Department for Business, Energy & Industrial Strategy

Domestic NEED Annex A: What is Domestic NEED?

24 June 2021 **National Statistics**

This document provides an overview of the Domestic National Energy Efficiency Data-Framework (NEED). This includes details of what information is contained within NEED, how what it is used for and how the data is produced. This document is Annex A of the Domestic NEED 2021 report.

What is Domestic NEED?

NEED is a framework in which property level data from existing sources (administrative and commercial) are used to provide insights into energy use and the impact of energy efficiency measures on gas and electricity consumption in residential properties.

Why is Domestic NEED important?

Domestic NEED provides the largest source of data available for analysis of energy consumption.

NEED forms an important element of BEIS's evidence base and plays a key role in the development and evaluation of BEIS policies on energy efficiency.

What information is included?

Consumption data

- Electricity consumption 2004-2019
- Gas consumption 2004- 2019
- Electricity meter profile class 2004-2019

Property characteristics

- Property size (m^2)
- Number of bedrooms
- Property type (e.g. Semi-detached)
- Property age

Household characteristics

- Number of adults living in the household
- Household income
- Length of residence
- Tenure (e.g., owner occupied, privately rented etc.)

Energy efficiency measures

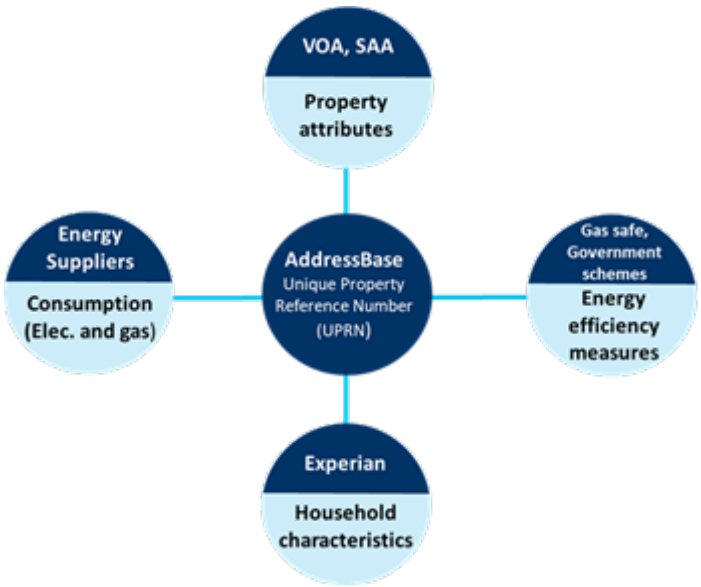
- Type of measure installed (e.g. loft insulation)
- Date of installation

What is within scope?

In Scope	Out of Scope
Domestic (residential) properties	Non-domestic (e.g. commercial, public sector)
Great Britain	Northern Ireland
Metered gas and electricity	Non-metered fuels (e.g. oil, coal, onsite-generation)
Energy Efficiency Measures installed through government schemes	DIY measures and other measures not installed through Government schemes

How is it produced?

The address information in each dataset is used to retrieve the unique property reference number (UPRN) for each record which then enables matching.



In addition to this annex, the other documents included in the publication are as follows:

- **NEED report: Summary of analysis 2021** – provides analysis of key trends in energy consumption and for the impact of measures.
- **Consumption data tables** – provides gas and electricity consumption estimates for different property/household characteristics.
- **Impact of measures data tables** – provides estimated consumption savings arising from installation of different energy efficiency measures.
- **Annex B: Overview of Data Tables** – provides a list of all the published tables and their contents.
- **Annex C: Comparisons with other Sources** – provides a summary of the data sources used in NEED and provides comparisons of NEED outputs with other data sources.
- **Annex D: Methodology Note** – provides details of how the estimates of domestic electricity and gas consumption by property attributes/ household characteristics, are produced. It also sets out how the estimates of the impact of energy efficiency measures were derived.

Quality assurance of all data sources is undertaken before they are used in Domestic NEED and throughout to ensure consistency. This validation includes comparisons of data sources which is published in Annex C.

