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ANNEXE(S)
A OFF-GRID STATISTICS AND POPULATION SIZE ESTIMATE

A.1 Our study has sought to estimate the size of the domestic off-grid energy market in the United Kingdom (UK) in terms of the number of households.

A.2 We define off-grid consumers as those households that are not connected to the mains gas grid. This includes both:

- 'Potentially connectable' households who are not connected to a mains gas supply but who may be able to obtain a connection due to proximity to the mains gas grid.
- 'Likely non-connectable' households who are not connected to a mains gas supply and for whom the mains gas grid is too distant for connection to be either practically or economically feasible.

A.3 We have drawn on a range of inputs in our estimation of market size and of the potentially connectable proportion within this. Our main sources are, as described in more detail in this annexe:

- Consumer Focus analysis of Great Britain (GB) housing survey data, to be published by Consumer Focus\(^1\) (the Consumer Focus Report).
- Welsh Government data on off-grid households.
- Gas connection data from Xoserve Limited.
- Northern Ireland (NI) House Condition Survey 2009 data.
- NI Authority for Utility Regulation (Utility Regulator) data.
- Other company data.

\(^1\) Off-gas consumers: Information on households without mains gas heating, to be published by Consumer Focus.
• 2001 Department for Trade and Industry (DTI) report data.

A.4 Our estimates of the market size by nation are set out in Table A.1. This combines the Consumer Focus Report data for England and for Scotland, the Welsh Government data for Wales, and data from the NI Utility Regulator.

Table A.1: Off-grid populations by nation

<table>
<thead>
<tr>
<th>Mains gas availability</th>
<th>England ('000 households)</th>
<th>Scotland ('000 households)</th>
<th>Wales ('000 households)</th>
<th>NI ('000 households)</th>
<th>UK ('000 households)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Off-grid</td>
<td>2,631</td>
<td>488</td>
<td>253</td>
<td>594</td>
<td>3,966</td>
</tr>
<tr>
<td>Off-grid as a percentage of total households</td>
<td>12%</td>
<td>21%</td>
<td>19%</td>
<td>80%</td>
<td>15%</td>
</tr>
</tbody>
</table>

Source: As set out in paragraph A.4

A.5 Our estimates of the potentially connectable and likely non-connectable segment sizes by nation are set out in Table A.2. This draws on OFT analysis of Consumer Focus Report data, Scotia Gas Networks data and NI Utility Regulator data; and on Welsh Government data and analysis.
Table A.2: Estimates of the percentage of potentially connectable off-grid households

<table>
<thead>
<tr>
<th>Potential connectivity</th>
<th>England</th>
<th>Wales</th>
<th>Scotland</th>
<th>NI</th>
</tr>
</thead>
<tbody>
<tr>
<td>(within 50 m)</td>
<td>N/A</td>
<td>6%</td>
<td>N/A</td>
<td>30%</td>
</tr>
<tr>
<td>(within 1 or 2 km)</td>
<td>20% (Southern Gas Network only, 2 km)</td>
<td>31% (1 km)</td>
<td>40% (2 km)</td>
<td>N/A</td>
</tr>
<tr>
<td>(in gas postcode)</td>
<td>42%</td>
<td>22%</td>
<td>35%</td>
<td>N/A</td>
</tr>
</tbody>
</table>

Source: As set out in paragraph A.5

A.6 The remainder of this annexe details the key data sources used.

Consumer Focus Report data

A.7 The Consumer Focus Report provides background information on the housing and household characteristics of off-gas consumers in England, Scotland and Wales. It draws upon analysis and statistical tables and figures provided by Dr Richard Moore, an independent consultant formerly responsible for the English House Condition Survey. The analysis uses four main sources of data: the 2008 English Housing Survey (EHS), the 2007/09 Scottish House Condition Survey (SHCS), the 2008 Living in Wales Survey (LIWS) and a gas postcode file from Transco. The analysis updates existing on/off gas variables in the abovementioned surveys to derive new gas variables consistent across the nations that categorises households into those with:

a. communal heating

b. mains gas as the main heating fuel

c. a gas supply, but where gas is not the main heating fuel
d. no gas supply, but on the mains gas grid (which we assume to be a reasonable proxy for 'potentially connectable' households), and

e. off the mains gas grid (which we assume to be a reasonable proxy for 'likely non-connectable' households).

Please refer to the Consumer Focus Report for more detail of the methodology applied.

A.8 Table A.3 summarises the Consumer Focus Report findings with respect to these new gas variables.

