning that a household is considered fuel poor if it needs to spend more than 10% of its income on total household fuel costs.

In England, the LIHC (Low Income-High Cost) measure is used, which states that a household is fuel poor if its income is below the poverty line (taking into account energy costs) and its energy costs are higher than is typical for their household type. A second measure, the fuel poverty gap, is also used to reflect the extent of fuel poverty experienced by a given household – this is defined as the amount of money needed to meet the fuel poverty threshold.

The causes of fuel poverty are threefold – high energy prices, low incomes, and energy inefficient housing. Apart from low incomes, Ofgem has the ability to influence these factors; the energy regulator has an obligation to protect the interests of existing and future energy consumers, in particular, the interests of vulnerable consumers. In this context, vulnerable consumers include those of pensionable age, living with children, who are on low incomes, living in rural areas, or who are disabled or chronically sick.

1.2 Ofgem's role in tackling Fuel Poverty

As the regulatory body for the electricity and gas market, Ofgem plays a well-defined and specific role in addressing fuel poverty. Ofgem regulates the monopoly companies which run the gas and electricity networks, taking decisions on price controls and enforcement. In carrying out this remit, the regulator has the duty to protect the interest of all current and future energy consumers, with a particular consideration for vulnerable consumers, including those in fuel poverty.

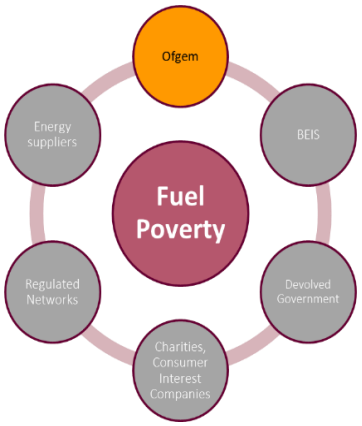

FIGURE 1 - OFGEM PLAYS A SPECIFIC ROLE IN TACKLING FUEL POVERTY

In practice, Ofgem performs its role by taking a variety of actions which include:

- Promoting value for money; and
- Promoting security of supply, sustainability; and
- Supervising the development of markets and competition; and
- Regulating and deliver government schemes.

[1] Please note that in the document "Fuel Poverty Strategy for Scotland 2018", released in June 2018, the Scottish Government proposes a new definition for fuel poverty. "a household is defined to be in fuel poverty if: "Households should be able to afford the heating and electricity needed for a decent quality of life. Once a household has paid for its housing, it is in fuel poverty if it needs more than 10% of its remaining income to pay for its energy needs, and if this then leaves the household in poverty."

It follows that Ofgem's role in tackling fuel poverty is one that includes incentivising regulated networks to deliver desirable, value for money outcomes for households in fuel poverty.

1.3 Introduction to the FPNES scheme

The Fuel Poverty Network Extension scheme was introduced by Ofgem in GDPCR1 and continued in RIIO-GD1, the price control regulating the gas distribution industry until March 2021.

The FPNES supports households in fuel poverty by providing subsidies that allow those currently off the gas grid get a connection and access mains gas as an alternative fuel. Gas is among the most cost-effective ways to heat a home.

The scheme is set by Ofgem who provide funding to eligible households to help them cover the costs of connecting to the gas or heat networks owned by the GDN (gas distribution network) and IGT (independent gas transporter) companies.

During RIIO-GD1, each company has an obligation to fulfill a set number of connections under the FPNES. The GDNs are broadly on track to meeting their targets by the end of the price control, already having connected over 52,000 fuel poor households to the gas grid in the first four years of RIIO-GD1. By 2021, the target is for over 91,000 households to have received a subsidised gas connection. The table below presents these figures[2] by network company and license area.

		FPNES connections between 2014 and March 2017	FPNES connections to deliver by March 2021
Cadent	*East of England*	5,967	12,046
	London	1,119	2,880
	North West	6,664	13,330
	West Midlands	4,282	8,360
Northern Gas Networks		7,967	14,500
SGN	*Scotland*	14,364	17,130
	Southern	4,550	10,367
Wales & West Utilities		7,448	12,590
Industry		**52,361**	**91,203**

Until recently, the eligibility criteria for households accessing the scheme stated that these must:

- Reside within the 25% most deprived areas, as measured by the government's Index of Multiple Deprivation (IMD), which is defined separately for England, Wales and Scotland; or
- Be eligible for measures under the Home Heating Cost Reduction Obligation (HHCRO) aspect of the Energy Company Obligation (ECO), Nest (in Wales) or the Home Energy Efficiency Programmes (HEEPs) (in Scotland); or
- Be in fuel poverty based on the latest definition or indicator for the relevant area. These differ for England, Wales and Scotland.

Following a consultation, Ofgem decided to amend these pre-defined criteria in December 2017, resulting in the removal of the IMD criterion. This took effect on 1 July 2018. By removing the IMD criterion, Ofgem expects that more households currently in fuel poverty will benefit from the FPNES.

[2] Ofgem. *Vulnerable consumers in the energy market: 2018*, 2018, p.48, London.

This is expected to be in the interest of all consumers and to provide better value for money for society.

For the purpose of this report, a 30% targeting rate has been assumed as a working basis for our calculations and assessments. This rate, however, is not entirely verifiable and is based on the share of customers who are fuel poor and benefit from the HCCRO scheme. The source of this figures comes from BEIS analysis. Their 2016 "*Help to Heat*" document on households accessing help under the Affordable Warmth scheme found 29% of these homes in England to be in fuel poverty (according to the English fuel poverty indicator)[3]. We must note that this figure is reached via proxies and rigorous evidence to suggest that this mirrors reality is not available.

It is difficult to assess the accuracy of the targeting rate of fuel poor households due to different definitions of fuel poverty, inconsistent eligibility criteria for schemes, as well as insufficient or inconsistent information on customers collected by GDNs or local organisations. Another difficulty of measuring targeting accuracy is tied to the churn in the population of the fuel poor. This is not a static group and may change its composition within a short timeframe based on the volatility of factors ranging from energy prices to temperatures.

1.4 Objective and structure of this report

Following the recent changes to the eligibility criteria and with a view to inform its position on the evolution of this scheme in RIIO-GD2, Ofgem has engaged Sia Partners to:

- Assess whether the existing FPNES is the most efficient solution in addressing the needs of fuel poor customers; and
- Assess whether FPNES, in its current form, is value for money to *all* customers; and
- Assess whether FPNES is at odds with the government's policies/targets on fuel poverty and decarbonization; and
- Develop ideas for alternative options to improve or replace the FPNES scheme; and
- Engage stakeholders and report their views on these options; and
- Calculate the cost-benefit profiles of options desirable to stakeholders

This report presents our findings on the five key topics listed above as well as the methods we employed to calculate cost-benefit analyses, engage stakeholders and record their views. The objective of this report is to inform the RIIO Gas Network team's work leading up to the sector-specific consultation that will take place in December 2018.

The report is presented in two distinct parts:

- **Part 1**, including chapters 2,3 and 4, presents our evaluation of the value for money profile of the existing FPNES scheme as well as its alignment with government policy and ability to address the needs of those in fuel poverty, and
- **Part 2**, including chapters 5, 6 and 7, presents alternative options for the FPNES scheme, a summary of stakeholders' views on each of these as well as other topics and trends which surfaced from the feedback gathered. It further presents our analyses of and findings on the cost benefit of the favoured options, including social impacts.

[3] Department of Energy & Climate Change. *ECO: Help to Heat Consultation Document,* 2016, p. 12, London

PART 1

2. Assessing the effectiveness of the FPNES at addressing the needs of fuel poor customers

2.1 Introduction to the profile and needs of consumers in fuel poverty

Fuel poverty is a complex issue that affects households that face both lower incomes and higher energy needs compared to typical households. In England, the typical fuel poor household's income is less than half of that of a typical household, with energy needs that are more than 20% higher[4].

The recognised drivers of fuel poverty are high energy prices, low incomes and energy inefficient housing. Energy customers may experience these effects in different ways, depending on variables such as household income, household composition, building energy efficiency, energy type, consumption pattern, and payment type.

The average fuel poor household (in England) is defined by these characteristics[5]:

- Mainly families with children;
- Usually private tenure (owner occupied or private rented);
- Living in larger homes (terraced and semi-detached);
- Living in old dwellings;
- In employment;
- Paying high prices off-grid;
- Not energy efficient with low efficiency ratings.

Based on this profile, the overarching needs of fuel poor consumers are the ability to heat their homes, the ability to pay for energy, and the ability to access advice and support.

There are limits in the ability to identify and list a comprehensive set of needs of fuel poor customers across Great Britain. Fuel poverty definitions are not consistent across devolved governments (see paragraph 1.1) and, as a result, different groups of people, with differing situations, characteristics and needs can all be identified as fuel poor.

Fuel poor households *generally* (across the devolved nations) share these characteristics:

Warm Homes	Lower prevalence of central heating or smarter forms of heating control, and less likely to have a comfortably heated home
	Less likely to feel able to heat homes more, if they wanted to
	Homes that are not always warm or under-heated are most likely younger, all-student and low-income households, as well as private renters
	Particularly affected households are those receiving benefits, those with children and those who pre-pay for their energy
	Energy-related behaviour may be informed by budget rather than weather conditions

[4] Department for Energy and Climate Change, *Cutting the cost of keeping warm – a fuel poverty strategy for England*, 2015, p. 17, London.
[5] Ibid, p. 18-19.

	Less likely to know heating is the main user of energy
	80.8% of fuel poor households are connected to the gas grid (in England); but unconnected households are approx. 1.5 times more likely to be fuel poor than the national average[6]
Payments & billing	More likely to struggle with bills (especially through pre-payments), suggesting they are not only facing generally higher energy costs, but also struggle more to meet those costs
	May be less able to repay when falling into arrears
	Fuel poor households mostly require grants to cover costs, rather than loans
Energy efficiency measures	Less likely to be aware of how to make homes more efficient, especially among renters
	More likely to face compounded challenge of struggling with bills in general and not being able to make energy efficiency improvements even if they want to
	Households with an FPEER of Band G are the most severely affected, households with uninsulated solid walls facing the largest average fuel poverty gap in England
Advice	Unlikely to have taken steps to reduce their bills by seeking advice or support, and less likely to be aware of available support
	Less likely to be engaged in the energy market, less likely to have switched suppliers or know about the switching process, especially among private renters
	More likely to receive information or advice from friends and family than from trusted third parties

2.2 Assessment of how FPNES overlaps with the needs of consumers in fuel poverty

To assess how well the FPNES addresses customer needs *in principle*, a comparison can be made between the intended deliverables of the scheme against the *overarching* needs of fuel poor customers.

Needs of fuel poor	What can the scheme deliver?	Overlap *in principle*
Ability to heat their homes	The scheme provides customers with a gas connection. Having access to gas is an important part of being able to heat a home for less but it does not in itself allow a customer to heat their home.	**Partly**
Ability to pay for energy	Using gas to heat their homes, fuel poor customers may be more likely to pay their bills (or reduce chances of falling into arrears) as gas is seen as a generally more affordable fuel.	**Yes**

[6] Department for Business, Energy & Industrial Strategy, *Annual Fuel Poverty Statistics, 2018* (2016 data), 2018, p. 27, London.

Ability to access advice about bills, schemes, etc.	The scheme aims to deliver associated benefits of having a gas connection, e.g. energy efficiency measures or support schemes, however, this is not an obligation for network companies. Customers receiving a connection will not necessarily receive information on how they can get help/advice on consumption behaviour, tariff or supplier switching or other contributors to fuel poverty.	**No**

It follows that FPNES, taken in isolation, is not an effective and/or efficient way to tackle fuel poverty. While the scheme provides consumers with a cheaper fuel to heat their homes, the equipment needed to use gas for heating is not provided by the scheme, as well as several other types of support which are required to effectively tackle fuel poverty.

2.3 Role played by FPNES within the ecosystem of fuel poverty schemes

The diagram below presents an overview of all contributing factors to fuel poverty. The three variables that drive fuel poverty are income, the prices paid by a customer for the energy they consume and the energy they require to heat their homes to an acceptable level (i.e. energy efficiency of their home).

Each variable is defined by a set of sub-variables. For instance, someone's income is partly defined by their employment status, their wage and/or pension, the taxes they pay, the benefits they receive, their living costs.

This diagram clearly presents the role played by FPNES in tackling fuel poverty. While the scheme, in isolation, does not effectively tackle the issue as a whole, it plays a key role in alleviating fuel poverty. By providing a cheaper source of heating for customers, the scheme can help lower the price paid by customers to heat their home and in turn alleviate the 'depth' of fuel poverty.

To effectively alleviate fuel poverty, all variables and sub-variables in the diagram above need to be acted on.

It follows that, to assess the effectiveness of FPNES in addressing the needs of fuel poor customers, one needs to assess its place within the complete ecosystem of public and private initiatives aimed at addressing the issue.

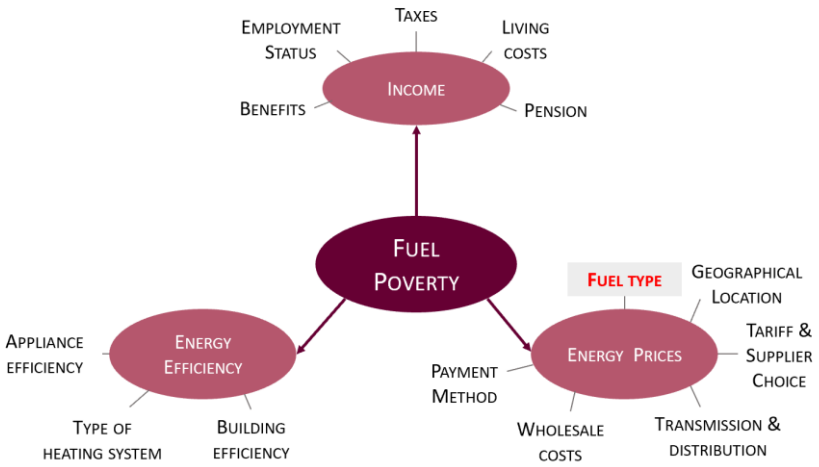

FIGURE 3 - FPNES PLAYS A LIMITED AND SPECIFIC ROLE IN TACKLING FUEL POVERTY

The table below maps several private and public initiatives and schemes aimed at tackling fuel poverty (first column) against the key drivers of fuel poverty as shown in the diagram above. The table shows with the symbol 'X' the drivers *directly* addressed by each scheme.

	ENERGY PRICES					ENERGY EFFICIENCY			INCOME			
SCHEME	Fuel type	Tariff & supplier	Wholesale cost	Geogra-phic location	Trans. & distr. Charges	Heating system	Appliance efficiency	Biulding efficiency	Benefits	Taxes	Living costs	Employ-ment / pension
GB-wide schemes												
Fuel Poverty Network Extension Scheme	X											
Warm Home Discount											X	
Winter Fuel Payments											X	
Cold Weather Payments											X	
Domestic Renewable Heat Incentive (RHI)						X						
Energy Company Obligation (ECO3)								X				
Scotland-specific schemes												
Scotland's Energy Efficiency Programme (SEEP)								X				
HEEPS Equity Loan								X				
HEEPS Warmer Homes Scotland Scheme						X		X				
Climate Challenge Fund							X	X				
HEEPS Loan Scheme for Registered Social Landlords								X				
Wales-specific schemes												
Arbed Energy Efficiency Scheme						X		X				
NEST Energy Efficiency Scheme						X		X				
Industry schemes												
Affordable Warmth Solutions (National Grid/Cadent)	X							X				
Power Up (WPD)		X				X	X	X	X	X	X	X
Affordable Warmth Local Action Fund (WPD)		X									X	
Warm Home Assistance scheme (Wales & West Utilities)	X										X	

Three conclusions can be drawn from the table above:

1. FPNES plays a well-defined role within the portfolio of schemes aimed at tackling fuel poverty. While two other private sector schemes exist to provide a subsidised connection to gas, the two rely on the existence of FPNES to function. It follows that removing FPNES would leave a gap in the support available to fuel poor consumers.
2. Most of the existing schemes focus on the delivery of energy efficiency measures. This is in line with fuel poverty reduction targets that are centered on the EPC rating of the GB's housing stock, as well as decarbonization policies.
3. No scheme expressly mandates the delivery of behavioral advice following up the installation of energy efficiency measures or the provision of a subsidised gas connection.