There is also a Non-Domestic National Energy Efficiency Data-framework (ND NEED) which is not covered by this note, although the key methods and data sources used are similar in both cases.

Contents

1. Introduction

The UK has collected and published energy consumption data within the Digest of UK energy Statistics since 1948. This has been produced and published at a national level and is based on aggregate information from energy suppliers. Data relating to domestic energy use has also been published in Energy Consumption in the UK. Whilst these data are still used, the development of UK energy policy has required more detailed data to help deliver and monitor reductions in energy use and emissions.

In 2004, the Department for Business, Enterprise and Regulatory Reform first started to collect individual meter point data primarily to produce small area consumption data, but by working closely with the energy industry and other key energy efficiency stakeholders, plans were established for a future data architecture suitable for matching the consumption data with other data sources. The National Energy Efficiency Data-Framework (NEED) is the means by which this has been achieved. Gas and electricity consumption data are matched at an individual property level, with information about energy efficiency measures installed in households, property attributes and household characteristics.

The Framework was first announced in the Heat and Energy Saving Strategy in 2009 and was subsequently developed by the Department for Energy and Climate Change (DECC), with support from the Energy Saving Trust (EST) and gas and electricity suppliers, in order to assist DECC in its business plan priority to “save energy with the Green Deal and support vulnerable consumers”. It now forms a key element of BEIS’ evidence base, and supports BEIS to:

- Develop, monitor and evaluate key policies including Energy Company Obligation (ECO).
- Identify energy efficiency potential which sits outside the current policy framework.
- Develop a greater understanding of the drivers of energy consumption.
- Gain a deeper understanding of the impacts of energy efficiency measures for households.

The data framework provides the largest source of data available for analysis of gas and electricity consumption and the impacts of energy efficiency measures. Previously, BEIS has relied on evidence from surveys and small technical monitoring trials. The first results from the framework were published in June 2011 as a pilot to test the framework approach worked. It demonstrated the value of NEED, and its importance to BEIS and a wider group of stakeholders. Since 2011 BEIS has updated and expanded NEED further.

2. The Overall Framework

Domestic NEED links together various existing data sources (administrative and commercial) to report on the electricity and gas consumption of households in Great Britain. This data framework, which holds information on individual properties, also demonstrates the real-world impact of installation of energy efficiency measures on electricity and gas consumption. Domestic NEED includes data on:

- annual electricity and gas consumption;
- characteristics of the property (floor area, property age, property type, etc.);
- characteristics of the household (household income, tenure, number of adults etc.); and
- information about the area in which the property is located (local authority, index of multiple deprivation etc.).

Table 2.1 summarises the data sources that feed into Domestic NEED, and more information about the individual data sources is provided in Section 3 and 4. The main aim of this dataset is to provide insights into energy use in domestic (residential) properties and the impact of energy efficiency measures on gas and electricity consumption. More information about how Domestic NEED has been used is provided in Section 5.

Table 2.1: The data sources that feed into Domestic NEED

Data	Source
Meters and consumption	
Gas meters and gas consumption	Xoserve
Electric meters	Gemserv
Electricity consumption	Electricity data aggregators
Geographical information	
Address information	Ordnance Survey (OS)
Geographies and area classifications	Office for National Statistics (ONS)
Property characteristics	
Domestic properties in England and Wales	Valuation Office Agency (VOA)
Energy Performance Certificate (EPC) ratings for England and Wales	Ministry for Housing and Local Government (MHCLG)
Domestic properties in Scotland	Scottish Assessors Association (SAA)
Household characteristics	Experian
Energy efficiency measures installed	
New boiler installations	Gas Safe Register
Energy efficiency measures installed under the Energy Company Obligation (ECO) scheme (as well as other schemes such as Green Deal)	Ofgem
Solar panels within the Feed-In Tariffs (FITS) scheme	Ofgem