### Table A.3: Availability and use of mains gas in England, Scotland and Wales.

<table>
<thead>
<tr>
<th>Mains gas availability and use (households)</th>
<th>England</th>
<th>Scotland</th>
<th>Wales</th>
<th>GB</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Thous</td>
<td>Col %</td>
<td>Thous</td>
<td>Col %</td>
</tr>
<tr>
<td>a) Communal heating (mains gas)*</td>
<td>257</td>
<td>1.2</td>
<td>16</td>
<td>0.7</td>
</tr>
<tr>
<td>b) Main heating fuel is mains gas</td>
<td>18,031</td>
<td>84.2</td>
<td>1,773</td>
<td>76.1</td>
</tr>
<tr>
<td>c) Gas supply, not main heating fuel</td>
<td>489</td>
<td>2.3</td>
<td>53</td>
<td>2.3</td>
</tr>
<tr>
<td>d) No gas supply, but on gas grid</td>
<td>1,096</td>
<td>5.1</td>
<td>171</td>
<td>7.3</td>
</tr>
<tr>
<td>e) Off mains grid</td>
<td>1,535</td>
<td>7.2</td>
<td>317</td>
<td>13.6</td>
</tr>
<tr>
<td><strong>Total households</strong></td>
<td><strong>21,407</strong></td>
<td><strong>100.0</strong></td>
<td><strong>2,330</strong></td>
<td><strong>100.0</strong></td>
</tr>
</tbody>
</table>

Source: Consumer Focus Report. *Fuel for communal heating not recorded, but assumed to be mains gas if in gas postcode or urban area

A.9 We consider the combination of categories d and e above to best match our definition of the off-grid population as set out in paragraph A.2.
However, unless otherwise stated all GB off-grid statistics cited from the Consumer Focus Report refer to statistics for households in category c, d and e combined, which is the most similar grouping published within that report. While category c is not covered by our off-grid definition, they will face similar issues to the off-grid population.

A.10 The households in category c are connected to a mains gas supply but do not use it as their main heating source. As these households fall outside our off-grid definition, we will not specifically consider them further in the context of this study, except to note that – being a material and potentially readily addressable subset of those households who may struggle with non-gas heating costs – they may be of particular policy interest and we refer interested parties to section 2.6 of the Consumer Focus Report which analyses this subset of the population in England.

A.11 The OFT commissioned some additional analysis on potentially connectable households (those in category d) from Dr. Richard Moore. These tables are published in Annexe C alongside tables on the relevant sample sizes.

A.12 Please note that the OFT has not sought to rebase the total household figures from these housing surveys which were undertaken at different time periods, to a common recent period, as we did not wish to make assumptions regarding the proportion of new houses that are off-grid.

**Welsh Government data on off-grid households**

**Aims of project**

A.13 The Welsh Government has been working with Wales and West Utilities (WWU) to map active gas connections in Wales.

A.14 The aims of the project are to identify and locate dwellings without an active gas connection and to place them into one of the following three categories:
• Very close to the existing gas network (GIS reference point within 50m). These properties could potentially be connected to the existing network at a reasonable cost. Converting to mains gas from more expensive and/or carbon intensive fuels like electricity, oil, LPG or coal can result in significant bill and/or greenhouse gas savings.

• Fairly near to the existing gas network (50m – 1km). These properties could potentially benefit from a gas network extension project at a reasonable cost, provided that they are part of a sufficiently dense cluster.

• More than 1km from the existing gas network. These properties are unlikely to be able to be connected to the gas network at reasonable cost in the near future, and will therefore have to use more expensive and/or carbon intensive heating fuels like electricity, oil, LPG or coal. Significant bill and/or greenhouse gas savings could be achieved by improving energy performance and/or considering renewable energy systems in these homes.

A.15 Preliminary estimates are shown in Table A.4. These figures are still subject to checking and revision and the final more detailed results (including information on location) will be published by the Welsh Government later in the year. For confirmation of the final estimates and details of the underlying methodology, please refer to the report when published.
Table A.4: Analysis of the off-grid population in Wales

<table>
<thead>
<tr>
<th>Number</th>
<th>% of dwellings in Wales</th>
<th>% of estimated no. dwellings that do not have an active gas connection</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dwellings in Wales</td>
<td>1,365,000</td>
<td></td>
</tr>
<tr>
<td>Estimated no. of dwellings that do not have an active gas connection</td>
<td>At least 253,000</td>
<td>At least 19%</td>
</tr>
<tr>
<td>Of which:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;50m from existing WWU network</td>
<td>At least 16,000</td>
<td>1.1%</td>
</tr>
<tr>
<td>50m – 1km from existing WWU network</td>
<td>At least 62,000</td>
<td>4.5%</td>
</tr>
<tr>
<td>1km from existing WWU network</td>
<td>175,000</td>
<td>13%</td>
</tr>
</tbody>
</table>