Key Finding

The FPNES alone does not represent the most efficient method to address the need of fuel poor customers. While the scheme plays a non-overlapping, well-defined role in tackling fuel poverty, it only addresses a portion of the issue which *must be complemented* to deliver full and effective support to those in fuel poverty.

In addition, FPNES should not be expanded to deliver additional types of support, such as energy efficiency measures or income maximisation advice.

Doing so would duplicate efforts of existing schemes and initiatives and would require GDNs to develop capabilities that are not currently within their remit. Rather, the delivery of a subsidised gas connection should be linked to the delivery of other types of support via existing mechanisms and local networks of expert partners.

Relying on existing schemes presents the most cost-effective solution to ensure the delivery of a 'whole home' solution to fuel poverty.

3. Assessment of FPNES value for money profile

3.1 Definition and assessment of 'value for money'

There are several potential definitions (and methods to assess) value for money – the National Audit Office, for instance, defines value for money as "*the optimal use of resources to achieve the intended outcomes*"[7]. In general, value for money is a relative assessment of an initiative's cost with respect to the benefit which it generates. The benefit can be both financial (in this context, the amount of money saved by a customer on heating as a result of having access to gas as a fuel source) and social (in this context, social benefits include the health benefits as a result of a warmer home, less GP visits and ambulance calls among many others).

It must be stressed that value for money is not an absolute measure – there is no widely accepted figure which represents value for money for any given initiative. One can assess value for money of an initiative with respect to comparable or related initiatives.

For the purpose of this study we have chosen to measure value for money with two separate assessments:

- **Qualitative assessment**
  The National Audit Office uses four criteria to assess the value for money of government spending.
  - *Economy* – minimizing the cost of resources used or required; and
  - *Efficiency* – the relationship between the output from goods or services and the resources to produce them; and
  - *Effectiveness* – the relationship between the intended and actual results of public spending; and
  - *Equity* – the extent to which services are available to and reach all people that are targeted.
- **Quantitative assessment**
  As part of this report, Sia Partners assessed both the financial and social benefit realized by fuel poor households that received a subsidised connection as part of the Fuel Poverty Network Extension Scheme. Several assumptions were made to perform this cost-benefit analysis – a detailed breakdown is available in Appendix 1
  - *Costs* – The same costs apply to both the financial and social cost-benefit analyses. We modeled the cost of a 'standard connection' based on the total allowance for FPNES and the relative connection target. These analyses focus exclusively on building costs associated to a connection, and *do not* cover 'search costs' and 'administration costs' tied to the delivery of FPNES.
  - *Financial Benefits* – The key financial benefit to households exposed to subsidised connection is the amount of money they save in heating their home to the recommended temperature. We modelled the cost of heating an average household with 12,500 kWh over the course of a year with seven different types of fuels:
    - Mains Gas
    - LPG
    - Heating Oil (Kerosene 28)
    - Wood Pellets
    - Electricity (Economy 7)
    - Electricity (Standard rates)
    - Coal

[7] National Audit Office, Assessing value for money, *https://www.nao.org.uk/successful-commissioning/general-principles/value-for-money/assessing-value-for-money/* (accessed September 28, 2018).

The table below presents the fuel cost used in our analyses. These costs include standing charges. The assumptions, limitations and references for the data below can be found in Appendix 1.1.

Fuel Type	Fuel price (£/kWh)	Added standing charge (SC)	Fuel price allowing for appliance efficiency (£/kWh)	Appliance efficiency	Total Heating cost[8] including SC (£/y)
Mains Gas	0.036	83.87	0.041	89%	595.1
LPG	0.067	0	0.076	89%	946.6
Heating Oil	0.063	0	0.081	78%	1006.4
Wood (Pellets)	0.064	0	0.098	65%	1223.1
Economy 7	0.098	78.4	0.098	100%	1303.4
Coal	0.057	0	0.126	45%	1577.8
Standard Electric	0.140	72	0.140	100%	1822.0

The financial benefit to households was estimated by calculating the cost difference in heating a household with gas versus each of the fuels listed above. In doing so, we assumed that the breakdown of central heating solutions found across UK dwellings not connected to gas also applied to the population of fuel poor homes – more information on these assumptions can be found in Appendix 1.1 and 1.3. Total heating costs were cross-checked with a range of sources and found to be broadly consistent.[9]

The table above shows that after taking appliance efficiency into consideration, mains gas is the cheapest fuel to heat a home. In the case where a household was heating a home via the use of electric radiators while on a standard electric tariff, the annual saving on heating costs is equal to £1,227, *all else remaining equal*.

For households to save money on heating by switching to gas as a result of a connection made under FPNES we must assume that these households receive support to install a gas-based central heating system – this is a central assumption of our cost-benefit calculations.

- *Social Benefits* – The FPNES is a scheme aimed at fuel poor households; as such, it targets those affected by situations of vulnerability, whether permanent or transitory. The ability of a fuel poor customer to live in a warm home implies benefits that are wider than the cost savings realized by switching to gas. Cold homes have been tied to a variety of health and mental issues which include[10]:
    - Increased chances of circulatory conditions such as blood pressure, heart attacks and stroke.
    - Worsened respiratory conditions such as bronchitis or asthma.
    - Exasperated conditions such as diabetes or ulcers.
    - A higher risk of falls and accidents for elderly people.

[8] Assuming 12,500 kWh required to heat a home. This figure is broadly in line with the average energy consumption of a UK household (including the non-fuel poor) on heating - 10,514 kWh (2017). Department for Business, Energy & Industrial Strategy, Energy Consumption in the UK 2018 update, *https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/729326/ECUK_Tables_2018.xlsx* (accessed October 3, 2018).

[9] See "Comparative space and water heating costs for Scotland based on the Sutherland tables (as 2015)" *https://www.ofgem.gov.uk/ofgem-publications/98027/insightspaperonhouseholdswithelectricandothernon-gasheating-pdf*

[10] Centre for Sustainable Energy, Assessing the health impact of cold homes, *https://www.cse.org.uk/downloads/reports-and-publications/fuel-poverty/energy-advice/insulation-and-heating/Assessing-the-health-impacts-of-cold-homes.pdf (accessed October 4, 2018).*

- Depression.
- High levels of anxiety.
- Existing medical conditions can become worse.
- Children's cognitive development can be affected.

In our analysis, we have modelled the social benefit that FPNES delivers by enabling fuel poor households to heat their home properly. This was done by selecting relevant financial proxies that can provide a value for a positive event or behavior taken by a fuel poor household (e.g. fewer GP consultations, reduced likelihood of hospitalization and more). Naturally, not all households benefitting from a subsidised connection will realize these additional benefits – to mirror this we took assumptions on the likelihood of the events affecting a sub-set of those involved.

The full list of financial proxies, their value, description and references, including the assumptions taken in our calculations can be found in Appendix 1.2.

3.2 Qualitative assessment of value for money profile

Economy

Minimising the cost of resources used or required

To comment on the *economy* of FPNES connections one must distinguish among the different types of costs incurred by GDNs and/or their partners in the delivery of connections. Our research and engagement point to three distinct cost items:

- *Delivery costs* – the amount required to connect a customer eligible for FPNES to the existing gas grid. This includes building and reinstatement costs.
- *Search costs* – the expense incurred by GDNs and/or their partners to identify consumers potentially eligible for a subsidised connection under FPNES.
- *Administrative costs* – the costs incurred to verify the eligibility of a given customer to access a subsidised connection under FPNES.

Delivery costs vary from case to case based on variables such as a household's distance from the existing gas grid, the 'complexity' of the connection and other related factors. In most cases, delivery costs can be lowered by identifying groups of nearby households eligible for FPNES – a GDN's ability to achieve this has decreased based on the removal of the IMD criteria for FPNES eligibility. Our assessment does not indicate that delivery costs can be systematically lowered while increasing targeting accuracy.

Search costs, as well as administrative costs have increased as a result of the IMD criterion's removal. GDNs and their partners must transition from an area-based approach to a household/customer-based approach – this is due to the remaining FPNES eligibility criteria (i.e. being in fuel poverty or being eligible for Nest/HHCRO/HEEP). Our assessment indicates that, while GDNs are moving to use appropriate tools and processes, there is still a sizeable opportunity to lower search and administrative costs. Proposals are discussed in Chapter #5.

In summary, costs involved in the delivery of FPNES scheme can be lowered.

Efficiency

The relationship between the output from the service provided and the resources to produce them

The efficiency of the FPNES is strictly related to its accuracy in targeting those customers who are affected by fuel poverty – in other words, the higher the share of customers who have received a connection under FPNES and are also fuel poor, the more efficient the scheme.

As a result of our assessment, we understand that more granular targeting of households eligible for a subsidised connection increases the costs involved with the delivery of each marginal connection. A balance must be struck between the extent to which only fuel poor households are targeted and the costs involved with the delivery of the scheme.

While companies have started to take steps in the right direction to lower costs involved and at the same time increased the share of FPNES beneficiaries who are also fuel poor, there is further scope to improve efficiency in the delivery of the scheme. This is discussed in Chapter #5.

Effectiveness

The relationship between the intended and actual results

The FPNES is effective for *all customers* over the medium run as one of the sources of support to fuel poor customers. The benefits delivered by FPNES, both financial and social accrue over the years for each additional customer who receives a connection. The financial cost-benefit analysis reveals that under all scenarios the FPNES reaches break-even in under 12 years. ***See section 3.2 for more detail.***

While there is scope to improve the effectiveness of this scheme by identifying cost-efficient ways to target those in fuel poverty, the scheme is effective.

Equity

The extent to which services are available to and reach all the people they are intended to

The FPNES scheme, in line with Ofgem's remit and role in tackling fuel poverty, is aimed at providing a cheaper fuel for fuel poor customers to heat their homes affordably. Should the assumed 30% targeting rate be verified, it would follow that the FPNES is not equitable.

Furthermore, within the 30% of FPNES beneficiaries who are assumed to be in fuel poverty, there is no evidence that those most in need (identified as those whose 'fuel poverty gap' is the largest) are being targeted proactively and prioritised in the delivery of the scheme.

There is no clear evidence that the FPNES scheme is equitable. ***In Chapter 6 we discuss ways in which more information can be made available to provide more transparency on the delivery of the scheme.***

3.3 Financial Cost-Benefit Analysis

This section presents the result of our financial cost-benefit analysis. This is based on an assumed average cost to perform a 'standard connection' and the benefit realised by customers by saving money on their heating bills between 2014 and 2021.

Modelling the benefits of consumers who benefit from a subsidised connection is a complex task, the amount of money saved by customers varies from case to case and is impacted by factors ranging anywhere from weather, to energy efficiency, age of appliances among several others. A detailed list of assumptions, references, limitations is included in Appendix 1 at the end of this report. One key assumption needs to be highlighted*: the calculation assumes that all of those who receive a subsidised connection also receive a central heating system to realise to heat their home with gas.*

As mentioned in the section above, the effectiveness of the FPNES is strictly tied to the share of customers who benefit from this scheme *and* are also in fuel poverty. The costs, on the other hand, are calculated on *all connections delivered under this scheme*.

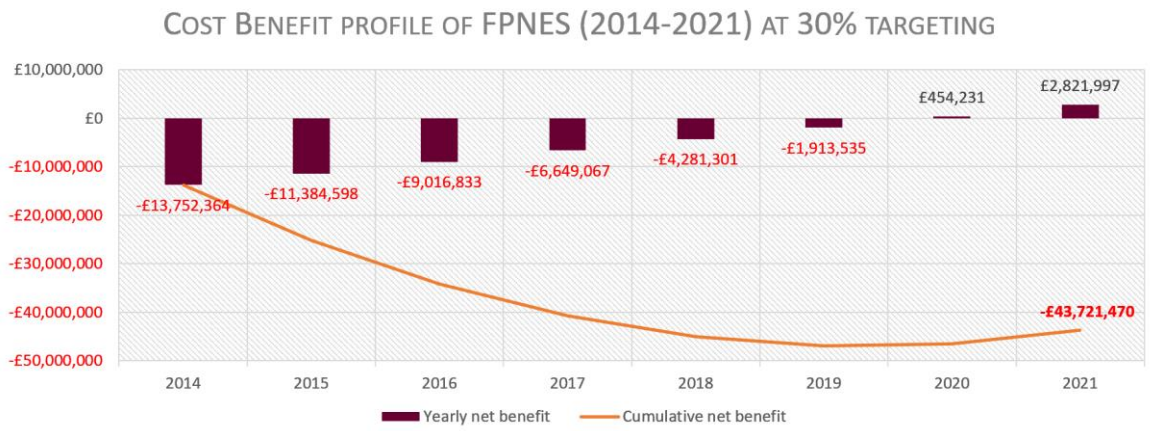

FIGURE 2 – COST-BENEFIT PROFILE REALISED WITH 30% TARGETING (2014-2021)

The graph above presents the first of the three scenarios we modelled. At 30% targeting (in other words, 3 out 10 households which receive a subsidised connection are in fuel poverty) the cumulative net benefit over the period of RIIO-1 is -£43.7m.

We observe that the yearly net benefit profile – calculated as the amount of benefit realised by all new FPNES beneficiaries plus the benefit to those who benefitted in the past, minus the cost to build the connection – improves over time. This is due to financial benefits accruing over time; should a household receive a connection in 2014, this same household would benefit from the foregone costs of higher heating bills each year after 2014.

The net cumulative benefits, which indicate the overall value for money profile of the FPNES scheme at 30% targeting, see an improvement in 2019 (year 5). This is due to the yearly net benefits of the scheme breaking even by 2020. More importantly, the analysis suggests that the FPNES scheme, as a whole, would deliver positive benefits by the year 2026 (year 12) assuming 30% targeting and only considering direct and measurable household financial savings.

To show the impact of targeting accuracy on the value for money profile of the FPNES scheme we modelled two further scenarios, assuming 50% and 75% targeting accuracy. The two graphs below present these scenarios.

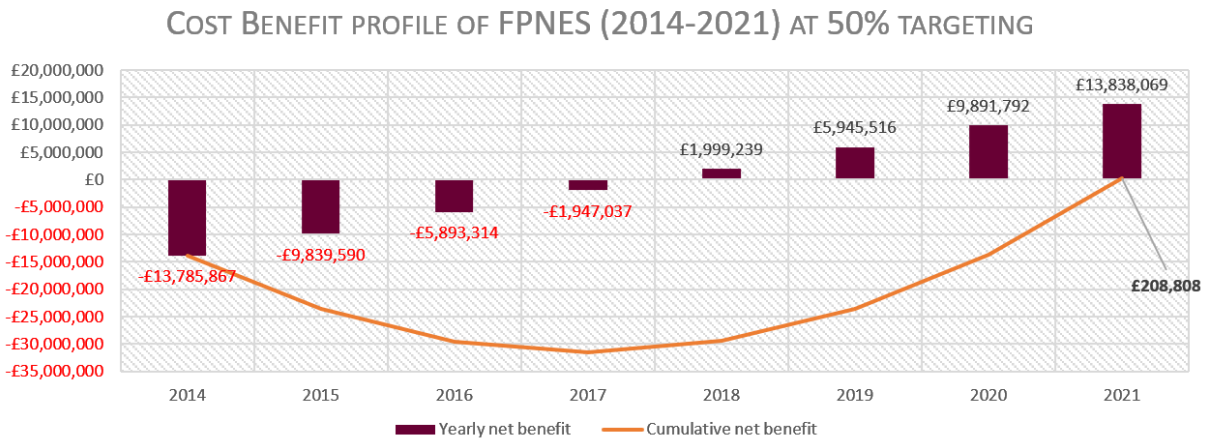

FIGURE 3 - COST-BENEFIT PROFILE REALISED WITH 50% TARGETING (2014-2021)

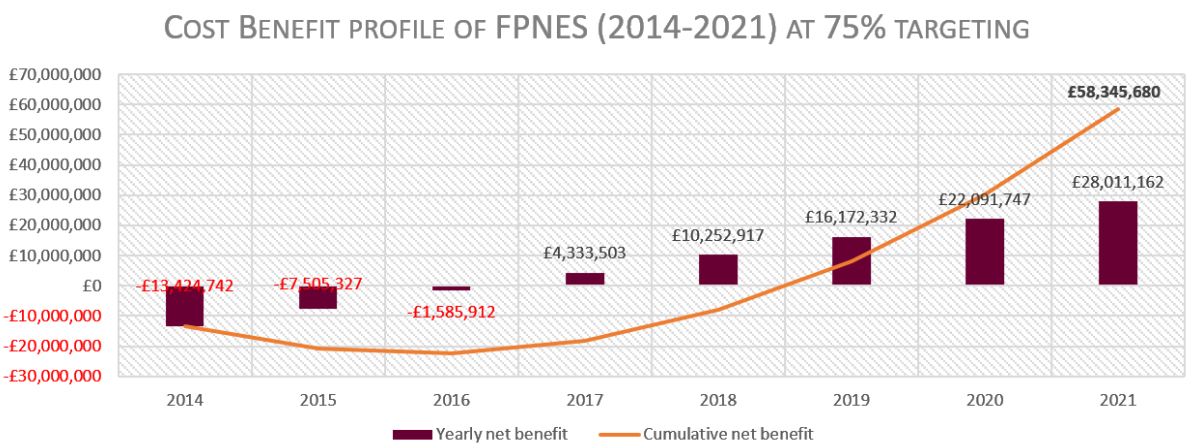

FIGURE 4 - COST-BENEFIT PROFILE REALISED WITH 75% TARGETING (2014-2021)

The two scenarios above recognise that the expenditure required to connect households to the gas grid increases in line with targeting accuracy – all things remaining equal, more granular targeting also increases search and administration costs associated with the delivery of the FPNES. These additional costs are not modelled in the assessment above. The analysis assumes that building costs (including reinstatement) will increase by 10% with 50% targeting accuracy and by 20% in the 75% targeting accuracy scenario with respect to the base case. The base case models the building cost for a 'standard connection' at £1,414[11].