The scope of Domestic NEED

Table 2.2: Summary of the scope of Domestic NEED

In scope	Out of scope
Domestic (residential) properties	Non-domestic (e.g., commercial, public sector)
Great Britain	Northern Ireland
Metered gas and electricity	Non-metered fuels (e.g., oil, coal) and consumption from on-site generation (e.g. generated by solar panels)
Energy Efficiency Measures installed through government schemes	DIY measures and other measures not installed through Government schemes

The scope of Domestic NEED is summarised in Table 2.2. Although NEED provides data and analysis on domestic (residential) properties across Great Britain, it is noteworthy that the statistics for Scotland are provided separately to those for England and Wales (which are combined). This is due to different data sources used for property characteristics for Scotland. Northern Ireland is also not included within the Domestic NEED framework; however, BEIS does produce some summary estimates of electricity consumption in Northern Ireland and gas consumption in Northern Ireland.

While Domestic NEED only covers residential properties, there is also a separate Non-Domestic National Energy Efficiency Data-Framework (ND NEED) which covers England and Wales.

Only metered gas and electricity are included within Domestic NEED. BEIS does not currently monitor the use of other (non-metered) fuels (such as oil, coal and wood) by individual households. While Domestic NEED includes metered gas and electricity consumption, BEIS cannot monitor what this energy is being used for by individual households (space heating, hot water, lighting, cooking, etc.) so this information is not included within Domestic NEED. However, BEIS does provide an estimated breakdown of total UK household energy consumption by fuel source (inc. non-metered fuels) and end use, as a part of the Energy Consumption UK (ECUK) publication. The ECUK figures are based on survey information and modelling.

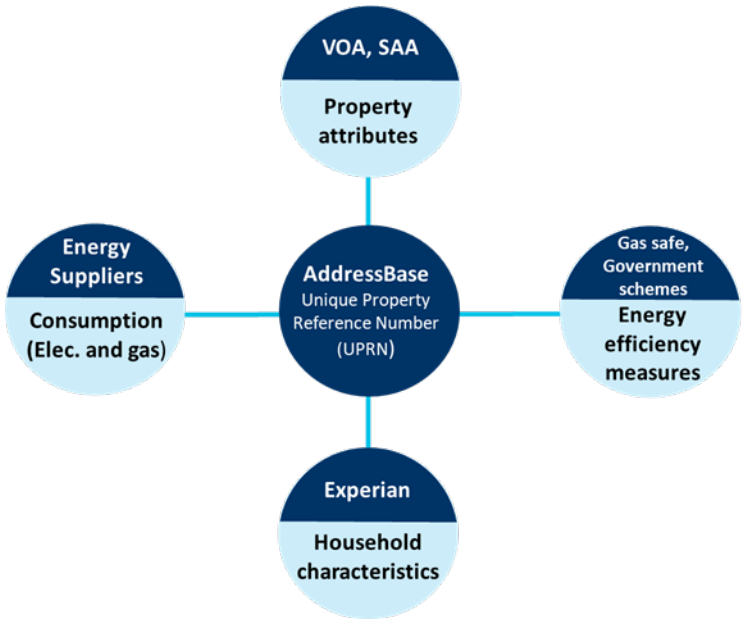
Domestic NEED includes information on the energy consumption impact of measures installed as a part of Government schemes such as the Energy Company Obligation (ECO) and Green Deal. This information is provided to BEIS by Ofgem. While these schemes are generally Great Britain wide, information is included for past Scotland-specific schemes (Homes Energy Efficiency Programmes). However Domestic NEED does not include information on any efficiency improvements being made outside of Government schemes.

Information from the government's Feed-in Tariff (FiT) scheme, designed to promote the uptake of renewable and low-carbon electricity generation technologies, is also incorporated into Domestic NEED. The main technology included from the FiT scheme is solar panels. BEIS also receives information on new condensing (gas) boilers being installed from the Gas Safe register. While it is mandatory to register the installation of all new condensing boilers in England and Wales, registration is not mandatory in Scotland. Therefore, NEED is likely to only include information on some installations of new condensing boilers in Scotland.