Source: Welsh Government

A.16 Table A.4 confirms that there is potential to connect at least six per cent of off-grid households\(^2\) in Wales to the mains gas network, with some potential for a further 25 per cent of off-grid households to consider connection. The analysis being finalised by the Welsh Government with the assistance of WWU will assist in further targeting of such households. Cooperation of the Independent Gas Transporters (IGTs) will also help to improve this dataset (around 60,000 dwellings in Wales are connected to mains gas via an IGT, that is, not WWU).

\(^2\) To obtain this estimate the OFT has assumed an average of one household per dwelling; that is, we use the percentage of dwellings as a proxy for the percentage of households.
A.17 For Wales we have relied on this analysis of off-grid households, being the most current and updated available.

Xoserve connection data

A.18 For the report, to identify areas of the UK that do not have a gas connection, we obtained data on the 21 million connections on the large gas transporter network in GB from the company Xoserve Ltd (Xoserve) that provides centralised services to the gas industry on behalf of the large Gas Transporters (National Grid, Northern Gas Networks, Scotland Gas Networks, Southern Gas Networks and Wales & West Utilities).

A.19 There are an estimated 1.35 million\(^3\) connections on the IGT networks.

A.20 The GB data provided by Xoserve gave the number of connections in each postcode sector, though where there were fewer than 10 connections the actual number was not disclosed to maintain data confidentiality. We made assumptions to try to exclude the non-domestic\(^4\) connections and obtain an estimate for the minimum number of people off-grid. To mitigate the non-domestic effect, we limited the number of SSP connections to be, at most, the number of households in the postcode sector. To obtain the estimate of the minimum number off-grid, where there are fewer than 10 connections in a postcode sector we assumed the best connection rate possible and assumed that there are nine connections.

A.21 To estimate the number of households that are off-grid, we need an estimate of the number of domestic gas connections and the number of households. The result of this Xoserve data analysis combined with the

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\(^3\) Xoserve estimate.

\(^4\) SSP is a gas usage threshold measure. It is set to be at domestic usage levels, but small non-domestic users may fall under this usage level and therefore a small number of non-domestic users may be included in the SSP data. As a result, it is possible that some postcode sectors may have been classified as on-gas where there were no domestic connections but at least one non-domestic SSP connection.
The estimated number connected to an IGT gives an estimated 22.4 million gas connections.

A.22 The number of households can be estimated in two ways. First we can use the number of households in the GB postcode data, but acknowledge this is all domestic delivery points and will include unoccupied, demolished and yet to be built dwellings. In effect this should give the maximum number of households available and as such will over estimate the number of occupied (and energy using) households in GB. Second, we can use the estimated number of households from Government estimates. Whilst these might be best estimates of household numbers, they are estimates as of 2008 in England and Wales and 2010 in Scotland and as such should be treated as a minimum number of households.

A.23 Using the estimated 22.4 million connections and the two estimates of the number of households, we estimate that between three million and 4.1 million households in GB are off-grid as shown in Table A.5.
Table A.5: Estimates of number of GB off-grid households from Xoserve data

<table>
<thead>
<tr>
<th></th>
<th>Off-grid households based upon number of households in GB postcode file</th>
<th>Off-grid households based upon number of households in Government data⁵</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Connected</td>
<td>Number off-grid</td>
</tr>
<tr>
<td>GB</td>
<td>22,400,000</td>
<td>4,100,000</td>
</tr>
</tbody>
</table>

Source: Data from Xoserve and the estimate of IGT connections. Figures rounded to nearest 100,000.

A.24 This table serves as a good cross check to the 3.4 million GB off-grid households estimated from the data underlying the Consumer Focus Report and ongoing Welsh Government analysis combined. Generally, therefore, we consider that the Xoserve data and IGT estimate is not necessarily inconsistent with an estimate of the domestic GB off-grid population size of at least 3.4 million households as identified from other sources.

NI House Condition Survey 2009

A.25 The NI Housing Executive regularly undertakes House Condition Surveys to meet its statutory responsibility in relation to housing research as set out in the Housing (NI) Order 1981.


A.26 The most recent survey published is the NI House Condition Survey 2009. Information about and links to the results from this survey are published on the website of the NI Housing Executive.  