Having factored in higher connection costs, the 50% and 75% targeting scenarios show that improved targeting can substantially improve the value for money profile of the FPNES scheme:

- With 50% targeting, the FPNES reaches positive yearly benefits in 2018 (2 years in advance) and delivers a total of £208k net cumulative benefits by the end of RIIO-1.
- In the 75% scenario, the FPNES delivers positive yearly benefits by 2017 (3 years in advance) and has delivered a total of over £58 million in net cumulative financial benefits by the end of RIIO-1. This is in contrast with net cumulative benefits of -£43m in the 30% targeting accuracy scenario.

Key Finding

Assuming a targeting accuracy of 30%, and only considering financial benefits realised by fuel poor households involved, the Fuel Poverty Network Extension Scheme implies a net cost to society of £43m between 2014 and 2021, eventually breaking even in 2026.

In contrast, when assuming 75% targeting accuracy, the FPNES scheme delivers a total of £58m in net benefit over the same period.

The scheme ultimately delivers a net benefit to society in all scenarios modelled. We conclude that, when taking only financial benefits of households involved:

- The **FPNES scheme is value for money in *absolute terms***, delivering net benefits during the RIIO-2 price control period.
- The **FPNES scheme is not value for money *in relative terms***, given the vast difference in net benefits delivered within the RIIO-1 price control period based on improved targeting.

[11] We are aware that the FPNES voucher which covers the cost of a connection for an eligible customer can reach a figure well in excess of £2000 + VAT. The figure employed assumes an average cost based on the total budget allocation for FPNES connections £129m over RIIO-1 and the revised connections target of over 90,000 households.

3.4 Social Return on Investment Analysis

The Fuel Poverty Network Extension Scheme aims to provide a cheaper way to heat homes for households in fuel poverty. The ability to heat homes implies wider social benefits which need to be considered to gain a complete understanding of the value-for-money profile of the initiative.

In addition to estimating the direct, measurable financial benefits realised by households receiving a subsidised connection, we estimated the wider benefits that can occur as a result of a warmer home. One must note that it is notoriously difficult to rigorously estimate and verify benefits which are, in several cases, non-quantifiable. To do so, we have adopted proxies that can model the forgone cost to society as a result of a warmer home.

We have based our social cost-benefit analysis on the base scenario of 30% targeting accuracy introduced in the section above.

We assume that the ability of a fuel poor customer to heat a home affordably will result in mental and physical health benefits. Summarised below is a list of such benefits (and the proxies used to model them) included in the social cost-benefit analysis:

SOCIAL BENEFIT	FINANCIAL PROXY	ESTIMATED VALUE	DESCRIPTION
IMPROVED PHYSICAL HEALTH	Cost of GP consultation	£ 38	Comfortable and warm homes reduce amount of illness cases
IMPROVED MENTAL HEALTH	Life satisfaction change per individual	£ 499.38	Ability to heat home is linked with improved confidence
IMPROVED PHYSICAL HEALTH	Cost of time off work (seven days)	£ 29,200	Low temperatures can lead to sickness that leads to long-term hospitalisation

The social benefits listed above do not apply to all fuel poor households that are able to heat their homes as a result of a subsidised connection under FPNES. In Appendix 1.2 and 1.3 we list the assumptions taken and the method employed to calculate the realisation of these benefits.

The graph below shows in purple the same net yearly *financial* benefit presented in Figure 2 (30% targeting accuracy case in section 3.2) but adds to these yearly *social* benefits in orange. Similar to financial benefits, the social benefit increases yearly given that those who benefit from better physical and mental health upon receiving a subsidised connection keep doing so across the lifetime of the asset.

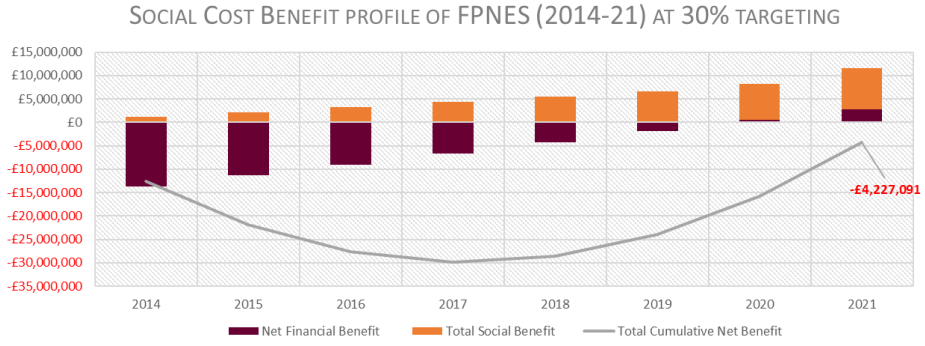

FIGURE 5 – SOCIAL COST BENEFIT PROFILE OF FPNES (2014-21) AT 30% TARGETING

With respect to Figure 2, where only cost savings due to a fuel switch are quantified, the graph above shows a cumulative net benefit to society (financial + social) of -£4.2m over the period of RIIO-1. This is in contrast with the net *financial* benefit of -£43.7m over the same timeframe, presented in the previous section.

This report includes additional iterations of this social cost-benefit analysis, these can be found in Part 2, Chapter 3. These analyses estimate the cost-benefit profile of different options for the evolution of the Fuel Poverty Network Extension Scheme.

Key Finding

When considering the wider social benefits tied to warmer homes, the value-for-money profile of the FPNES scheme improves drastically.

A limited number of social benefits impacting a fraction of those connected to the gas grid under FPNES bring the net benefit to society from -£43.7m between 2014-2021 to -£4.2m over the same timeframe. This represents a 90% improvement.

The inclusion of social benefits further strengthens the finding that the FPNES scheme is value for money in absolute terms.

4. Assessment of whether FPNES is in line with fuel poverty and decarbonisation policies of England, Scotland and Wales

This section presents a range of national and devolved government strategies/targets on fuel poverty and decarbonisation. Comparing the goals and actions set out in these policies against the FPNES and its aims provides an assessment of whether the scheme is in line with government policy.

4.1 Government fuel poverty policies and strategies

The following table presents an overview of the relevant fuel poverty policies and strategies across England, Wales and Scotland:

Policy / strategy	Overall aims	Delivery & actions
UK ECO (Energy Company Obligation) *Only describing part of scheme related to fuel poverty*	• Help reduce carbon emissions • Help tackle fuel poverty	• HHCRO (Home Heating Cost Reduction Obligation) - the part relating to fuel poverty • Promotion of measures to improve ability of low income and vulnerable households to heat their homes by suppliers • Incl. actions that result in heating savings, e.g. replacement or repair of a boiler

English Fuel Poverty Strategy	• Sets overall fuel poverty target to ensure as many fuel poor households as possible have EPC C by 2030 • 3 key objectives, one of which is ensuring light, power and transport are affordable for households and businesses	• Focus on improving energy efficiency of fuel poor homes as a priority for tackling fuel poverty • Prioritisation of most severely fuel poor • Clear set of challenges to overcome, incl. partnerships to help fuel poor, increasing effective targeting, improving reach to certain high-cost homes such as non-gas ones, and to low-income homes • Paying particular attention to the fuel poverty gap for non-gas households and counteracting this factor of high energy costs
Scottish Fuel Poverty Strategy (*Draft)*	• Outcomes-based framework focussing on removing energy efficiency as a driver of fuel poverty • Target of no more than 5% of Scottish households in fuel poverty by 2040	• New definition of fuel poverty focussing on low income households, thus increasing number of eligible households • Review eligibility to schemes based on new definition • Provide advice & support to households on a range of fuel poverty related factors • Actively engage councils to make national schemes work better • Establish public energy company to help tackle fuel poverty and promote economic development • Creation of low-carbon jobs to maximise income • Continue and develop partnerships across various sectors
Welsh Fuel Poverty Strategy	• Reduce impact of fuel poverty on households and, as far as reasonably possible, eradicate fuel poverty • Create green jobs and business opportunities • Reduce greenhouse gas emissions in the domestic sector	3 aims to be delivered through 14 policies, broadly focussing on energy efficiency, such as: • Promote the coordination and joining up of support • Develop initiatives for fuel poverty in coordination with poverty actions • New services in partnerships with existing ones by local agencies • Coordinate advice & support to reduce fuel bills, maximise income and improve energy efficiency • Target the most in need • Run All-Wales Fuel poverty programme (2-way referral network)

Across Great Britain, fuel poverty strategies and ECO's HHCRO aim to tackle fuel poverty by focusing on money and poverty-related drivers. The ultimate objective of all schemes is to reduce the impact of fuel poverty by improving households' ability to heat their homes.

Similarly, these schemes specifically target "the most in need" or "most severely fuel poor" and enable these households to access grants or subsidies to lower their energy bills – this stresses the importance of singling out those most impacted by fuel poverty and prioritising them for action.

The Scottish and Welsh fuel poverty strategies clearly set out how – through a new definition and working in coordination with poverty programmes– these intend to alleviate fuel poverty by addressing issues of income and affordability. Similarly, the English fuel poverty strategy focuses on non-gas households. Improved targeting of this group and a reduction of their depth of fuel poverty are set as clear priorities.

In summary, by providing gas as a cheaper alternative to heat a consumer's home, FPNES is in line with government policy and plays an important role in the achievement of its goals.

4.2 Government decarbonisation policies and strategies

The table below gives an overview of decarbonisation and other environmental targets and strategies:

Policy / strategy	Overall aims	Delivery & actions
UK ECO *Only describing part of scheme related to decarbonisation*	• Help reduce carbon emissions • Help tackle fuel poverty	• Carbon Emissions Reduction Obligation (CERO) – the part relating to decarbonisation • Promotion of primary measures by suppliers, incl. roof and wall insulation and connections to district heating systems • Some of these obligations must be delivered in rural areas
UK Clean Growth Strategy	• Increase economic growth while decreasing emissions • Deliver social and economic benefits beyond emission reduction	• Phase out installation of high-carbon fossil fuels in new and existing homes currently off gas grid • Upgrade energy efficiency in homes through ECO • Upgrade as many homes as possible to EPC C by 2030 • Improve boiler standards • Develop and innovate on new energy efficiency and heating technologies • Invest in low carbon heating technologies • Variety of efforts to reduce power costs
UK Climate Change Act	• Reduce greenhouse gas emissions by at least 80% below 1990 levels by 2050 • Decarbonisation of the power sector	• Renewable generation to reduce power sector emissions • Emissions reductions in buildings and industry through energy efficiency improvement and introduction of new technologies

Scottish Climate Change Plan	• Reduce emissions by at least 42% by 2020, and by 80% by 2050 (below 1990 levels) • Enable the transition to a low carbon economy while delivering sustainable economic growth • Creation of a low carbon society	• Includes policies and proposals to reduce emissions from electricity generation, buildings, and many other sectors • Promotion of renewables • Delivery of energy efficiency solutions (insulation, boiler replacement) and improve EPC ratings • Financial support to renewable heating system owners, targeted at off-gas grid solutions • Promote understanding of energy consumptions and benefits maximisation to those vulnerable or in fuel poverty
Welsh Decarbonisation Programme	• Limit greenhouse gas emissions by reductions of 3% per year and adjust to changes in climate • Achieve emission reductions of at least 40% by 2020	• Promote behavioural change and considering climate change in all decision-making • Cut emissions and adapt to climate change • Support R&D, technology, innovation & skills • Effective adaptation that delivers for those most in need and less able to adapt • Targeting of a range of sectors, one of which is residential – through energy efficiency measures in all households, targeting investment at those who are vulnerable to fuel poverty

GB's clear intention, on both national and devolved levels, is to move towards a low-carbon economy whilst driving economic growth. Reductions in greenhouse gas emissions are set as a clear priority, along with job creation and improving social benefits. The overarching focus for achieving this is the decarbonisation of heat and transport, through stimulating the take up of renewables and improving energy efficiency in a range of sectors, especially the residential one.

Phasing out fossil fuels in homes currently off the gas-grid, as stated in the UK's Clean Growth Strategy, is at odds with the FPNES, which connects off-gas households to the gas grid. However, the FPNES works on a much shorter timeframe and aims to deliver an immediate benefit to fuel poor households, whereas the strategy's targets are long-term. This indicates that the FPNES and the Clean Growth Strategy do not directly oppose each other.

Synergies and tensions also exist between the FPNES, the planned increase in investment and use of renewables and low-carbon heating technologies. This objective (along with specific initiatives such as financial support to renewable based heating system for off-gas households, part of Scottish Climate Change Plan) are not wholly in line with the gas connections provided by the FPNES. Notwithstanding these tensions, the significant changes in residential heating brought about by decarbonisation targets will take many years to be realised – the FPNES can still provide a short-term solution to off-gas households with a cost-effective solution.

The Climate Change plans of the UK and Scotland, as well as the Welsh decarbonisation programme are all geared towards counteracting the drivers of fuel poverty, mainly through energy efficiency measures, promoting behavioural change, benefits maximisation, as well as improving the understanding of energy consumption. These efforts all work in conjunction with the FPNES in tackling fuel poverty and complement it well by targeting those drivers that the FPNES does not. The Welsh and Scottish plans particularly target their support efforts at those who are vulnerable, in most need or in fuel poverty, which is in full alignment with the FPNES.

Box 1 - The future role of gas networks

One key question for governments on devolved and national levels, network companies and Ofgem is what the future role of natural gas in GB will be. As part of the transition towards a low-carbon economy, as indicated in GB's Clean Growth Strategy, a clear role for gas needs to be identified. Part of this decision regards the use of gas infrastructure in the long term. Working towards achieving decarbonisation will require the replacement of fossil fuels with renewables. In this picture, gas could serve as a bridge in this transition period as a more cost-effective way to reduce emissions.

The role that gas will play in the future has a fundamental impact on the FPNES. The potential to use existing gas infrastructure to deliver new types of fuel that will, one day, replace (or complement) gas is a key consideration in the decision to extend the gas network today. Should the gas network be repurposed for future use, those lacking a gas connection would be further disadvantaged in reaping the benefits of innovation and cleaner growth. On the other hand, should gas be phased out, the expense of extending the gas network may not return the full extent of the benefits expected.