Linking datasets

Domestic NEED is formed from linking various existing datasets (both administrative and commercial) which each provide different information on individual residential properties or households. How these datasets are linked to each other is illustrated in Figure 2.1 below.

Figure 2.1 – The overall structure of Domestic NEED



Ordnance Survey maintains the AddressBase database of all addresses in Great Britain, in which a Unique Property Reference Number (UPRN) is assigned to each address. For each Domestic NEED input dataset, the addresses therein are matched to the addresses in AddressBase so that the UPRN can be retrieved for each record. This process is referred to in Domestic NEED documentation as “address matching”. Once the records in each of the input datasets have been address-matched they are linked on the UPRN.

However, as addresses are not recorded in a consistent way across datasets, address matching has some limitations. There are some addresses which cannot be matched confidently to AddressBase, and a proportion of matches that are made are likely to be incorrect. BEIS’s address matching algorithm, when applied to domestic addresses, typically achieves a match rate of around 90% with an error rate of around 1%. In general, there can be a trade-off whereby accepting matches more readily can admit more incorrect matches and thereby increase the error rate.

The 10 per cent of records removed through the address matching process is not evenly distributed across different property types. For example, flats are less likely to be matched to AddressBase and consequently, proportionately more records are lost in cities and metropolitan areas.

Some of the datasets which BEIS receives are already matched to a UPRN. The main datasets that BEIS needs to address match before they can be incorporated into Domestic NEED are the gas and electricity meter data, all data on energy efficiency measures installed and the Energy Performance Certificate (EPC) data. More information on the match rates for the various datasets can be found in *Annex C: Comparisons with other Sources*.

Information on domestic properties

The gas and electric meter data that BEIS receives from industry does not allow it to adequately distinguish between meters installed in domestic properties and those installed in non-domestic properties. A database of domestic properties is therefore required so that BEIS can match energy meters to domestic properties.

Since 2019, BEIS has received a dataset containing all properties in the VOA Council Tax Database for England and Wales. An updated dataset is received on an annual basis[1].

For Scotland, the Scottish Assessors Association (SAA) dataset of domestic properties is used. However, this dataset was received several years ago and therefore some of the attribute information for Scotland may be out of date. As a result of this, domestic properties built in Scotland in recent years are not included, despite being within the scope of Domestic NEED.

How Domestic NEED is created

The steps for the creation of Domestic NEED are as follows:

1. The VOA data (for England and Wales) and the SAA data (for Scotland) form Domestic NEED's database of domestic properties in Great Britain.
2. The gas and electricity meter data which BEIS received from the industry is address matched so that each meter has a UPRN (representing a domestic property) matched to it.
3. Based on the UPRN, gas and electric meters can then be linked to properties in Domestic NEED's database of domestic properties in Great Britain.

[1] Prior to the 2019 NEED, a stratified random sample of approximately one in five records was selected from the complete property attribute dataset held by VOA.

4. The NEED methodology allows for the fact that some domestic properties may have more than on gas meter or more than electricity meter. It permits up to two gas meters to be assigned to a domestic property and up to two electric meters to assigned.
   - Properties which have had more than two gas meters linked to them will be discarded for the purposes of gas consumption (with the address matching assumed to be erroneous), and likewise for electricity.
   - For properties with two gas meters, the consumption from both meters will be aggregated to give the total gas consumption for the property (and likewise for electricity.
5. The other various datasets are address matched (where they do not already have a UPRN field) and they can then be linked into NEED using the UPRN.

Table 2.3 summarises the number of properties in Domestic NEED 2012 for both Gas and Electricity. As mentioned previously, address matching and the resulting linking of datasets is not a perfect process, and so electric meters could only be matched to 91% of domestic properties. A higher proportion of domestic properties had an electricity meter matched to them than a gas meter. This is to be expected given that a certain proportion of domestic properties are not connected to the gas grid. The lower proportions of properties with meters matched to them for Scotland (for both gas and electricity) may in part be due to the fact that the property level (SAA) data that BEIS holds for Scotland was acquired several years ago (2014).