A.27 The NI House Condition Survey 2009 estimates 740,000 dwellings and 691,500 households in NI.

A.28 Some of the NI House Condition Survey 2009 statistics refer to households and some to dwellings. Where we have been able to quote percentages of households, we have done so in the main report. Where such percentages are not available, we have used the percentage of NI dwellings as the best available proxy. Hence we have used the two terms 'household' and 'dwelling' interchangeably for the purposes of this report.

**NI Utility Regulator data**

A.29 For NI, the NI Utility Regulator provided the OFT with the data shown in Table A.5 below:

- The number of connections on the network owned by each of Phoenix Natural Gas (PNG) and firmus energy (firmus).

- Estimates of households that are readily connectable, which includes those already connected. In this context a premise is defined as readily connectable if its curtilage is situated within 50 meters of a distribution pipeline.  

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6 Refer to: [www.nihe.gov.uk/index/sp_home/research-2/house_condition_survey.htm](http://www.nihe.gov.uk/index/sp_home/research-2/house_condition_survey.htm)

7 Correspondence with the NI Utility Regulator.
Table A.5: Connectable households* in NI

<table>
<thead>
<tr>
<th>connectable households</th>
<th>firmus</th>
<th>PNG</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>already connected</td>
<td>7,000</td>
<td>139,000</td>
<td>146,000</td>
</tr>
<tr>
<td>remaining to be connected</td>
<td>31,000</td>
<td>145,000</td>
<td>176,000</td>
</tr>
</tbody>
</table>

Source: Utility Regulator. Data for PNG are at end December 2010 and for firmus are at end September 2010. To nearest 1,000

A.30 Combining the above with data from the NI House Condition Survey 2009 estimating the total number of households in NI, the OFT derived:

- An estimate of the number of NI households that are off-grid: 594,000 (80 per cent of all NI households).

- An estimate of the number of readily connectable NI off-grid households: 176,000 (30 per cent of NI off-grid households).

---

As explained in paragraph A.28, we have used the two terms ‘household’ and ‘dwelling’ interchangeably for the purposes of this report. In estimating the percentage of NI off-grid households, we have used the total number of dwellings rather than households, given that connections are recorded by dwelling rather than by household. As the number of dwellings exceeds the number of households, this will slightly underestimate the actual number and percentage of off-grid NI households.
Other company data

A.31 Scotia Gas Networks estimates that:

- 120,000 (20 per cent) of its 600,000 off-grid households (12 per cent are off-grid) in the Southern GDN area are connectable, and
- 200,000 (40 per cent) of its 500,000 off-grid households (21 per cent are off-grid) in the Scotland GDN area are connectable

where connectable households are defined as those that are 'already within a network area but have no supply or are part of a community that is in close proximity (less than two km) from a suitable connection point'.

DTI Working Group data

A.32 In 2001 the DTI chaired a working group to consider the extension of the gas network, also taking into account fuel poverty considerations. The resulting Report of the Working Group on Extending the Gas Network (the DTI Report) estimated that 'approximately 4.5 million GB households … rely on fuels other than mains gas for their energy supplies'. Among this population were 4,017 settlements containing more than 150 dwellings, 1,341 settlements containing more than 300 dwellings and 105 settlements containing more than 750 dwellings.

A.33 The DTI Report also estimated the proximity of settlements containing more than 150 dwellings to a gas main at the time.

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Table A.6: Proximity of selected settlements to mains gas

<table>
<thead>
<tr>
<th>Settlements &gt; 150 dwellings</th>
<th>Within 2 km of a mains gas grid</th>
</tr>
</thead>
<tbody>
<tr>
<td>South-West</td>
<td>799</td>
</tr>
<tr>
<td>East Anglia</td>
<td>729</td>
</tr>
<tr>
<td>South-West</td>
<td>568</td>
</tr>
<tr>
<td>Wales</td>
<td>396</td>
</tr>
<tr>
<td>W Midlands</td>
<td>301</td>
</tr>
<tr>
<td>Scotland</td>
<td>281</td>
</tr>
<tr>
<td>E Midlands</td>
<td>248</td>
</tr>
<tr>
<td>North</td>
<td>237</td>
</tr>
<tr>
<td>South-East</td>
<td>191</td>
</tr>
<tr>
<td>Yorkshire</td>
<td>134</td>
</tr>
<tr>
<td>North-West</td>
<td>94</td>
</tr>
<tr>
<td>N London</td>
<td>39</td>
</tr>
<tr>
<td>Total</td>
<td>4017</td>
</tr>
</tbody>
</table>

Source: Data extracted by the OFT from Table 2 of the 2001 DTI Report

A.34 From the above we estimate that 35 per cent of settlements larger than 150 dwellings in England were within two km of a gas main at the time of the DTI Report. The corresponding figures for Wales and Scotland were 12 per cent and 21 per cent respectively.