Key Finding

- FPNES is clearly in line with fuel poverty policies on a devolved and national level. The scheme plays a clear, non-overlapping role, to complement the delivery of energy efficiency measures which are the main focus of these policies.
- There are both tensions and synergies in between FPNES and decarbonization policies. While on one end the scheme leads to more homes consuming natural gas, it can supplement the use of more carbon intensive fuels such as electricity and/or alternative fuels (e.g. coal, heating oil). In addition to this, the *potential* to repurpose the existing gas infrastructure to transport future alternative fuels (e.g. hydrogen) provides a strong case for this scheme to be in line with the future of decarbonization – this is uncertain at the moment and needs to be explored further.

PART 2

5. Options for the evolution of FPNES

5.1. Background on the development of potential FPNES options

Based on our assessment of the current scheme as outlined in Part 1 of this report, it was concluded that the FPNES serves one distinct function in the overall effort to tackle fuel poverty. By providing subsidised gas connections, however, the scheme addresses only one part of a multifaced issue. Along with the FPNES there exist a wide range of uncoordinated efforts to tackle this issue.

We found that the FPNES should not offer other types of support but rather, should be more closely integrated with the delivery of varied support. Overall, the scheme's targeting should also be improved, as this can greatly increase the benefit to the target group and value for money profile of the scheme to all customers. An analysis of national and developed policies indicates that he FPNES is also in line, with fuel poverty targets and exhibits both tensions and synergies with decarbonisation strategies.

In developing options for the evolution of the FPNES we considered that:

- Our findings support a continued role for FPNES in RIIO-2, especially if steps can be taken to improve the targeting of fuel poor homes in cost-effective ways.
- While focussing on developing options that would include adjustments and changes to the existing scheme to maximise its effectiveness, it is also important to get stakeholder views on alternatives to the FPNES.

5.2. Overview of potential FPNES options

Following an initial assessment of the current FPNES and our findings, five potential options for the future of the scheme were developed – three of these would include changes to the current scheme, the other two would replace the scheme.

The five proposed options are as follows:

Option type	List of Options
Change FPNES	1. Improve targeting of the FPNES in its existing form
	2. Link the delivery of a FPNES connection to support provided by other government schemes
	3. Ofgem to assess the effectiveness of FPNES connections delivery
Replace FPNES	4. Scheme focused on the delivery of gas connections to off-gas communities
	5. Scheme to install renewable generation for off-grid fuel poor customers

Option 1 – Improve targeting of the existing FPNES

Background	Proposal
• The current FPNES has an estimated accuracy rate of 30%, meaning that of all the subsidised gas connections made, only 30% go to households that are in fuel poverty. • Poor targeting could mean that the scheme is not value for money for all customers who fund gas connections through their energy bills.	• Improved targeting can lead to more benefits for the target customer group for the same investment in subsidised connections. • We have proposed four ways for improving targeting, as described in the image below.

1 Use data mapping tools

- Several network companies use data mapping tools relying of government data, private and purchased datasets
- These mapping tools have the ability to indicate fuel poverty concentration by area and down to a household level in some cases
- Such tools can be used to inform targeted awareness campaigns and pro-active referrals
- The accuracy of such tools should be tested and compared to existing targeting measures

2 Eliminate HHCRO/Nest/ HEEP criteria

- To be eligible for the FPNES scheme one needs to be eligible for existing energy efficiency schemes or be affected by fuel poverty.
- The HHCRO criterion for instance, provides funding for the installation of energy efficiency measures to home owners or private renters who benefit from schemes such as Pension Credit, Child tax credit, among others.
- Customers who are not currently in fuel poverty may access FPNES funding via eligibility to these schemes, diluting targeting efforts.

3 Introduce eligibility checks

- The introduction of mandatory eligibility checks prior to a FPNES-subsidised connection can impact both delivery volumes and targeting efforts.
- While GDNs can ensure that anyone who benefits from FPNES is at least currently affected by fuel poverty, the additional bureaucracy surrounding access to the scheme may deter some customers from applying.
- We believe the net effect would still render the FPNES scheme value for money.

4 Integrate in two-way partnerships

- UK network companies have established and developed 2-way partnerships with organisations that support vulnerable customers to enhance their delivery in value-for-money ways.
- These schemes are made of a capillary network of partners which act as trusted third parties on a local scale – they know the issues and know those affected.
- Integrating subsidised connections in the work already carried out by these partners can increase uptake and targeting accuracy.

What changes

Existing funding and allocation mechanism stay unchanged.

Actions are taken to increase the percentage of fuel poor customers who receive a subsidised connection. Search and administrative costs are lowered.

Scheme offers a better value for money profile to *all customers*

Option 2 – Link the FPNES to other government schemes

Background	Proposal
• There are several large scale schemes aimed at tackling fuel poverty and addressing different needs of customers in fuel poverty. • These schemes which include the ECO, Warm Home Discount and Cold Weather payments, mainly support the installation of energy efficiency measures but also support customers' incomes. • The co-delivery of different schemes aimed at solving different aspects of the issue is necessary to effectively help customers in fuel poverty.	• Align eligibility criteria of all government schemes to ensure that customers who access one are able to access all others. • Develop formal referral processes to automatically refer a customer to organisations delivering other schemes and mandate that these organisation make proactive contact with this customer. • Government would need to take action to create measures (like the above) which support the delivery of fuller fuel poverty support. • This option does not rely on private sector to take action and can lead to faster change at the expense of companies' innovative solutions.

What changes


Existing funding and allocation mechanism stay unchanged.


There is little or no improvement in the percentage of fuel poor customers out of all those receiving a subsidised connection


Scheme improves value for money profile for *all customers* across all fuel poverty schemes. Administrative costs to validate customer eligibility are lowered.


Fuel poor customers benefit from far more effective and holistic support

Option 3 – Assess the effectiveness of connections delivery through an incentive mechanism

Background	Proposal
• Currently, GDNs have a target of fuel poor connections to complete before 2021. Network companies are incentivised to meet target numbers with no consideration as to how effective their efforts are in: 1. Identifying fuel poor households. 2. Delivering help to those who need it the most. 3. Ensuring Value-For-Money identification of customers and delivery of fuel poor connections. 4. Promoting the opportunity to benefit from FPNES in a targeted way. 5. Etc…	• While maintaining the current form of the FPNES, Ofgem could introduce an assessment of GDN efforts as part of the Stakeholder Engagement Incentive or a similar measure. • The types of activities carried out (e.g. promotion, value for money delivery of support) to ensure the efficient delivery of FPNES are similar to those that the GDNs perform to safeguard their customers. • This option provides the incentive to deliver FPNES efficiently while promoting innovative solutions and pushing GDNs to over-perform the status quo.

What changes

- Existing funding and allocation mechanism stay unchanged.
- Ofgem need to introduce changes to the existing SEI or a similar measure in RIIO-2
- GDNs will have to take more responsibility in the planning and delivery of connections
- Increase the opportunity for GDNs to innovate and push boundaries of existing practice

Option 4 – Put in place a scheme focussing on off-gas communities

Background	Proposal
• The current FPNES has particularly benefited households located within 23 metres of the existing gas network. This is due to the cost-efficiency of connecting single customers who require large investments to extend the gas network. • The section of customers who are in fuel poverty but reside in an area which is off the gas grid cannot benefit from FPNES support. • The existing scheme is effectively only targeting a specific section of all fuel poor households, customers in off-gas grid communities do not have access to the same level of support.	• Existing funding dedicated to FPNES is redirected to a new scheme which focuses on bringing gas infrastructure to whole communities. • New scheme could tap into other sources of fuel poverty funding as investment required could be sizeable. • The scheme would necessarily have to be very targeted to the communities most in need across network areas served by GDNs. Delivery of scheme could be subject to assessment of whether the projects are indeed targeting those most in need.

What changes


Existing funding and allocation mechanism are changed.


Government to take action and restructure FPNES or develop a new fuel poverty scheme


Ability of community-based schemes does not allow better targeting of fuel poor households


Value of social benefit needs to be formally considered as part of feasibility analyses

Option 5 – Put in place a scheme to install renewable generation

Background	Proposal
• FPNES has particularly benefited households located within 23 m of the existing gas network. This is due to the higher costs of gas connections to single customers. • The section of customers who are in fuel poverty but reside in an area which is off the gas grid cannot benefit of FPNES support. • The existing scheme is effectively only targeting a specific section of all fuel poor households, customers in off-gas grid communities do not have access to the same level of support.	• Existing funding dedicated to FPNES is redirected to a new scheme which focuses on installing renewable generation. • New scheme could tap into other sources of fuel poverty funding as investment required could be sizeable • The scheme can be targeted to specific households flexibility, distance from gas grid is no longer a crucial factor. • Scheme can support Feed in Tariffs and incentivise companies providing free installation to target fuel poor.

What changes

- Existing funding and allocation mechanism are changed.
- Government to take action and restructure FPNES or develop a new fuel poverty scheme
- Ability to improve targeting of fuel poor households and viable solution for off-gas communities
- In line with decarbonisation targets, job creation efforts and reduction of fuel poverty
- Can provide fuel poor with additional income support
- Relatively non-disruptive and fast

6. Stakeholder feedback on FPNES options

Stakeholders overwhelmingly view the FPNES as an effective scheme that serves one distinct function in tackling fuel poverty. Stakeholders from all groups (government/councils, energy industry, consumer groups) expressed that the scheme provides a benefit to households, helps people heat their homes, and is therefore fulfilling its purpose. No stakeholder was in favour of removing the scheme or replacing it entirely with something else, and while not all stakeholders saw a specific need to change or amend the scheme, many were open to amending it and considering potential options to do so for the future.

6.1 Our approach to stakeholder engagement

For the purpose of this report, we engaged with a vast range of stakeholders to gather their views and recommendations on the different potential options of the FPNES as well as general thoughts on the scheme itself.

In total, we engaged with over 30 stakeholders from 23 different organisations, representing five stakeholder groups. These stakeholders were selected because of their involvement with or interested in the FPNES. Given the nature of the topic, and with the aim to gather valuable and actionable feedback in a short time frame, the selection favoured stakeholders with existing knowledge of the scheme's working.

Only one stakeholder declined to participate; those with whom we planned to but did not ultimately engage were unresponsive to our invite. The stakeholder breakdown is as follows:

Stakeholder type	# of organisations contacted	# of organisations engaged
Energy Industry	11	10
Government and councils	9	5
Consumer groups	8	5
FPNES partners	2	2
Housing associations	2	1
Total	**32**	**23**

All our stakeholder engagement was conducted through phone calls, with one skype call conducted. The main aim of these calls was to gather feedback on the five proposed options that had been sent to stakeholders in advance of the calls, as well as to discuss the FPNES, its aim, and some more specific questions depending on stakeholder type. This included, for example, questions on promotion efforts of the scheme, targeting methods, mapping tools and partnership networks.

Most calls lasted approximately 45 minutes with some lasting up to an hour. This amount of time was generally needed to at least discuss the five different options. All stakeholders had sufficient time to express their views. The ability to provide follow-up information, responses or evidence was offered to all stakeholders.

6.2 General feedback on the FPNES

Stakeholders are overwhelmingly in favour of the FPNES and believe it is a valuable scheme that helps tackle one specific aspect of fuel poverty. By providing a subsidised gas connection, households can access a more cost-effective and cheaper fuel, thus enabling them to heat their homes better. Many respondents said it is an effective scheme that helps getting households off electric heating, particularly serving low-income homes. Stakeholders believe that the scheme should continue to exist.

Although the scheme is believed to be making a difference, stakeholders stated that it needs to be complemented and better jointly delivered with other types of support that first-time gas receivers need. This primarily applies to in-house works (i.e. energy efficiency improvements and central heating solutions), as funding for these is not covered by the FPNES. Other drawbacks of the scheme include the difficulty of targeting the right households and ensuring uptake, as some people may be reluctant to reveal personal or sensitive data such as income. The scheme is more dependent on individuals sharing personal data following the removal of the IMD, area-based eligibility criteria.

When considering the FPNES and its role in the long-term, a small number of stakeholders questioned its sustainability, especially in the trade-off between its delivery and carbon emission reduction efforts. Another question raised was what the future role of gas would look like, including under RIIO-GD2, and whether this impacted the value for money profile of providing more gas connections (e.g. if these required a replacement in the future).

6.2.1 Targeting under the FPNES

In terms of targeting and its effectiveness, stakeholders shared a range of views. Some stated that the current level of targeting was acceptable and that increased efforts would lead to higher administrative and identification costs. As there is no consistent form of engagement or approach to this across the GDNs, some thought an established mechanism could be useful. However, there was concern that once targeting became more granular, the cost per connection would increase, and could possibly divert focus from other areas.

Regarding the difficulty of gathering information and data, a number of stakeholders pointed towards the Digital Economy Act. This piece of legislation will allow for greater data sharing and could lead to more sophisticated data sets and therefore more reliable proxies to identify the fuel poor. This could help GDNs or other organisations in targeting the right households and delivering the scheme more effectively, as well as reducing the need to collect information directly from people. However, ensuring that all data was up-to-date would be very challenging due to changes in people's situations and churn in the population of the fuel poor. Privacy concerns would also need to be considered.

6.2.2 What changes could be made to the FPNES?

The central recurring piece of feedback was the co-delivery of other types of support that fuel poor households need. Gas connections need to be complemented by in-house works. Funding for these cannot be delivered by the FPNES and is already provided by ECO in some cases. In general, many advocated for a more coordinated approach to tackling fuel poverty. One stakeholder mentioned the FPNES could be linked to the central heating scheme to support the installation of insulation and other energy efficiency measures.

Embedding other types of support and advice into the delivery of gas connections would mean houses received holistic help and could benefit from a whole-house solution.

Wider types of support include behavioural advice on how to best and most effectively use energy, information on other schemes and their eligibility, or help with switching tariff or supplier. Ideally, advice provision should be standardised to maximise effectiveness.

All stakeholders understand and recognise the need for providing fuller support and the benefit of different schemes working together coherently. One stakeholder mentioned that the joining-up of schemes would also benefit a common working approach towards decarbonisation and the overall alignment with government policy.

One particular opportunity would be working closely with 'LA Flex' or Local Authority Flexibility (i.e. delivered through ECO, LA Flex is a system where local authorities are given greater flexibility on eligibility and referrals). Delivering this together with the FPNES could significantly improve fuel poor households' situations in the long term, as the 'LAFlex' engages with energy suppliers to identify households that would benefit from energy efficiency measures. As suppliers have different information available than GDNs, combined insights and targeting efforts might be able to better capture churn in the population.

Stakeholders further expanded on the topic of flexibility with the idea of including households in the FPNES that are on the verge of or at risk of fuel poverty but may not strictly qualify under the existing criteria. This would mean a return to a more area-based approach (since the removal of the IMD criterion) that some favour and could provide greater economies of scale. Taking a broader view of the fuel poor population would have the added benefit of better accounting for churn in the population and people's changing situations, and potentially serve a preventative function. Widening the scope to people on the verge of fuel poverty would also require less time and money for identification. We recognise, however, that this is at odds with Ofgem's role and remit.

The following section provides a detailed description of stakeholder feedback on each of the five suggested options. For each option, general views as well as supportive or opposing arguments and reasons behind these are presented. In addition to this possible suggestions and new ideas raised by stakeholders are also included. Each section concludes with a brief summary of all stakeholder views.

6.3 Feedback on the potential FPNES options

6.3.1 Option 1 – Improve targeting of the FPNES

All stakeholders agreed that good targeting is needed under the scheme as this provides value-for-money to all customers and allows help to reach the right households. While improved targeting, i.e. a higher targeting rate than the existing estimate of 30%, would be desirable, several stakeholders raised both costs and flexibility as areas of concern.

The more granular targeting gets, the lower the economies of scale of the connections, driving up costs per connection, as well as targeting costs. For example, costs may rise due to the need for increased data gathering efforts, higher resource requirements to personally contact households among other factors. Another reason to caution against this option was the potential risk of ignoring or excluding certain areas or sub-groups that could have otherwise been included and identified in a wider approach. This is particularly pertinent in the case of fuel poverty, as fuel poor households are not a static group and may move in and out of what is defined as fuel poverty within a short timeframe. As the population and their situations are flexible, people on the verge of or at risk of fuel poverty should be included.