Table 2.3: The number of properties included in Domestic NEED 2021
(numbers of properties are given in millions)

	Total domestic properties	Number of properties with meter(s) matched to them		Percentage of properties with meter(s) matched to them	
		Gas	Electricity	Gas	Electricity
England and Wales	26.3	20.3	24.0	77%	91%
Scotland	2.5	1.7	2.2	67%	86%
Total	**28.7**	**22.0**	**26.2**	**77%**	**91%**

While Table 2.3 shows the total number of properties contained in Domestic NEED 2021 for both gas and electricity, any analysis carried out using Domestic NEED will typically require further exclusions. Reasons for excluding certain properties from analysis include the meter readings being implausibly high or implausibly low for certain years. The exclusions made will be influenced by factors such as what years are to be included in the analysis. Full details of the further exclusions made in producing annual consumption estimates are provided in Annex D: Methodology Note.

Data protection

NEED is constructed to ensure it is compliant with the Data Protection Act. Data in NEED are gathered from a variety of sources including publicly available data and through commercial licences, voluntary agreements and service level agreements with owners of datasets. As part of these agreements the Domestic NEED publication process ensures that no individual property or energy supplier can be identified; only aggregated or anonymised results are published. The anonymised NEED dataset is published at individual property level, but in an anonymised format. Other NEED outputs are based on a minimum of 5 observations for each result quoted; any results based on fewer than 5 properties are suppressed. More information on data protection is available in the NEED Privacy Impact Assessment.

3. Energy meter and consumption data

BEIS has collated and analysed property level electricity and gas consumption data since 2004 for the purpose of producing aggregate statistics at a sub-national level. BEIS publish these data at a range of geographical levels including country, regional, local authority, Middle Layer Super Output Area (MSOA) and Lower Layer Super Output Area (LSOA). BEIS also published experimental statistics on gas and electricity consumption at the postcode level.

The meter point level electricity data are obtained from the existing administrative systems of the energy companies and provided to BEIS by the data aggregators. Gemserv provide the addresses and profile classes corresponding to each electric meter point administration number (MPAN).

All gas data are provided by Xoserve for each gas meter point reference number (MPRN).

Gas and electricity years

Domestic NEED publishes gas and electricity consumption by "consumption years". The definition of a consumption year differs between gas and electricity due to their different data collection requirements.

For electricity consumption, the consumption year covers the months February to January. For example, the 2019 electricity consumption year refers to the period 31 January 2019 to 30 January 2020.

For gas consumption, the consumption year has varied historically according to the manner in which the gas meter point data has been provided to BEIS. The gas consumption years are as follows:

- Prior to 2015: October – September (same period as 2015)
- 2015: October 2014 – September 2015
- 2016: mid-July 2016 – mid-July 2017
- 2017: mid-June 2017 – mid-June 2018
- 2018: mid-May 2018 – mid-May 2019
- 2019: mid-May 2019 – mid-May 2020[2]

For this report and all accompanying annexes and tables, when years are mentioned with reference to electricity of gas consumption (or savings), these relate to the respective consumption years as set out above, rather than calendar years.

[2] The 2019 data covers the early part of the first COVID-19 lockdown, but this should not have a material impact on the trends described in this release. For more information on the overall impacts of COVID-19 on domestic consumption, please see the Energy Trends publication.

Annual household consumption estimates

Gas

Xoserve provide annualised estimates of consumption for all the MPRNs based on an Annual Quantity (AQ). An AQ is an estimate of annualised consumption based on two meter readings at least six months apart.

As gas consumption is heavily influenced by the weather (as it is predominantly used for space heating), annual gas consumption estimates are weather corrected to remove the effect of year-on-year changes in weather conditions, to enable more like for like comparisons over time. Weather correcting entails adjustment to reflect “seasonal normal weather conditions”, a typical years’ weather taken as the average of multiple years. More information on this can be found in the overview of weather correction of gas industry consumption data.