A.35 While the report dates from 2001, we are not aware of any significant gas grid extension since, or of any similar but more recent GB-wide analysis. Therefore, while the state of play may have altered over time, this may still be useful indicative data. The data are included only for completeness as we have preferred to rely on more recent data. However, we generally consider that, as a cross-check, the DTI data corroborate that our study estimate of the GB off-grid population size is reasonable and that there appears to be a material proportion of potentially connectable off-grid households within each GB nation.

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10 These estimates assume that the settlements within two km of a mains gas grid are a subset of the settlements with more than 150 dwellings.
B METHODOLOGY FOR OFF-GAS AREA MAPPING

Overlay off-gas map

B.1 For the report, we needed to identify areas of the UK that do not have a gas connection. In GB, the areas mapped as off-gas in the report came from the data on the 21 million connections on the large gas transporter network provided by Xoserve as described in Annexe A.

B.2 There are an estimated 1.35 million\(^\text{11}\) connections on the IGT networks. We have not obtained data from the IGTs regarding these connections so they are not included in the mapping analysis.

B.3 As described in Annexe A, postcode sectors (for example EC4Y 8) were identified as off-gas if there were no SSPs in that postcode sector. These off-gas areas were then overlaid on maps of deprivation, fuel poverty and rural/urban classification. It has been noted however that 'these classifications make it easy to slip into the 'ecological fallacy' – for example thinking of all people in the most deprived areas as deprived, when in fact many people in the most deprived areas are by no means 'poor' and the majority of deprived people do not live in deprived areas. Even the biggest rural to urban difference can obscure there being more variation within areas than there is between them.'\(^\text{12}\)

B.4 For NI there are two gas transporter networks. From the information available in section 3.3.3 of the Joint Gas Capacity Statement 2011, available here: www.cer.ie/en/gas-security-of-supply.aspx, it is possible to identify the Local Government Districts (LGDs) that intersect the gas grid and therefore possible to map LGDs that are not connected. Using

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\(^{11}\) Xoserve estimate.

\(^{12}\) www.neighbourhood.statistics.gov.uk/HTMLDocs/images/rt43-rural-urban-areas_tcm97-107562.pdf
this information we have identified\textsuperscript{13} postcode sectors that are within unconnected LGDs and mapped these as off-gas.

**Deprivation map**

**B.5** The data (and information regarding the quality of the data) for the deprivation map are available at source via the following websites:


- Wales (2008 LSOA level) – data is available here: [www.statswales.wales.gov.uk/TableViewer/tableView.aspx?ReportId=6028](http://www.statswales.wales.gov.uk/TableViewer/tableView.aspx?ReportId=6028) at the time of writing the 2011 deprivation statistics had been released (31 August 2011) but too late to be included in this report.

- Scotland (2009 data zone level) – data is available here: [www.scotland.gov.uk/Topics/Statistics/SIMD](http://www.scotland.gov.uk/Topics/Statistics/SIMD)


**B.6** The limitations of the deprivation data are that deprivation is measured differently and at different points in time in each UK nation. This means that areas cannot be compared between nations, for example, the most deprived area in England cannot be compared to the most deprived area in Wales. More information is available on the neighbourhood statistics website here: [www.neighbourhood.statistics.gov.uk/dissemination/Info.do?page=analysisandguidance/analysisarticles/indices-of-deprivation.htm](http://www.neighbourhood.statistics.gov.uk/dissemination/Info.do?page=analysisandguidance/analysisarticles/indices-of-deprivation.htm)

\textsuperscript{13} MapInfo used to identify postcode sectors not intersecting with connected LGDs.
Fuel poverty map

B.7 The data (and information regarding the quality of the data) for the fuel poverty map are available at source via the following websites:

- Wales (2004 LSOA level) – data is available here: www.wales.gov.uk/topics/environmentcountryside/energy/fuelpoverty/fuelpovertymaps/northwales/?lang=en
- Scotland (2007-2009 Local Authority level) – data is available here: www.scotland.gov.uk/Topics/Statistics/SHCS/LA0709

B.8 In the same way as for the deprivation data, the limitations of the fuel poverty data are that fuel poverty is measured differently and at different points in time within the UK. It has been said, 'these data are unlikely to accurately reflect the level of fuel poverty today, but the relative concentration of fuel poor households between different areas is unlikely to have changed significantly'.