One stakeholder pointed out the importance of keeping a degree of flexibility with regards to eligibility to the scheme. Delivering it together with ECO was very useful, and in some cases, people can greatly benefit from a gas connection and other support, even if they are not strictly defined as fuel poor.

When considering improved targeting under the FPNES, most stakeholders were open to the idea, but cited further areas of difficulty including people's reluctance to share sensitive or personal information such as income, limits in third parties' resources, and higher search & administrative costs. One possible solution to this could be greater data sharing and having improved data sets in the future (e.g. enabled by the Digital Economy Act), which could help all parties involved under the FPNES to reduce costs.

Below is a summary of feedback and views on the four proposed ways that targeting could be improved.

1st option for improved targeting: use of data mapping tools

Stakeholders were broadly in favour of or accepting of the first one - using mapping tools. Only one stakeholder objected, as they believed the underlying problem was eligibility itself, and not targeting. Stakeholders who were particularly in favour of this method mentioned that one way of effectively utilising this was to map the gas network and specifically target households further away from the existing grid.

Most stakeholders, regardless of their level of support of mapping tools, expressed uncertainty about additional time and money that would need to be spent on such tools, as well as the quality of data. The tools would only be as good as the data behind them and it may be difficult to keep all information up-to-date due to people's changing situations. Publicly available data, such as EPC ratings, are imperfect, and may not always be a good indicator for fuel poverty. Other stakeholders said these tools already existed and would not necessarily be needed or not necessarily require improvements.

One respondent mentioned they had found a strong correlation between rent arrears and fuel poverty, so this had been helpful for their targeting. It was also mentioned that targeting should generally allow for more flexibility to possibly include people on the verge of or at risk of fuel poverty, as this would deliver a great benefit.

2nd option for improved targeting: removal of HHCRO/Nest or other criteria

Removing eligibility for other schemes as FPNES criteria was not welcome by stakeholders. There are two main reasons for this:

1. eligibility for other schemes, especially the HCCRO criterion, have been useful indicators for fuel poverty and have made the identification of households easier.
2. Removing the HHCRO criterion would risk the decoupling from other schemes' support, mainly funding that a fuel poor customer may need. Complementary works, such as important in-house works, are often delivered jointly this way.

Others mentioned that the existing HHCRO criteria is not "particularly generous" and should therefore not limit eligibility further, and that it was helpful to have other proxies, especially since the removal of the IMD criterion.

3rd option for improved targeting: carrying out eligibility checks

The third option, carrying out eligibility checks, was not favoured by stakeholders, with respondents cautioning against this for practicality reasons. The main objection was that these are already being carried out, and more stringent checks would be extremely difficult if not impossible to carry out given people's reluctance to give out information and occasional scepticism.

In addition to issues for local organisations or GDNs in terms of financial and human resources needed to perform more stringent eligibility checks, stakeholders said that additional steps could deter take-up of the scheme.

One stakeholder mentioned that instead of making these checks more stringent, eligibility could instead be widened to include more low-income and vulnerable customers.

4th option for improved targeting: integration into two-way partnership networks

Partnership networks were generally welcomed as an idea by most stakeholders, but some respondents said partnerships already existed and that local organisations were already cooperating with one another as well as with some network companies.

While some raised the points of sources for increased funding (for example to cover higher costs for local organisations or referral fees), most stakeholders, including those already working with some partners, said that more could be done in this area and efforts could be optimised.

All stakeholders fully recognised the benefit of taking a customer-centric approach and the need for full end-to-end support that gives fuel poor off-gas households holistic help. Some stakeholders believe this could be particularly useful in combination with the LA Flex (Local Authority Flex) scheme that is delivered under ECO.

Conclusion

There was broad consensus on option 1 being a sensible suggestion and that targeting the right households is key to delivering the scheme effectively. However, concerns about higher time and financial requirements, as well as the difficulty of overcoming people's reluctance of sharing information call into question whether increased targeting would be both feasible and worthwhile. Scepticism about the effectiveness of granular targeting was expressed by different stakeholder types as they believe it may cause some households or areas to be ignored and argued in favour of a wider and more inclusive targeting approach.

Of all the ways to improve targeting, the use of data mapping tools was favoured the most, followed by integrated partnership networks. Stakeholders were broadly opposed to the other two options of removing eligibility criteria from other schemes and introducing more stringent eligibility checks.

6.3.2 Case studies: targeting methods and mapping tools used in the GB Energy sector

Box 1 - SSEN mapping tool

SSEN have developed a tool to map different datasets providing an overview of situations of vulnerability as well as social issues across the networks it serves. Among other things, the tool can show the overlap between pockets of fuel poor households and areas with a high concentration of households off the gas grid. The tool is based on LSOA data (England and Wales), Data Zones (Scotland), EPC ratings and XoServe data along with other datasets. Indicators that aggregate different datasets (e.g. Fuel poverty indicators) are computed and mapped against the GIS (Geographic Information System) to show areas of vulnerability. Layering of different maps can help in the identification of particular target groups, such as an area with the highest percentage of fuel poverty and households which are privately rented. In general, SSEN informs decision making with the insight provided by the tool. The actions taken are complemented by direct engagement by field teams during an event.

Box 2 - UKPN mapping tool

Similarly to WPD and SSEN, UKPN use a data mapping tool based on proprietary and publicly available information to identify those on low income and other types of vulnerability. Although it does not go down to household level, it pinpoints areas of high likelihood, so initiatives can be targeted to that area.

Similarly to other DNOs, UKPN uses the insight provided by mapping tools to identify areas with high concentrations of vulnerable situations and then look for existing or new partners to deliver support to customers in these areas.

With respect to other DNOs, UKPN wants to avoid undesirable behaviours which could raise by incentivising third party organisations to provide a larger number of referrals. In line with this, the company rewards its partners based not on the number of referrals but rather on the volume of support delivered to customers in situations of vulnerability.

Box 3 - Energy Saving Trust mapping tool

Energy Savings Trust (EST) have developed a mapping tool called “Home Analytics” that can map a variety of datasets across Wales, England and Scotland. It consists of both publicly available and purchased data that can identify property and energy efficiency characteristics for every home.

The tool can model characteristics such as wall type, main fuel supply, boiler type, fuel poverty indicators, property tenure and age, and more down to a household level.

Specifically, in terms of fuel poverty, the mapping can indicate fuel poor households with 87% accuracy, with the ability to produce a numeric risk of fuel poverty based on both the LIHC definition, as well as the 10% income threshold definition. In addition to this the tool can indicate homes off the gas grid. Importantly, this includes the distance of a household from the gas grid.

This information is available to companies that want to effectively target and reach customers in need of support. The cost per household identified depends on datasets used but is usually around 2pence.

This example indicates how GDNs and their partners could identify households that are likely to be both in fuel poverty and eligible for the FPNES with a high degree of accuracy and low search costs.

Box 4 - WPD Partnership Networks and mapping tools

PowerUp

PowerUp is WPD's own partnership network through which identified households can receive different types of support from a range of organisations, depending on the needs of the customer. Once a customer is identified, either by WPD or by a 'lead organisation' that is responsible for seeing through the end-to-end support, they can get referred to other partners for help.

WPD works together with CSE (Centre for Sustainable Energy) to carry out a 'horizon scan' to identify lead organisations. These tend to be larger organisations, as they may need to handle up to 300 referrals a week. These get tasked to build a network of sub-partners through desktop research and telephone interviews. In 2017, 160 organisations were identified to jointly deliver 1 or more of the 6 interventions (including tariff switching advice, energy efficiency measures). WPD refer around 100 customers per week and tend to reward partners based on referral volumes.

Affordable Warmth Scheme

The Affordable Warmth model incentivises the delivery of a minimum number of referrals between local organisations and WPD. WPD have set themselves a minimum target of 1,250 referrals in each licence area and run one partnership programme per area over 6 periods a year. The overall aim is to deliver support to 7,000 customers per area.

Primarily, the aim is to deliver on their six interventions (income maximisation, tariff advice, energy efficiency measures, boiler replacement and heating technologies, behavioural changes and health and wellbeing measures). WPD reward organisations for identifying customers in need. Following this model, should a customer result as being in fuel poverty, they could receive support and get referred to a subsidised gas connection as part of wider types of support.

Lead partners rely on their networks of local trusted third parties to have meaningful discussions with those in situations of vulnerability. While the mapping tool provides insight on where to focus efforts, the role of local partners is seen as indispensable for the success of the scheme.

WPD set £120 as the maximum identification cost per customer. The average saving to a customer as a result of the support delivered by their schemes is at least £120. The total cost of running their four schemes was £284,000 which benefitted 6,500 households. This brought the identification cost per capita to £44.

Mapping tool

WPD developed a mapping tool to identify customers in situations of vulnerability. It is largely based on their own data and complemented by Experian Mosaic data. They continue to add data sets and maintain the tool to ensure it is as up-to-date as possible.

WPD frequently contact customers to cleanse the PSR (Priority Service Register); a part of that effort is identifying customers struggling with fuel-poverty related issues, e.g. those who are off the gas grid or vulnerable to power cuts. Call centre staff is trained to identify clues of these situations and to have 'difficult discussions' with customers.

Overall, this mapping tool has proven very useful and WPD have found fuel poverty in all the areas they expected to find it. In some cases, the data pointed them towards areas that they did not expect. When pushing local partners to go to those areas, the tool proved accurate and they identified people who were asset rich but cash poor.

6.3.3 Option 2 – Link FPNES to other government schemes

The majority of stakeholders welcomed this proposal and stated their support to align different criteria of schemes all working towards a common goal. Some stakeholders expressed reservations, and others objected to this option in its entirety.

Supporters of option 2 see benefit in aligning funding and different types of support, especially funding for in-house works to subsidies for gas connections. The general consensus among these respondents was that more alignment was desirable, across GB and devolved nations. Despite expressing support, all said this option would be extremely difficult to achieve, as it would involve several different parties with overlapping responsibilities and a lot of coordination efforts.

Other stakeholders shared the view that alignment of criteria would be beneficial for its potential to highlight gaps in support or areas of duplication. In addition, supporters stated that effectively tackling fuel poverty rests on a household's ability to access both in-home and out-of-home types of support – by aligning eligibility the likelihood that a household may access all support is improved.

Two stakeholders who opposed this suggestion stated that it was unrealistic to align eligibility criteria across all schemes as different schemes serve different purposes and tend to address different target groups.

Conclusion

Linking the FPNES to other government schemes and aligning criteria across these was strongly favoured by stakeholders, as it would facilitate the joint delivery of different types of support and funding. Fuel poor off-gas households could greatly benefit from receiving a gas connection as well as in-house works, for example. Some key stakeholders highlighted the difficulty of achieving this and shared the view that this would not happen because of the diverging objectives of fuel poverty schemes.

6.3.4 Option 3 – Ofgem to assess the effectiveness of FPNES connections delivery

Incentivising GDNs to demonstrate the effectiveness in their delivery of FPNES connections was welcomed by most stakeholders. Some generally support incentivisation and believe this is the best approach and see a particular benefit in the increase of information made available by GDNs. By recording more information to showcase their efforts, companies could allow for a better before-and-after comparison and allow all parties involved to gain a fuller picture of the benefits achieved. It would be particularly useful to have more insight on sources of funding, for example for in-house works. One stakeholder also mentioned that the quality of support to fuel poor off-gas households was important and that only having a hard target of number of connections to be made was not the best way to measure success.

However, supporters mentioned that cooperation and partnerships must not suffer as a result of this and must continue. Other stakeholders suggested that if incentivisation occurred through the SEI (Stakeholder Engagement Incentive), it could be linked to other targets, such as energy efficiency measures.

Some of the stakeholders who were not in favour of this option argued that effectiveness in the delivery of FPNES connection was already being measured through the DRS (Discretionary Reward Scheme). These stakeholders questioned whether it would be worth collecting and recording additional information and whether this was within the remit of a GDN.

Two stakeholders made the points that this would neither solve the in-house work issue, nor the difficulty of getting information from people.

Conclusion

Incentivising GDNs' performance and quality of support to households was favoured by most stakeholders, with only a few voicing concerns or generally not supporting the idea of incentivisation.

Box 6 - Overlap between Discretionary Reward Scheme and the proposals of Option 3

The DRS incentivises GDNs to undertake activities that help address a range of social, carbon monoxide safety and environmental issues with a maximum reward of £12m available over the price control across all networks. These activities can include initiatives to deliver low carbon objectives, facilitate sustainable energy solutions to the fuel poor, or to showcase an innovative approach to raising awareness of impacts of CO exposure.

While there may be some overlap between the DRS and the SEI, they reward and incentivise different activities. The delivery of environmental and social objectives should be underpinned by a coherent stakeholder engagement strategy, which assesses a wider range of activities than just those related to the environment or society. The SEI assesses whether stakeholder engagement activities are innovative, embedded in the business and leading to positive outcomes. Whilst both involve engaging with stakeholders, the DRS aims to cover other activities that networks are carrying out to deliver outputs on these topics.

In general, we do not believe that the DRS measures the effectiveness with which network companies are delivering on their connections targets and believe there is scope to do so as part of a future Stakeholder Engagement Incentive or similar measure. The ultimate objective should be to incentivise GDNs to adopt best practice, innovate on business as usual and deliver better outcomes for society (e.g. improve targeting accuracy, get help to the most in need, etc).

6.3.5 Option 4 – Scheme focused on the delivery of gas connections to off-gas communities

This option was not favoured by stakeholders, and although some potential benefits were mentioned, stakeholders do not believe it to be a good alternative. Although targeting off-gas communities could prove effective in some cases and may reduce costs per connection, it does not necessarily help address the wider issue of providing whole-house and holistic support to fuel poor households.

Several stakeholders were generally opposed to abolishing the FPNES and suggested it could be included as an option within the current scheme. This raises the question of additional funding sources. It was also unclear to stakeholders whether it would be fair for all customers to bear the costs of a gas connection, if not all or only few were actually fuel poor, and if it would be helping the right people.

A few stakeholders stated that off-gas community projects are already being undertaken in some parts of GB (for example because ECO allows for this), as well as district heating schemes already helping towards this. Several stakeholders voiced a concern that option would go against decarbonisation targets. Looking forward, there is uncertainty about the role of gas over the next decades, calling into question the effectiveness and durability of such a project.

Two stakeholders suggested that a focus on community connections could be combined with Option 5 of installing renewable generation. This was seen to be more in line with decarbonisation policies.

Conclusion

Focusing on off-gas communities was not seen as a good alternative to the current. Several stakeholders shared the view that it would not solve the current problem of providing holistic end-to-end support to a target group. Further concerns about this option include a clash with decarbonisation targets and the aspect of the fairness of cost-splitting.

6.3.6 Option 5 – Scheme to install renewable generation for fuel poor households

The option to replace the FPNES with the installation of renewable generation was not seen as a viable or effective alternative by almost all stakeholders. Only one stakeholder strongly supported this suggestion, stating that it could be combined with ECO funding in cases where gas connections were not viable and that this was fully in line with decarbonisation targets. Although the latter was generally recognised as a valid point by all, it would still not warrant the replacement of the FPNES.

Opponents argued it would not address the problem of whole-house solutions and in-house works, as well as its lack of focus on other issues such as energy efficiency and insulation. The other main argument against this option was that affordable heating was still the priority in helping fuel poor households.

While a few stakeholders felt the option could be interesting in principle, they were unsure about the practicality and feasibility of such an alternative. Many pointed towards the unknown future role of gas and changing energy systems overall. Although funding for other decarbonisation schemes could be redirected towards this, stakeholders were unsure about the actual benefits this could deliver, especially since feed-in-tariffs have decreased over the past years. Another practical point raised was the seasonal effect this could have on a household's energy use and ability to heat a home. If, for instance, people had solar panels but returned to using electrical heating in cold winter months, there would be no consistent and long-term improvement in their ability to heat their home.

Others raised reservations on the level of education required by this option, and one stakeholder pointed out that those in vulnerable situations, in particular, tend to face difficulties in dealing with these systems.

Many respondents thought this alternative did not fit in with the main aim of the scheme and the particular side of fuel poverty it is trying to address – to make heating homes more affordable. One stakeholder thought some progress was already being made through the RHI (Renewable Heat Incentive), while another stakeholder suggested the RHI or district heating schemes could be linked with the FPNES but should not replace it entirely. Although renewable energies could be an option in cases where gas connections are simply not economically feasible, this can largely depend on landlords. Some stakeholders concluded that renewable generation could be an option offered under the FPNES.