The summer of 2017 saw the implementation of new gas meter point management and settlement processes, which caused a change in the period of gas consumption covered by the 2016 data. Furthermore, with the 2016 consumption figures, Xoserve introduced a new data collection system. Due to this, a large proportion of meters which had not reported for some time had their annual consumption figures updated in the 2017 gas consumption figures.

Electricity

For electricity, annualised estimates are based on either an annualised advance (AA) or estimated annual consumption (EAC). The AA is an estimate of annualised consumption based on consumption recorded between two meter readings. In comparison an EAC is used where two meter readings are not available, and an estimate of annualised consumption is produced by the energy company using historical information and the profile information relating to the meter.

More information on meter point level gas and electricity consumption data can be found here.

4. Data sources used in NEED

Address and geographical information

AddressBase

AddressBase is the brand name for the compilation of local authority Addressing Datasets managed by Ordnance Survey. AddressBase matches 29.5 million Royal Mail postal address file records to local authority unique property reference numbers (UPRN).

AddressBase is updated on a regular basis and provides comprehensive coverage of all addresses in Great Britain. The Local Land and Property Gazetteer (LLPG) and Local Street Gazetteer (LSGs) remain with the creating authority, who will provide updates to the single address gazetteer database, as they do for the National Land and Property Gazetteer (NLPG) and National Street Gazetteer (NSG).

In AddressBase each record has a Unique Property Reference Number (UPRN) which provides a reference key to join related address records across different datasets. Even if a property is demolished, the UPRN can never be reused and retains its historical information.

ONS UPRN Directory

The ONS UPRN directory provides a range of different attributes about the local area in which the domestic property is situated, including the urban-rural classification and the output area classification.

Property characteristics

Valuation Office Agency (VOA) Council Tax data

The Valuation Office Agency (VOA) is responsible for allocating homes in England and Wales to the appropriate Council Tax band. In order to do this, it maintains a property database covering all properties in England and Wales. It includes information on the age of property, property type, number of bedrooms and floor area.

Since 2019, an updated dataset has been received from the VOA on an annual basis. This was made possible through an enhanced data sharing agreement with the VOA. Prior to 2019 a stratified random sample of approximately one in five records taken from the full dataset was used for Domestic NEED.

Scottish Assessors Association (SAA) Council Tax data

The Scottish Assessors Association (SAA) is Scotland's equivalent of the VOA. The dataset of all domestic properties in Scotland along with property characteristics, was last acquired from the SAA in 2014 and it has not been updated since. This version of this data currently used in Domestic NEED contains 2.5 million properties, while the SAA reported at total of 2.7 million properties in June 2021.

Property age is not recorded consistently in the SAA with very wide year ranges (e.g., 'Post 1945') recorded against a large number of properties. This is why modelled data from Experian for the ages of domestic properties in Scotland is used in Domestic NEED instead.

Energy Performance Certificate (EPC) data

The Ministry of Housing and Local Government maintains a register of EPC ratings carried out on domestic properties in England and Wales, and it publishes this information as open data. More information can be found here.

A large proportion of properties will not have had an EPC Assessment carried out (it is generally only mandatory to have a valid EPC certificate for new properties, those which are being rented and at the point of sale). The EPC register contained EPC ratings for around 16 million properties in September 2020. In addition to this EPC certificates are valid for 10 years, so many properties may have an EPC rating assessed several years ago which may no longer reflect its current energy efficiency.

The equivalent EPC data for Scotland were published by the Scottish Government in February 2021, and these data are yet to be incorporated into Domestic NEED.

Household characteristics

Experian – domestic data

Experian is a commercial organisation which produces modelled data of household characteristics at address level. Variables include income group, number of adults and tenure. The Experian model derives these variables for each address using data from a range of sources including Census outputs and Experian's consumer survey. BEIS has purchased data for the UK. A quality assessment of these data is provided in *Annex C: Comparisons with other Sources*.