B.9 For this reason, the areas were ranked from lowest to highest within each nation and this relative measure was mapped in rank quintiles. This ranking implies that areas cannot be compared between nations, for example, the most fuel poor area in England cannot be compared to the most fuel poor area in Wales. Further, unless already included in the source data, there has been no attempt made to correct for weather or ambient temperature effects, which contribute to fuel usage and therefore fuel costs.

14 wales.gov.uk/about/aboutresearch/social/latestresearch/fuelmaps
Further details on how fuel poverty is measured, its accuracy and limitations can be found on the following websites:

- England information is available here:

- Wales information is available here:

- Scotland information is available here:

- NI information is available here:
  [www.dsdni.gov.uk/ending_fuel_poverty_-_a_strategy_for_ni.pdf](http://www.dsdni.gov.uk/ending_fuel_poverty_-_a_strategy_for_ni.pdf)

### Rural/Urban map

The data (and information regarding the quality of the data) for the rural/urban map are available at source via the following websites:

- England and Wales (2005 LSOA level) – data is available here:

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• Scotland (2009-2010 6 fold classification) – data is available here: www.scotland.gov.uk/Publications/2010/08/2010UR


B.12 More detailed information on comparing urban and rural classifications can be found on the neighbourhood statistics website here: www.neighbourhood.statistics.gov.uk/HTMLDocs/images/rt43-rural-urban-areas_tcm97-107562.pdf

Methodology for heating oil delivery area mapping

B.13 Data was gathered from the Federation of Petroleum Suppliers, Consumer Council for NI (CCNI), price comparison sites, and a small number of individual firms. This data described the postcode districts (for example EC4Y) that each supplier serves. This allowed us to count the number of suppliers serving each district, counting each firm only once even where they operate under multiple brands. The map shown colours each postcode district according to the number of suppliers that serve it. Postcode district boundary information for use in geographic information systems (GIS) is available from many companies. Although the coverage data is not exhaustive, it provides a good indication of which areas have the most and fewest suppliers.

Other off-gas area mapping

B.14 As part of the market study, we also received analysis from AEA Technology Group plc (AEA) produced as part of the management of the National Atmospheric Emissions Inventory (NAEI) on behalf of the Department of Energy and Climate Change (DECC) and the Department for Environment, Food and Rural Affairs (Defra), the Department of the Environment in NI, the Scottish Government and the Welsh Government. The upcoming publication of UK Emission Mapping Methodology 2009 written by AEA for DECC and Defra will present emission maps. An important part of these maps is domestic energy use by fuel type. The report includes maps of domestic heating oil and LPG usage in the UK.
Further, this data allows AEA to identify areas that do not have domestic gas users. The underlying data used 2009 estimates of gas usage in UK; however, for NI we used areas as described in paragraph B.4 as this was 2011 information. For our purposes, the Xoserve GB data was also more recent and was used in the mapping shown in the main report.17

B.15 Permission has been granted to use the fuel usage UK maps as well as the AEA off-gas boundaries in GB, and for completeness this GB analysis together with the NI estimates, can be seen below. Again the deprivation, fuel poverty and rural/urban maps (as above) are overlaid with the AEA and NI (defined as above) estimated off-gas areas.

B.16 Full GB methodology and data sources can be found in the upcoming publication of UK Emission Mapping Methodology 2009. However Figure B.1 gives an overview of the data sources used.

---

17 Note that these fuel maps, presented in the main report, may not be accurate in every individual location and should be treated as experimental data. Within each fuel usage map, the distribution of its domestic use are presented as a percentage of its total UK domestic fuel use.
Figure B.1: NAEI Domestic model diagram

Figure B.2: Map of UK off-gas areas by fuel poverty

Source: OFT mapping analysis as detailed above, based on AEA data
Figure B.3 Map of off-gas areas by rural/urban classification

Source: OFT mapping analysis as detailed above, based on AEA data
Figure B.4: Map of UK off-gas areas by multiple deprivation indices

Source: OFT mapping analysis as detailed above, based on AEA data
C ADDITIONAL ANALYSIS OF CONSUMER FOCUS OFF-GAS DATA

C.1 The tables in this annexe were produced for the OFT by Dr. Richard Moore, the independent consultant who provided analysis for the Consumer Focus Report.