Conclusion

While the importance of renewable generation in working towards decarbonisation was recognised, replacing the FPNES with this was neither considered practically or financially viable nor providing the right type of support to fuel poor homes that are currently being targeted. Instead, the installation of renewable generation could potentially be offered to off-gas households as an option under the scheme.

7. Cost-benefit profile of proposed policy options

As part of our assessment of the policy options introduced above, we calculated their cost-benefit profiles. The approach taken to carry out these analyses is consistent with the financial and social cost-benefit calculations employed to assess the FPNES in its current form (*see Chapter #3)*.

Stakeholder feedback on the potential policy options was overwhelmingly in favour of keeping FPNES in place – this implies that Option #4 (scheme focused on off-gas communities) and Option #5 (scheme to support the installation of renewable generation for fuel poor households) are not desirable.

In reflection of stakeholder feedback, the scope of our cost-benefit analyses is restricted to the first three options which all include keeping the FPNES in place. The three policy options we have modelled are the following:

- Option 1- Improve targeting of the existing FPNES
- Option 2- Link the FPNES to other government schemes
- Option 3- Assess the effectiveness of connections delivery

The analyses estimate the financial and social impact on households involved across all three options. Each of these implies a different set of benefits, these are presented in the table below.

What benefits would households receive?	Income Maximisation	Health Benefits	Tariff Advice	Heating technology improvements	Energy efficiency measures	Support to access government schemes
Option #1 *(Improved targeting accuracy)*	X	X	X	X	X	X
Option #2 *(Linking to other government schemes)*		X		X	X	X
Option#2 *(Measuring efficiency)*	X	X	X	X	X	X

TABLE 1 - BREAKDOWN OF SOCIAL BENEFITS EXPECTED ACROSS POLICY OPTIONS

The table above shows that Option #1 and Option #3 include the same set of social benefits. We have made the assumption that in a bid to improve targeting efforts, GDNs and their partners will have to rely on networks of local partners to deliver a wide range of support services to the fuel poor households they identify.

We believe that the same would occur in Option #3 – should GDNs be incentivised to deliver FPNES connections efficiently, it is likely that they will adopt cost-effective tools and processes to target and engage households. Learning from the experience and the results already achieved by Distribution Network Operators these efforts could translate into the establishment of the same type of local partner networks and the use of mapping tools – these actions drive towards better targeting and a wider set of social benefits delivered along with a subsidised connection. Given the similarity between Options #1 and #3, we present their cost-benefit profile together in the next section.

7.1 Cost-benefit profile of Option #1 and Option #3

Options Description

The first option is to improve the accuracy with which GDNs and their partners target fuel poor households to deliver subsidised connections. This can be achieved in several ways, including better use of data mapping tools as well as capillary networks of local partners to check household eligibility and deliver support – these are introduced and discussed in Chapter #6.

Option #3 proposes the introduction of a mechanism through which the efficiency of GDNs and their partners in targeting and delivering connections for fuel poor homes could be measured. As described in the section above, we believe that if incentivised and given freedom to act, GDNs would adopt measures similar to those described for Option #1.

List of costs and benefits

Financial benefits, defined as the saving realised by households connected to the gas network on their heating costs, for Option 1 and 3 are in line with scenarios of increased targeting accuracy introduced in Chapter #3 (i.e. we model the impact on financial benefits of 50% and 75% targeting accuracy).

The analysis also recognises that with increased targeting the cost to complete individual connections will rise. Existing evidence (*see Mapping tools and Partnership networks case studies)* point to the potential for GDNs and their partners to drastically reduce administrative and search costs incurred for the delivery of the FPNES. We note, however, that these costs are not modelled in the cost-benefit analyses included in this report.

In terms of social benefits, we expect that Option 1 and 3 would ultimately lead GDNs and their partners to refer fuel poor households to a wide range of support. We expect that this would be driven by the integration of subsidised connections within a range of services including income maximisation advice, energy efficiency subsidies, access to other government schemes, and others. This scenario is a realistic one, several Electricity Distribution companies have established a version of these networks and currently deliver analogous support services.

The social benefits we have included in the cost-benefit profile of Option 1 and 3 are the following:

- Income maximisation as a result of advice
- Health benefits as a result of a warmer home
- Tariff switching as a result of advice
- Boiler replacement and installation of heating technology
- Installation of energy efficiency measures
- Behavioral change as a result of advice
- Access to related government schemes to support fuel poor customers

These benefits can be hard to observe and measure, to do so we selected relevant financial proxies for each (in line with the Cabinet Office's Social Return on Investment method) and assumed the probability that each of these may occur within the population of fuel poor homes impacted by the Fuel Poverty Network Extension scheme. These proxies are described in detail in Appendix 1.2 and 1.3.

Cost-benefit profile

The graph below shows an analysis of the costs and benefits involved with Options 1 and 3. The calculation includes both the financial and social benefits described above. It is immediately clear that Options 1 and 3 present a more advantageous cost-benefit profile with respect to the existing FPNES.

Over the period of RIIO-1 alone, these options would deliver a total benefit of £279m and would reach positive cumulative benefits by 2015 (year 2) – this is in stark contrast with the social cost-benefit profile for the FPNES in its existing form (-£4m delivered over the same timeframe).

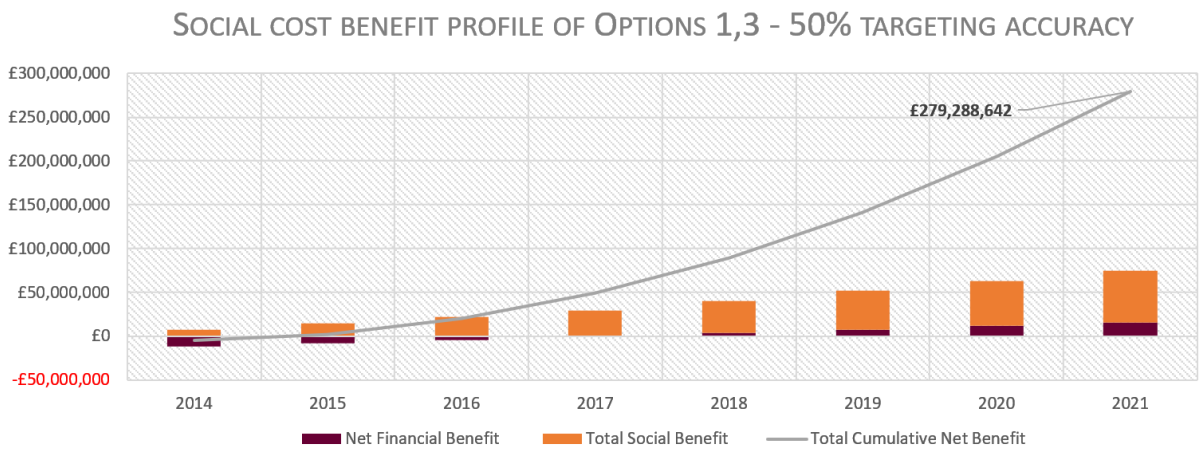

FIGURE 6 - SOCIAL COST-BENEFIT PROFILE OF OPTIONS #1 AND #3

While the net financial benefit has already been discussed in Chapter #2 (*see 50% and 75% targeting accuracy scenarios)*, it is beneficial to comment on the social benefits involved.

Figure 7, on the right, shows a breakdown of the types of social benefits delivered by the FPNES under Options 1 and 3 over the period 2014-2021. The model shows that tariff advice would deliver the most benefit over this timeframe – this is partly because of findings that as much as 64%[12] of those exposed to income maximisation, energy saving or fuel switching advice act and benefit from it.

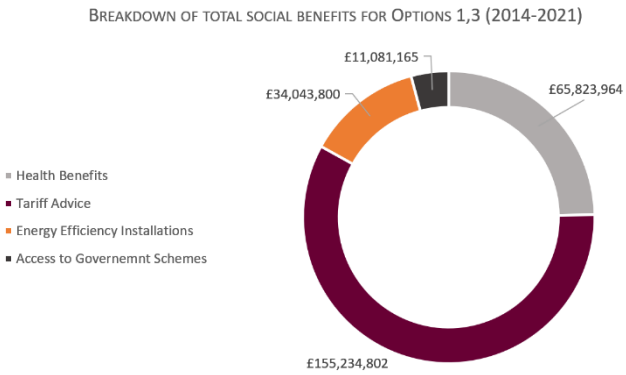

FIGURE 7 - BREAKDOWN OF SOCIAL BENEFITS BY TYPES (2014-2021)

7.2 Cost-benefit profile of Option #2

Option Description

Option 2 looks at the potential to mandate or support the referral of a household exposed to an FPNES connection to organisations delivering other government schemes. Exposure to these schemes would ultimately lead to the installation of energy efficiency measures or financial payments to support households' disposable incomes over the winter months.

[12] Westminster Sustainable Business Forum, Warmer & greener: a guide to the future of domestic energy efficiency policy, https://www.policyconnect.org.uk/sites/site_pc/files/report/734/fieldreportdownload/warmergreenerreport.pdf (accessed October 2, 2018).

List of costs and benefits

We expect the following differences with respect to Options 1 and 3:

- Targeting accuracy would not improve from the current base case scenario of 30%. This assumes that GDNs and their partners would not adopt tools and processes to lower search and administrative costs involved with the delivery of FPNES without an incentive or a requirement to do so.
- The absence of local networks of partners delivering systematically a wide range of support services to the households impacted by FPNES imply a lack of advice-related benefits (e.g. income maximisation, energy savings, etc.).

We assume that the health benefits stemming from warmer homes will also occur under Option #2.

Cost-benefit profile

The graph below presents the cost-benefit profile for Option 2 considering both financial and social benefits. As explored in Chapter 3, lower targeting accuracy of fuel poor households lowers substantially the amount of benefit delivered by the FPNES.

In general, Option 2 is an improvement with respect to the standard social benefit profile of the scheme today. The larger social benefits implied by the referral of households to efficiency and income maximisation schemes bring the cumulative net benefit over the period of RIIOGD-1 from -£4m (standard case counting social benefits) to £22.8m.

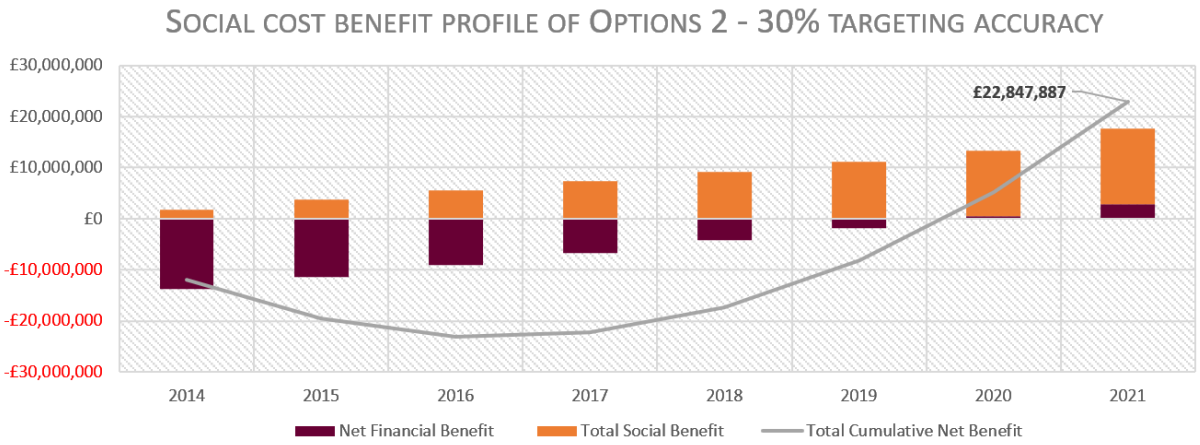

FIGURE 8 - SOCIAL COST-BENEFIT PROFILE FOR OPTION 2

Key Finding

- Options 1, 2 and 3 for the development of the FPNES scheme would all lead to an improvement in the value for money profile of the scheme.
    - Options 1 and 3 would deliver a cumulative net benefit of £279m over the period 2014-2021
    - Option 2 would deliver a cumulative net benefit of £22.8m over for the same period
- Options 1 and 3 would lead to the largest improvement – this is due to the wider range of social benefits for fuel poor households they imply.

8. Conclusion and recommendations

8.1 Conclusions

In this report Sia Partners explored the following key points:

1. We have assessed whether the existing FPNES is the most efficient solution to address the needs of fuel poor customers,
2. We have assessed whether FPNES, in its current form, is value for money to all customers,
3. We have assessed whether FPNES is at odds with the government's policies, targets and strategies on fuel poverty and decarbonisation,
4. We developed ideas for alternative options to improve or replace the FPNES scheme,
5. Engaged stakeholders and reported their views on these options, and
6. Calculated the cost-benefit profile of the policy options deemed desirable by stakeholders.

As a result of carrying out the activities listed above, we have reached the following list of conclusions:

- Stakeholders consider the Fuel Poverty Network Extension Scheme valuable and believe that removing it at the end of the current price control period is not desirable.
- The FPNES plays a well-defined, non-overlapping role within the portfolio of government and private schemes aimed at tackling fuel poverty. Fuel poverty is effectively tackled when households are exposed to support that addresses all drivers of the issue: energy efficiency, energy costs and income levels. However, we find that the delivery of these schemes is often uncoordinated. This limits the ability of each individual scheme to tackle fuel poverty.
- The FPNES should not include the delivery of other types of fuel poverty support (e.g. in-home energy efficiency measures), rather there is scope to build closer links to other schemes that offer analogous types of support via Gas Distribution Networks and their partners.
- The FPNES is broadly in line with fuel poverty strategies, policies and targets on a national and devolved government level. There are both tensions and synergies with respect to decarbonisation policies – while on one hand, the scheme is incentivising the use of more carbon fossil fuels, it is also providing access to a comparatively cleaner fuel type. The future role of the gas network can impact the desirability of extending the gas network.
- Our analysis suggests that in its current form, the FPNES offers value for money. However, we believe that the value for money profile of the scheme can be substantially improved by better targeting fuel poor homes.
- There is scope to better target those in fuel poverty. This can be done through tools and processes that have already been adopted by others in the energy industry. These tools include data mapping tools and networks of local partners among others. Gas Distribution Networks have indicated that they already employ these in the context of the FPNES, however, we believe their use can be expanded.

- There is scope to lower the cost of delivering the FPNES scheme. In particular, the cost of identifying fuel poor stakeholders and the cost to ensure that they are eligible to access the scheme could be lowered substantially. This is also tied to more rigorous use of mapping tools and local partnership networks.
- Two policy options for the development of the FPNES can be singled out as the most beneficial to both fuel poor customers and society as a whole:
    - Increasing the targeting accuracy of the FPNES in favour of fuel poor households, and
    - Measuring the efficiency with which Gas Distribution Networks deliver on their connection targets.

8.2 Recommendations

Based on the findings listed above, we recommend Ofgem to consider the following actions:

- Consider different approaches to stimulate the referral of those who receive a FPNES connection to the whole range of support services and government schemes aimed at tackling fuel poverty:
    - Effectively tackling fuel poverty rests on the ability of households to access both in-home and out-of-home fuel poverty support. Ofgem can consider several options to incentivise organisations delivering FPNES connections to drive these outcomes – this rests within Ofgem's remit. ***Please refer to section 6.3.4 for more detail.***
    - The social cost benefits included in this report highlight the value of this approach to society as a whole.
- Consider the potential to recommend or advise the standardisation of eligibility checks for potential beneficiaries of the FPNES. Stakeholders viewed this as a welcomed developed which would bring about lower administration costs.
- Incentivise or stimulate GDNs to provide more detailed information on the practices they employ to identify and qualify fuel poor customers in a cost-effective way. This can be done in a variety of ways which include requiring evidence as part of an incentive mechanism or further information in addition to the volume of connections delivered by GDNs. ***Please refer to section 6.3.4 for more detail.***
- For gas networks to carry out a more detailed assessment of the percentage of fuel poor customers out of those who they provided a subsidised connection to in the past. This is a good opportunity to self-identify best-practice in targeting fuel poor households while verifying the assumptions and accuracy of previously used tools and mechanisms for the delivery of the FPNES.
- Engage stakeholders to explore the impact that the future role of gas infrastructure may have on expanding the gas network as part of FPNES. ***Please refer to section 6.3.4 for more detail.***

APPENDICES

Appendix 1 – Assumptions and calculations of cost-benefit analyses

A1.1 – Financial cost-benefit assumptions

Heating costs calculation

The table below presents the raw data and assumptions taken to calculate the fuel costs incurred by household to heat a standard home.