Energy efficiency measures

Energy Company Obligation and Green Deal

The Energy Company Obligation (ECO) and Green Deal (GD) are Government energy efficiency schemes which began operating in 2013[3]. They replaced the previous schemes: Carbon Emissions Reduction Target, Community Energy Saving Programme and Warm Front. Their aim is to encourage the uptake of energy efficiency measures so that the efficiency of the building stock is improved. This has impacts such as reduced consumer bills and increased comfort in the home.

Homes Energy Efficiency Database (HEED)

HEED is a national database developed by the Energy Saving Trust. It was set up to help monitor and target carbon reduction and fuel poverty work. It contains details of energy efficiency and micro-generation installations such as cavity wall insulation and solar hot water, including the date of installation. Data have been recorded in HEED since 1995 including activity reported from Government programmes, such as the Energy Efficiency Commitment (EEC) and Carbon Emissions Reduction Target (CERT), and activity reported by trade associations such as Gas Safe and FENSA. Approximately 50 per cent of UK homes have a record in HEED[4].

Homes Energy Efficiency Programmes (HEEPs)

The Home Energy Efficiency Programmes for Scotland (HEEPS) are the Scottish Government's flagship delivery vehicles for tackling fuel poverty and improving the energy efficiency of the domestic housing stock. Launched in April 2013, HEEPS provide an offer of support to households across Scotland. The 2014/15 Programme had a total budget of £94m and funded a number of programmes, including advice and support.

[3] For more detail on ECO and GD see Annex A (page 34) of the Household Energy Efficiency Statistics 2017 report.
[4] There are records for approximately 50 per cent of homes in the UK, however there may not be full information for each of these records. There is no information on measures that a household has installed itself (DIY) or measures installed in the home when they were built.

Central Feed-in Tariff register

BEIS introduced the Feed-in Tariff scheme (FiTs) in April 2010 to promote the deployment of a range of small-scale renewable and low-carbon electricity generation technologies in Great Britain. FiTs closed to new applications from 1 April 2019.

The FiTs subsidises solar PV, hydro, wind, anaerobic digestion installations below 5 MW, and micro combined heat and power below 2 kW. Microgenerators receive guaranteed payments from electricity suppliers based on the amount of electricity produced, along with export tariffs for electricity not used on-site but fed ('exported') to the grid. Unless the microgenerator installs a second electricity meter specifically for exports, 50 per cent of the electricity generated is deemed to be used on-site, and the other 50 per cent, exported to the grid, and export payments are made accordingly.

5. Users and uses

Analysis using NEED has supported a number of BEIS policies:

- NEED has been used to understand the changes in consumption (and resulting impacts on energy bills) for households installing energy efficiency measures.
- The estimates from impact of measures analysis from NEED were used to inform “in use factors” for the Green Deal.
- NEED also informs a range of other BEIS policies, for example, the Renewable Heat Incentive and Fuel Poverty.
- NEED has helped Fuel Poverty analysis to better understand the actual consumption for different types of properties and households, and therefore to better understand how policy options will impact on different households. Having this information enables BEIS to provide better value for money and understand the impacts of policy options better, for both BEIS and consumers.
- NEED has also helped BEIS understand where further research should be focused. It provides high level results which have highlighted a need for further investigation.

BEIS last published an updated version of the anonymised record level NEED dataset in December 2019. Further versions of anonymised NEED will be available in due course. Users can access this and interrogate this data themselves. It is anticipated this will increase the use of NEED by enabling analysis by other individuals and organisations. NEED is also available to accredited researchers through the ONS Secure Research Service.

In addition, NEED published outputs are also used externally by a wide range of interested parties, including local authorities, academics and energy suppliers. These include:

- The Committee on Climate Change use the outputs to inform reports, including recommendations to Government.
- Energy companies and academics used the outputs to validate and inform their own research and estimates.
- Energy suppliers use the NEED reports to act as an independent trusted source demonstrating the benefit of installing energy efficiency measures.
- Local authorities use the outputs to help with modelling housing stock and understanding the impact of installing energy efficiency measures.

This publication is available from: www.gov.uk/government/collections/national-energy-efficiency-data-need-framework

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