Table C.1: Main heating fuel by location, where no gas supply but in gas postcode, England, 2008

<table>
<thead>
<tr>
<th>Location</th>
<th>LPG &amp; Bot. gas</th>
<th>Heating Oil</th>
<th>Solid Fuel</th>
<th>Electric heating</th>
<th>Total Households</th>
</tr>
</thead>
<tbody>
<tr>
<td>Urban area &gt; 10,000 population</td>
<td>23</td>
<td>20</td>
<td>51</td>
<td>722</td>
<td>816</td>
</tr>
<tr>
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<td>2.8</td>
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<td>6.3</td>
<td>88.5</td>
<td>100.0</td>
</tr>
<tr>
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<td>72.9</td>
<td>16.5</td>
<td>63.4</td>
<td>83.5</td>
<td>74.4</td>
</tr>
<tr>
<td>Town and fringe</td>
<td>3</td>
<td>21</td>
<td>10</td>
<td>107</td>
<td>141</td>
</tr>
<tr>
<td></td>
<td>1.8</td>
<td>15.1</td>
<td>7.3</td>
<td>75.7</td>
<td>100.0</td>
</tr>
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<td>18.0</td>
<td>12.7</td>
<td>12.3</td>
<td>12.9</td>
</tr>
<tr>
<td>Village</td>
<td>6</td>
<td>60</td>
<td>15</td>
<td>29</td>
<td>109</td>
</tr>
<tr>
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<td>54.7</td>
<td>13.7</td>
<td>26.2</td>
<td>100.0</td>
</tr>
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<td>50.4</td>
<td>18.5</td>
<td>3.3</td>
<td>10.0</td>
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<tr>
<td>Hamlet or Isolated dwelling</td>
<td>0</td>
<td>18</td>
<td>4</td>
<td>8</td>
<td>30</td>
</tr>
<tr>
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<td>0.0</td>
<td>59.7</td>
<td>14.6</td>
<td>25.7</td>
<td>100.0</td>
</tr>
<tr>
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<td>0.0</td>
<td>15.1</td>
<td>5.4</td>
<td>0.9</td>
<td>2.7</td>
</tr>
<tr>
<td>Total households</td>
<td>31</td>
<td>119</td>
<td>81</td>
<td>865</td>
<td>1,096</td>
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<tr>
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<td>2.8</td>
<td>10.8</td>
<td>7.4</td>
<td>79.0</td>
<td>100.0</td>
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<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
</tr>
</tbody>
</table>

Source: EHS 2008
Table C.2: Main heating fuel by location, where no gas supply but in gas postcode, Scotland, 2007/09

 Thousand households/row percentage/column percentage

<table>
<thead>
<tr>
<th>Location</th>
<th>LPG &amp; Bot. gas</th>
<th>Heating Oil</th>
<th>Solid fuel</th>
<th>Electric heating</th>
<th>Total Households</th>
</tr>
</thead>
<tbody>
<tr>
<td>Urban area</td>
<td>0.0</td>
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<td>4</td>
<td>144</td>
<td>151</td>
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<tr>
<td></td>
<td>0.3</td>
<td>1.5</td>
<td>2.7</td>
<td>95.4</td>
<td>100.0</td>
</tr>
<tr>
<td></td>
<td>22.0</td>
<td>28.5</td>
<td>65.6</td>
<td>93.1</td>
<td>88.2</td>
</tr>
<tr>
<td>Rural area</td>
<td>2.0</td>
<td>6</td>
<td>2</td>
<td>11</td>
<td>20</td>
</tr>
<tr>
<td></td>
<td>7.5</td>
<td>29.0</td>
<td>10.7</td>
<td>52.8</td>
<td>100.0</td>
</tr>
<tr>
<td></td>
<td>78.0</td>
<td>71.5</td>
<td>34.4</td>
<td>6.9</td>
<td>11.8</td>
</tr>
<tr>
<td>Total households</td>
<td>2.0</td>
<td>8</td>
<td>6</td>
<td>155</td>
<td>171</td>
</tr>
<tr>
<td></td>
<td>1.1</td>
<td>4.8</td>
<td>3.7</td>
<td>90.4</td>
<td>100.0</td>
</tr>
<tr>
<td></td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
</tr>
</tbody>
</table>

Source: SHCS 2007/09
### Table C.3: Main heating fuel by location, where no gas supply but in gas postcode, Wales, 2008