Fuel Type	Fuel price (£/kWh)	Added standing charge (SC)	Kg CO2e per kWh	Fuel price allowing for appliance efficiency (£/kWh)	Appliance efficiency	Cost of 12,500 kWh, excluding SC (£/y)	Total Heating cost including SC (£/y)	Total Kg CO2e* emissions
Mains Gas	0.036	83.87	0.209	0.041	89%	511.2	595.1	2612.5
LPG	0.067	0	0.242	0.076	89%	946.6	946.6	3025.0
Heating Oil (Kerosene 28)	0.063	0	0.296	0.081	78%	1006.4	1006.4	3700.0
Wood (Pellets)	0.064	0	0.051	0.098	65%	1223.1	1223.1	637.5
Economy 7	0.098	78.4	0.517	0.098	100%	1225.0	1303.4	6462.5
Coal	0.057	0	0.392	0.126	45%	1577.8	1577.8	4900.0
Standard Electric	0.140	72	0.517	0.140	100%	1750.0	1822.0	6462.5

*"Carbon dioxide equivalent" or "CO2e" is a term for describing different greenhouse gases in a common unit. For any quantity and type of greenhouse gas, CO2e signifies the amount of CO2 which would have the equivalent global warming impact. A quantity of GHG can be expressed as CO2e by multiplying the amount of the GHG by its GWP. E.g. if 1kg of methane is emitted, this can be expressed as 25kg of CO2e

Data sources

- Electricity and Gas Unit Prices and Standard Charges: BEIS[13]
- Other fuel prices: Nottingham Energy Partnership[14]
- Appliance Efficiency: Citizen Advice Scotland[15]
- CO_2 Emissions Figures: Nottingham Energy Partnership

[13] https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/743765/table_234.xls, https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/743758/table_221.xls

[14] https://nottenergy.com/our-services/resources/energy-cost-comparison/

[15] https://www.cas.org.uk/system/files/publications/2018-08-15_off-gas_report_final_0.pdf

Central Heating systems breakdown

The table below shows the breakdown of central heating solutions found in UK dwelling which *are not already equipped with a Central Heating system based on Mains Gas.*

Measure	Solid fuel	Electric storage	Other electric	Oil	Other	No central heating	Housing stock (dwellings)
# of Dwellings (thousands)	127.86	1559.790	183.88	1038.33	497.29	783.750	4191
% of Dwellings	3%	37%	4%	25%	12%	19%	100%

Data Source

- Electricity and Gas Unit Prices and Standard Charges: BEIS[16]

Financial-only cost-benefit calculation – 30% targeting accuracy scenario

	2014	2015	2016	2017	2018	2019	2020	2021
Cumulative number of connection	3,420	6,840	10,260	13,680	17,101	20,521	23,941	27,361
Aggregated Benefits								
Electricity (s) > Gas	£ *784,707*	£ *1,569,413.34*	£ *2,354,120*	£ *3,138,827*	£ *3,923,533*	£ *4,708,240*	£ *5,492,947*	£ *6,277,653*
Electricity (e) > Gas	£ *1,007,861*	£ *2,015,722*	£ *3,023,583*	£ *4,031,444*	£ *5,039,305*	£ *6,047,166*	£ *7,055,027*	£ *8,062,888*
LPG > Gas	£ *142,655*	£ *285,310*	£ *427,965*	£ *570,619*	£ *713,274*	£ *855,929*	£ *998,584*	£ *1,141,239*
Heating Oil > Gas	£ *348,515*	£ *697,030*	£ *1,045,545*	£ *1,394,060*	£ *1,742,575*	£ *2,091,090*	£ *2,439,604*	£ *2,788,119*
Coal > Gas	£ *51,267*	£ *102,534*	£ *153,800*	£ *205,067*	£ *256,334*	£ *307,601*	£ *358,867*	£ *410,134*
Wood Pellets > Gas	£ *32,762*	£ *65,523*	£ *98,285*	£ *131,047*	£ *163,809*	£ *196,570*	£ *229,332*	£ *262,094*
Total yearly benefit (includes only benefit to fuel poor customers)	£ 2,367,766	£ 4,735,532	£ 7,103,298	£ 9,471,064	£ 11,838,829	£ 14,206,595	£ 16,574,361	£ 18,942,127
Total yearly cost (includes non-fuel poor connections)	£ 16,120,130	£ 16,120,130	£ 16,120,130	£ 16,120,130	£ 16,120,130	£ 16,120,130	£ 16,120,130	£ 16,120,130
Yearly net benefit	-£13,752,364	-£11,384,598	-£9,016,833	-£6,649,067	-£4,281,301	-£1,913,535	£454,231	£2,821,997
Cumulative net benefit	-£13,752,364	-£25,136,963	-£34,153,795	-£40,802,862	-£45,084,163	-£46,997,698	-£46,543,467	-£43,721,470

Assumptions

- Average FPNES connection cost: £1,414

[16] https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/729326/ECUK_Tables_2018.xlsx

Financial-only cost-benefit calculation – 50% targeting accuracy scenario

	2014	2015	2016	2017	2018	2019	2020	2021
Cumulative number of connection	5,700	11,400	17,101	22,801	28,501	34,201	39,901	45,602
Aggregated Benefits								
Electricity (s) > Gas	£ 1,307,844	£ 2,615,688.90	£ 3,923,533	£ 5,231,378	£ 6,539,222	£ 7,847,067	£ 9,154,911	£ 10,462,756
Electricity (e) > Gas	£ 1,679,768	£ 3,359,536	£ 5,039,305	£ 6,719,073	£ 8,398,841	£ 10,078,609	£ 11,758,378	£ 13,438,146
LPG > Gas	£ 237,758	£ 475,516	£ 713,274	£ 951,032	£ 1,188,790	£ 1,426,548	£ 1,664,307	£ 1,902,065
Heating Oil > Gas	£ 580,858	£ 1,161,716	£ 1,742,575	£ 2,323,433	£ 2,904,291	£ 3,485,149	£ 4,066,007	£ 4,646,866
Coal > Gas	£ 85,445	£ 170,889	£ 256,334	£ 341,778	£ 427,223	£ 512,668	£ 598,112	£ 683,557
Wood Pellets > Gas	£ 54,603	£ 109,206	£ 163,809	£ 218,412	£ 273,015	£ 327,617	£ 382,220	£ 436,823
Total yearly benefit (includes only benefit to fuel poor customers)	£ 3,946,276	£ 7,892,553	£ 11,838,829	£ 15,785,106	£ 19,731,382	£ 23,677,659	£ 27,623,935	£ 31,570,212
Total yearly cost (includes non-fuel poor connections)	£ 17,732,143	£ 17,732,143	£ 17,732,143	£ 17,732,143	£ 17,732,143	£ 17,732,143	£ 17,732,143	£ 17,732,143
Yearly net benefit	-£13,785,867	-£9,839,590	-£5,893,314	-£1,947,037	£1,999,239	£5,945,516	£9,891,792	£13,838,069
Cumulative net benefit	-£13,785,867	-£23,625,457	-£29,518,771	-£31,465,808	-£29,466,569	-£23,521,053	-£13,629,261	£208,808

Assumptions

- Average FPNES connection cost: £1,555

Financial-only cost-benefit calculation – 75% targeting accuracy scenario

	2014	2015	2016	2017	2018	2019	2020	2021
Cumulative number of connection	8,550	17,101	25,651	34,201	42,751	51,302	59,852	68,402
Aggregated Benefits								
Electricity (s) > Gas	£ 1,961,767	£ 3,923,533.34	£ 5,885,300	£ 7,847,067	£ 9,808,833	£ 11,770,600	£ 13,732,367	£ 15,694,133
Electricity (e) > Gas	£ 2,519,652	£ 5,039,305	£ 7,558,957	£ 10,078,609	£ 12,598,262	£ 15,117,914	£ 17,637,567	£ 20,157,219
LPG > Gas	£ 356,637	£ 713,274	£ 1,069,911	£ 1,426,548	£ 1,783,186	£ 2,139,823	£ 2,496,460	£ 2,853,097
Heating Oil > Gas	£ 871,287	£ 1,742,575	£ 2,613,862	£ 3,485,149	£ 4,356,437	£ 5,227,724	£ 6,099,011	£ 6,970,299
Coal > Gas	£ 128,167	£ 256,334	£ 384,501	£ 512,668	£ 640,835	£ 769,002	£ 897,168	£ 1,025,335
Wood Pellets > Gas	£ 81,904	£ 163,809	£ 245,713	£ 327,617	£ 409,522	£ 491,426	£ 573,331	£ 655,235
Total yearly benefit (includes only benefit to fuel poor customers)	£ 5,919,415	£ 11,838,829	£ 17,758,244	£ 23,677,659	£ 29,597,074	£ 35,516,488	£ 41,435,903	£ 47,355,318
Total yearly cost (includes non-fuel poor connections)	£ 19,344,156	£ 19,344,156	£ 19,344,156	£ 19,344,156	£ 19,344,156	£ 19,344,156	£ 19,344,156	£ 19,344,156
Yearly net benefit	-£13,424,742	-£7,505,327	-£1,585,912	£4,333,503	£10,252,917	£16,172,332	£22,091,747	£28,011,162
Cumulative net benefit	-£13,424,742	-£20,930,068	-£22,515,980	-£18,182,478	-£7,929,560	£8,242,772	£30,334,519	£58,345,680

Assumptions

- Average FPNES connection cost: £1,697

A1.2 – Social cost-benefit analysis assumptions and methodology

The following table includes the full list of the financial proxies we used to calculate the social cost-benefit profile of the FPNES scheme and the three policy options deemed desirable by stakeholders. Those highlighted in green are the ones we utilised in the final calculations.

Proxy description	Unit	Unit cost	Activity	Source	Source Year
Total annual savings of vulnerable and poor customers after energy training	Year	£ 4.27	Reduction in the overall gas bill due to energy training programmes for customers	WPD SECV Submission	2017
Carbon price Carbon ETS	Ton	£ 18.12	Educate customers about the use of gas in the home and how to be more efficient	https://markets.businessinsider.com/commodities/co2-emissionsrechte	As of 11/10/2018
Cost per hour of private caretaker	Hour	£ 25.62	Elderly are able to stay at home	The unit cost of Health and Social care the UK	2017
Cost of GP consultation	Visit	£ 38.00	Comfortable and warm homes reduce the amount of illness cases	The unit cost of Health and Social Care UK	2017
Annual savings per vulnerable customer	Year	£ 194.31	Fight fuel poverty and give advice to vulnerable customers on how to save money and keep warm (during the winter)	WPD SECV	2017
Life satisfaction change per individual	Person	£ 499.38	Increase in quality of life	http://www.globalvalueexchange.org	2017
Average national cost of mold removal	Event	£ 2,147.00	Heating leads to higher quality homes and less need for home improvements	Home advisor	2016
Non-elective inpatient stays (long stays)	Event	£ 2,980.00	Reduced amount of long hospital visits due to safety	Unit cost of Health and Social care UK	2017
Feel in control of life (value to an individual aged >50 and living in the UK but outside of London)	Person	£ 15,733.72	Increasing self-esteem of 50+	http://www.globalvalueexchange.org	
Cost of time off (seven days)	Week	£ 29,200.00	Reducing time off work from sickness/injury	HSE cost to Britain model	2017

Savings for customers going onto social tariffs as opposed to the standard tariff	Year	£ 150.00	Average annual cost saving for customers going on to social tariffs as opposed to the standard tariff resulting in the long-term health consequences of living in fuel poverty	http://www.globalvaluexchange.org/valuations/8279e41d9e5e0bd8499f29cc	2009
Warm Home Discount	Person	£ 140.00	There are 2 ways to qualify for the Warm Home Discount Scheme: (1) you get the Guarantee Credit element of Pension Credit - known as the 'core group' and (2) you're on a low income and meet your energy supplier's criteria for the scheme - known as the 'broader group'	https://www.gov.uk/the-warm-home-discount-scheme	2018
Winter Fuel Payment	Person	£ 200.00	If you were born on or before 5 November 1953 you could get between £100 and £300 to help you pay your heating bills. This is known as a 'Winter Fuel Payment'.vYou usually get a Winter Fuel Payment automatically if you are eligible and you get the State Pension or another social security benefit (not Housing Benefit, Council Tax Reduction, Child Benefit or Universal Credit).	https://www.gov.uk/winter-fuel-payment	2018
Energy Efficiency savings	Household	£ 660.00	Based on average saving expected for a semi-detached house after the installation of loft insulation (0-270mm)	http://www.energysavingtrust.org.uk/home-insulation/roof-and-loft	2018

Cold Weather Payments	Household	£ 30.00	You are entitled to a CWP for any week when: (1) the average temperature in your area has been, or is expected to be, 0° Celsius or below for seven consecutive days, and you have an award of a specified benefit (see below), and (2) you are not living in a care home, and (3)you are not subject to immigration control.	https://www.gov.uk/government/statistics/cold-weather-payment-statistics-2017-to-2018	2018
Income maximization advice	Household	£ 1,032.00	Assumed 10% increase in disposable income on median income for fuel poor home (£10, 325)	Own Calculation, Median Fuel Poor income from: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/719106/Fuel_Poverty_Statistics_Report_2018.pdf	2018
Energy savings from installation of insulation	m2	£ 1,659.00	Customers invest in home improvements (assuming 100 square metre semi-detached home)	http://www.globalvalueexchange.org	2018

Social cost-benefit calculation – Options 1 and 3

		2014	2015	2016	2017	2018	2019	2020	2021
Cumulative number of beneficiaries		3,420	6,840	10,260	13,680	17,101	20,521	23,941	27,361
Net Financial Benefit		-£13,752,364	-£11,384,598	-£9,016,833	-£6,649,067	-£4,281,301	-£1,913,535	£454,231	£2,821,997
Total Social Benefit		£ 4,436,396	£ 8,872,791	£ 13,309,187	£ 17,745,582	£ 22,181,978	£ 26,618,373	£ 31,054,769	£ 35,491,164
Health benefits	*Cost of GP consultation*	£ 12,996	£ 25,993	£ 38,989	£ 51,986	£ 64,982	£ 77,979	£ 90,975	£ 103,971
	Life Satisfaction change	£ 85,397	£ 170,794	£ 256,190	£ 341,587	£ 426,984	£ 512,381	£ 597,778	£ 683,174
	Non-elective inpatient stays	£ 998,673	£ 1,997,346	£ 2,996,019	£ 3,994,691	£ 4,993,364	£ 5,992,037	£ 6,990,710	£ 7,989,383
Advice	*Income maximisation*	£ 2,258,916	£ 4,517,832	£ 6,776,748	£ 9,035,664	£ 11,294,580	£ 13,553,495	£ 15,812,411	£ 18,071,327
	Tariff Advice	£ 328,331	£ 656,662	£ 984,992	£ 1,313,323	£ 1,641,654	£ 1,969,985	£ 2,298,316	£ 2,626,646
	Energy Efficiency	£ 567,397	£ 1,134,793	£ 1,702,190	£ 2,269,587	£ 2,836,983	£ 3,404,380	£ 3,971,777	£ 4,539,173
Schemes	*Warm Home Discount Rebate*	£ 95,763	£ 191,526	£ 287,289	£ 383,053	£ 478,816	£ 574,579	£ 670,342	£ 766,105
	Cold weather payment	£ 20,521	£ 41,041	£ 61,562	£ 82,083	£ 102,603	£ 123,124	£ 143,645	£ 164,165
	Winter Fuel payments	£ 68,402	£ 136,805	£ 205,207	£ 273,609	£ 342,011	£ 410,414	£ 478,816	£ 547,218
Total Yearly Net Benefit		-£9,315,969	-£2,511,807	£4,292,354	£11,096,515	£17,900,677	£24,704,838	£31,509,000	£38,313,161
Total Cumulative Net Benefit		-£9,315,969	-£11,827,776	-£7,535,422	£3,561,093	£21,461,770	£46,166,608	£77,675,608	£115,988,769

Assumptions

- Assuming that all households receive advice and 64% of them take action to maximise income
- Assuming that all households receive tariff advice and 64% of them take action to switch tariff[17]
- Assuming that 10% of those who receive an FPNES connection install the full range of insulation options (i.e. energy efficiency measures)
- Assuming that 20% of those who receive an FPNES connection are supported and successful in their Warm Home Discount Rebate
- Assuming that 20% of those who receive an FPNES connection are supported and successful in getting Cold Weather Payments
- Assuming that 10% of those who receive an FPNES connection are supported and successful in securing Winter Fuel Payments

Social cost benefit calculation – Options 2

		2014	2015	2016	2017	2018	2019	2020	2021
Cumulative number of beneficiaries		3,420	6,840	10,260	13,680	17,101	20,521	23,941	27,361
Net Financial Benefit		-£13,752,364	-£11,384,598	-£9,016,833	-£6,649,067	-£4,281,301	-£1,913,535	£454,231	£2,821,997
Total Social Benefit		£ 1,849,149	£ 3,698,298	£ 5,547,446	£ 7,396,595	£ 9,245,744	£ 11,094,893	£ 12,944,042	£ 14,793,190
Health benefits	*Cost of GP consultation*	£ 12,996	£ 25,993	£ 38,989	£ 51,986	£ 64,982	£ 77,979	£ 90,975	£ 103,971
	Life Satisfaction change	£ 85,397	£ 170,794	£ 256,190	£ 341,587	£ 426,984	£ 512,381	£ 597,778	£ 683,174
	Non-elective inpatient stays	£ 998,673	£ 1,997,346	£ 2,996,019	£ 3,994,691	£ 4,993,364	£ 5,992,037	£ 6,990,710	£ 7,989,383
	Energy Efficiency	£ 567,397	£ 1,134,793	£ 1,702,190	£ 2,269,587	£ 2,836,983	£ 3,404,380	£ 3,971,777	£ 4,539,173
Schemes	*Warm Home Discount Rebate*	£ 95,763	£ 191,526	£ 287,289	£ 383,053	£ 478,816	£ 574,579	£ 670,342	£ 766,105
	Cold weather payment	£ 20,521	£ 41,041	£ 61,562	£ 82,083	£ 102,603	£ 123,124	£ 143,645	£ 164,165
	Winter Fuel payments	£ 68,402	£ 136,805	£ 205,207	£ 273,609	£ 342,011	£ 410,414	£ 478,816	£ 547,218
Total Yearly Net Benefit		-£11,903,216	-£7,686,301	-£3,469,386	£747,529	£4,964,443	£9,181,358	£13,398,273	£17,615,187
Total Cumulative Net Benefit		-£11,903,216	-£19,589,516	-£23,058,903	-£22,311,374	-£17,346,931	-£8,165,573	£5,232,700	£22,847,887

Assumptions

- Same above

[17] Westminster Sustainable Business Forum, Warmer & greener: a guide to the future of domestic energy efficiency policy, *https://www.policyconnect.org.uk/sites/site_pc/files/report/734/fieldreportdownload/warmergreenerreport.pdf* (accessed October 2, 2018).

A1.3 – Summary of fundamental assumptions and limitations

The list below indicates the assumptions on which the cost-benefit analyses were built as well as some of the limitations of our approach. Addressing these limitations can provide a clearer and more granular understanding of the value for money profile of the FPNES and the associated policy options.

- Fuel prices stay unchanged throughout the 2014-2021 period. Inflation and purchasing power changes over the 2014-2021 period are not modelled
- We assumed a uniform distribution of connections across years.
- We assumed an average connection cost of £1,414 in the standard case (30% targeting accuracy). This is based on the full budget earmarked for the scheme over the period of RIIO-1 and the updated connection's target. This figure does not take into consideration search and administrative costs tied to the delivery of the FPNES.
- We assume that those who receive a subsidised gas connection heated their homes with a wide range of fuels, as mentioned above in A1.1, we modelled the distribution of central heating solution based on national averages among those not using gas. In reality, we would expect a higher incidence households with no central heating using electricity radiators while on a standard electricity tariff with respect to national averages.
- We assume that each FPNES connection is matched by the installation of boilers and central heating solutions that allow customers to make use of gas to heat homes.
- The amount of financial benefit realised for a customer depends on a vast range of factors – this is inherently difficult to model with confidence. The calculations made in this report serve as an indication of the value of the scheme to all customers and can indicate the preference for one policy option over another based on estimates.
- We assume that the cost to build a connection increases as targeting of fuel poor households becomes more granular.
- The cost-benefit analyses assume that all dwellings require 12,500 kWh to be heated over a year. This is broadly consistent with the total amount of kWh spent by UK households, on average, in 2017 – 10,500 kWh. In reality, the amount of kWh required to heat a home can vary considerably depending on a vast range of factors.
- Boiler efficiency was assumed for every fuel type – in reality, we would expect efficiency rates to vary greatly depending on the type of technology, condition, and age of the heating infrastructure.
- We assumed that all those who did not use central heating were on a standard electricity tariff. All of those who had electric storage heating systems were modelled to be on the cheaper Economy 7 tariff.
- The calculations of social benefits do not include the cost of delivering fuel poverty-related types of support (e.g. the cost of delivering energy saving advice delivered by a charity or the installation of energy efficiency measures delivered by a different third party under ECO) – these costs are not tied to delivery of FPNES.
- The standard scenario for the cost-benefit analyses is based on the 30% targeting accuracy figure – there is no clear evidence that this figure reflects reality.
- The social benefits are assumed and non-exhaustive. More primary research should be conducted to identify relevant benefits, verify that those assumed did, in fact, realise and the likelihood that they take place once a household is exposed to support
- Social benefits do not include carbon emission reduction as a result of heating homes with less carbon-intensive fuels.

Appendix 2 – Feedback on options by stakeholder type

A2.1 - Energy industry

General feedback on the FPNES	
	• Overall, stakeholders from the energy industry believe that the FPNES is a good scheme that has helped many households to heat their homes. Many expressed that the scheme has been successful in enabling people to have warm homes, and generally do not support replacing or removing it. • A potential improvement to the scheme would be increased flexibility around eligibility and connection decisions – similar to 'LAFlex'. Some respondents raised the point of higher costs associated with more targeting, unsure whether this would really add value to the scheme. • Targeting and measuring the success of the scheme are considered difficult, as is getting data and information from people. More alignment with other schemes and eligibility could be helpful in the future. • The biggest difficulty for companies under the current FPNES is that they are not (always) able to offer other types of help and support to fuel poor households. This is particularly true for in-house works, which are often needed, or boiler improvements/replacements.
Feedback on proposed options	
Option 1 – Improved targeting	• Not all energy industry stakeholders are convinced that targeting necessarily needs to improve, and therefore expressed mixed views on the four proposed ways of doing so: • 1st: some already use data mapping tools to target certain areas, while others do not have one in place. Difficulties with this option are getting the right type of data and ensuring that it is of good quality, as well as the costs involved. • 2nd: removing HCCRO or other eligibility criteria was received negatively, as these are often a good indicator of fuel poverty and allow households to receive other types of support that cannot be delivered through the FPNES. • 3rd: carrying out more stringent eligibility checks was not seen favourably. • 3rd: These could increase administration and identification costs, would be very time-consuming. Some stakeholders already do these checks and worried that more stringent ones would cause drop-out rates to rise. • 4th: Partnerships were generally recognised as a good idea, but most said they already worked with local organisations and therefore saw no need to expand in this area to improve targeting.
	• Stakeholders all thought this would make a lot of sense and aligning eligibility across different schemes would help in having a more coordinated effort in solving fuel poverty. The issue of in-house works could potentially be more easily solved this way.

Option 2 – Link FPNES to other government schemes	• They also agreed that inconsistency of the criteria was an issue, and that linking the scheme to others would enable more cooperation, for example between gas networks and suppliers. • However, all respondents said this would be extremely difficult to do and were not sure if practically possible.
Option 3 – Assess effectiveness through SEI	• Not all stakeholders agreed that incentivising or requiring more than connection numbers was necessary. Although one stakeholder suggested having non-quantitative measures for GDNs, others argued that they already showed a lot of their efforts through the DRS (Discretionary Reward Scheme). • Others questioned whether this was still within a GDN's remit and whether it would be fair as GDNs serve different areas with different costs involved.
Option 4 – Scheme focussed on off-gas communities	• Focussing on off-gas communities was not seen as a good alternative to the scheme. Rather, it could be an option under the FPNES, or several smaller schemes could focus on communities instead. • Other reasons include that some GDNs already do this as it is possible under ECO, and also questioned its economic viability. One stakeholder suggested merging this with option 5, but not as a complete replacement of the FPNES.
Option 5 – Installation of renewable generation	• Stakeholders did not think installing renewable generation should or could replace the FPNES, as it would not focus on the same aim – ensuring homes are warm. It would also fail to address the issue of providing other types of support, and seasonal differences and funding remained unsolved. • There were further doubts about the actual benefit of the scheme and whether or not all customers would be able to or know how to best use these new technologies.

A2.2 - Consumer groups

General feedback on the FPNES
• All consumer groups that were engaged said that the FPNES does provide an improvement and helps people heat their homes. • It was expressed many times that full support to households was needed, i.e. additional advice, in-house works, etc., and that they were not sure about the long-term benefit of the scheme and how to measure that. The future role of gas was mentioned in this context. • Although targeting could be improved, consumer groups were not convinced this would be either beneficial or financially achievable. • Improvement ideas for the FPNES would be to standardise certain processes and advice provision and design the scheme to be more outcomes-based to enable whole-house solutions.

Feedback on proposed options	
Option 1 – improved targeting	• In general, all thought that improving targeting would make sense and could be explored. Some stakeholders thought a combination of some of the options below could be used to achieve this. • 1st: responses to mapping tool use were very supportive but raised doubts about data quality and reliability. • 2nd: all stakeholders opposed the idea of removing HHCRO or other scheme criteria as it was useful and could risk the decoupling from other help and funding. • 3rd: responses were limited in number. The difficulty of targeting would not be helped by this option and through greater data sharing and using the Digital Economy Act, there would hopefully be less need for doorstep assessments. • 4th: All agreed on the limitation of only getting a gas connection, as well as the need for fuller support and partnerships to deliver full support. Funding would be an unknown factor though, as well as a risk of shifting the onus away from GDNs.
Option 2 – Link FPNES to other government schemes	• Linking the scheme to others in GB made a lot of sense and could improve the help people get, as no single scheme itself treats fuel poverty holistically. • Concerns here are the practicality of aligning criteria and eligibility, as well as who would be responsible for seeing a process through from start to finish.
Option 3 – assess effectiveness through SEI	• Incentivisation of GDNs was seen as an overall good idea and having more information on doorstep processes. • However, stakeholders were unsure about the impact this could have on the FPNES, as it would not address network-wide challenges or the whole-house solution issue.
Option 4 – Scheme focussed on off-gas communities	• Stakeholders were opposed to closing or replacing the FPNES, as gas connections were still needed as a cheaper fuel. Although it would go against decarbonisation targets, there could be merit in exploring the idea of connecting communities.
Option 5 – Installation of renewable generation	• Renewables were considered an interesting idea, but the future role of gas remains an open question. • It was suggested to have this as an option under the FPNES for certain areas/households where this would be economically and otherwise feasible.

A2.3 - Government bodies and local councils

General feedback on the FPNES	
	• Stakeholders thought FPNES serves a role and connecting homes brings benefits to low income households. However, it should work more coherently with other schemes to bring more long-term benefits to fuel poor households. • In general, an area-based approach was seen favourably rather than specific targeting as households on the verge of or at risk of fuel poverty would benefit and make the network extension more economical. • The point of sustainability and long-term outlook of the scheme were mentioned, which will depend on the future role of gas. One stakeholder suggested that greater data sharing and having more sophisticated data sets in the future can lead to better proxies.
Feedback on proposed options	
Option 1 – improved targeting	• On improved targeting in general, stakeholders pointed out that people were transient and not a static group, so focusing on targeting alone may be difficult and potentially leave some areas or people out of focus. Higher costs and lower economies of scale were also mentioned as drawbacks. • 1st: using mapping tools was generally seen as a sensible and interesting option, but it was pointed out that data quality would need to be ensured, for example through a methodology gateway. • 2nd: all stakeholders opposed removing criteria from other schemes, as it would risk decoupling other types of funding and support. They would rather see the scope and flexibility of the FPNES widened, especially since the IMD criterion removal.
Option 2 – Link FPNES to other government schemes	• While one stakeholder thought this was unrealistic to achieve, others thought aligning criteria could deliver more targeted support such as the RHI (Renewable Heat Incentive). • However, the criteria should overall not become stricter.
Option 3 – Assess effectiveness through SEI	• Some respondents thought it could be interesting to not just look at connection numbers and change the way success of the FPNES is measured. Perhaps there could be a mechanism to collect information to ensure the right people are being reached and getting support.
Option 4 – Scheme focussed on off-gas communities	• This was not seen as a realistic replacement of the current scheme, as the FPNES does help people and they benefit from having a gas connection. It would go against decarbonisation targets, and not everyone in off-gas communities would be fuel poor. This begged the question of what the definition or cut-off point would be for an area. • One stakeholder raised the question of the future role of gas.

Option 5 – Installation of renewable generation	• Renewables were not seen as a good alternative to the FPNES, as gas gives the biggest benefit, according to one stakeholder. Not everyone would want renewable generation and economies of scale could be low. • Although it would be in line with decarbonisation, it would not share the same priority of providing more affordable heating. One respondent suggested linking it instead with the RHI or district heating schemes.

A2.4 - FPNES partners & housing associations

General feedback on the FPNES	
	• Stakeholders thought the FPNES was a good scheme and fulfilled its purpose of enabling people to heat their homes. Although it helps people, it still needs to deliver in-house works and other types of support along with gas connections and heating system works. • Overall, a wider scope of the scheme and greater flexibility would be favoured to potentially include people at risk of or on the verge of fuel poverty. This could almost work preventatively.
Feedback on proposed options	
Option 1 – Improved targeting	• Stakeholders were generally not convinced that improved targeting would be very effective due to changes in people's situations and churn in the population. • 1st: most respondents said mapping and data tools were already being used but were not able to take into account churn in the population and still required people to give out information. • 2nd: removing criteria was not favoured by any stakeholders, as in-house work may not be linked. One question was what to replace this with. • 3rd: Answers on this option were varied. While some said eligibility checks were already being done, others stated that it would be difficult to link with other schemes' eligibility and people's reluctance may still be an issue. • 4th: many said partnerships already existed, and that although these were generally a good idea, they were unsure how additional costs of canvassing or for referrals could be covered.
Option 2 – Link FPNES to other government schemes	• Some stakeholders thought this would make a lot of sense, but very difficult to achieve. Aligning criteria would be helpful, but GDPR and privacy issues were raised as a potential issue. • One stakeholder said this was already done, as the FPNES is linked to ECO and Affordable Warmth solutions.

Option 3 – Assess effectiveness through SEI	• Views on this option differed from support as it would involve GDNs and shift the focus from connection targets. Others thought it could work to give a better before-and-after picture of the support given and could include that other types of support were offered. • This would still require people to give out personal information though.
Option 4 – Scheme focussed on off-gas communities	• Some stakeholders raised decarbonisation as a concern and thought that district heating schemes could also be considered. • Others thought this could be aligned with ECO to offer combined help and funding but raised the question of connecting all vs not connecting anyone, as it is unclear what the cut-off rate of fuel poverty would have to be.
Option 5 – Installation of renewable generation for fuel poor homes	• Although one stakeholder particularly liked this option as it is in line with decarbonisation and could be linked with ECO funding, it would be practically very difficult. There may be other options available if gas was not viable, and some of this is already delivered through the RHI. • This could potentially be an option under the FPNES, but stakeholders were still unclear about funding and did not believe feed-in tariffs to be helpful to fuel poor households.

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