Thousand households/row percentage/column percentage

<table>
<thead>
<tr>
<th>Location</th>
<th>LPG &amp; Bot. gas</th>
<th>Heating Oil</th>
<th>Solid fuel</th>
<th>Electric heating</th>
<th>Total Households</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Urban area &gt; 10,000 population</strong></td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>14</td>
<td>20</td>
</tr>
<tr>
<td></td>
<td>3.6</td>
<td>8.1</td>
<td>17.0</td>
<td>71.3</td>
<td>100.0</td>
</tr>
<tr>
<td></td>
<td><strong>17.1</strong></td>
<td><strong>10.0</strong></td>
<td><strong>36.8</strong></td>
<td><strong>60.1</strong></td>
<td><strong>37.4</strong></td>
</tr>
<tr>
<td><strong>Town and fringe</strong></td>
<td>1</td>
<td>1</td>
<td>3</td>
<td>7</td>
<td>13</td>
</tr>
<tr>
<td></td>
<td>6.2</td>
<td>11.5</td>
<td>24.1</td>
<td>58.2</td>
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<tr>
<td></td>
<td><strong>18.8</strong></td>
<td><strong>9.1</strong></td>
<td><strong>33.5</strong></td>
<td><strong>31.5</strong></td>
<td><strong>24.0</strong></td>
</tr>
<tr>
<td><strong>Village</strong></td>
<td>2</td>
<td>8</td>
<td>2</td>
<td>2</td>
<td>13</td>
</tr>
<tr>
<td></td>
<td>16.6</td>
<td>56.2</td>
<td>15.9</td>
<td>11.4</td>
<td>100.0</td>
</tr>
<tr>
<td></td>
<td><strong>53.2</strong></td>
<td><strong>46.9</strong></td>
<td><strong>23.3</strong></td>
<td><strong>6.5</strong></td>
<td><strong>25.4</strong></td>
</tr>
<tr>
<td><strong>Hamlet or isolated dwelling</strong></td>
<td>0</td>
<td>5</td>
<td>1</td>
<td>0</td>
<td>7</td>
</tr>
<tr>
<td></td>
<td>6.5</td>
<td>78.7</td>
<td>8.4</td>
<td>6.4</td>
<td>100.0</td>
</tr>
<tr>
<td></td>
<td><strong>10.9</strong></td>
<td><strong>34.1</strong></td>
<td><strong>6.4</strong></td>
<td><strong>1.9</strong></td>
<td><strong>13.2</strong></td>
</tr>
<tr>
<td><strong>Total households</strong></td>
<td>4</td>
<td>16</td>
<td>9</td>
<td>23</td>
<td>53</td>
</tr>
<tr>
<td></td>
<td>7.9</td>
<td>30.5</td>
<td>17.3</td>
<td>44.3</td>
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<td><strong>100.0</strong></td>
<td><strong>100.0</strong></td>
<td><strong>100.0</strong></td>
</tr>
</tbody>
</table>

Source: LIWS 2008
### Table C.4: Use and availability of mains gas by tenure, Scotland, 2007/09

<table>
<thead>
<tr>
<th>Tenure</th>
<th>Mains gas primary heating</th>
<th>Gas supply but not main heating</th>
<th>No gas supply but in post-code with gas</th>
<th>Not in postcode with gas</th>
<th>Total Households</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Communal system</td>
<td>Individual home</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Owned with mortgage</td>
<td>0</td>
<td>686</td>
<td>17</td>
<td>34</td>
<td>83</td>
</tr>
<tr>
<td></td>
<td>0.0</td>
<td>83.6</td>
<td>2.1</td>
<td>4.2</td>
<td>10.1</td>
</tr>
<tr>
<td></td>
<td>1.4</td>
<td>38.7</td>
<td>32.6</td>
<td>20.0</td>
<td>26.3</td>
</tr>
<tr>
<td>Owned outright</td>
<td>1</td>
<td>492</td>
<td>19</td>
<td>37</td>
<td>100</td>
</tr>
<tr>
<td></td>
<td>0.1</td>
<td>75.9</td>
<td>2.9</td>
<td>5.6</td>
<td>15.4</td>
</tr>
<tr>
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<td>6.0</td>
<td>27.7</td>
<td>36.0</td>
<td>21.3</td>
<td>31.5</td>
</tr>
<tr>
<td>Privately rented</td>
<td>1</td>
<td>123</td>
<td>7</td>
<td>40</td>
<td>48</td>
</tr>
<tr>
<td></td>
<td>0.3</td>
<td>56.2</td>
<td>3.3</td>
<td>18.1</td>
<td>22.0</td>
</tr>
<tr>
<td></td>
<td>3.9</td>
<td>7.0</td>
<td>13.8</td>
<td>23.2</td>
<td>15.2</td>
</tr>
<tr>
<td>Rented from LA</td>
<td>2</td>
<td>288</td>
<td>5</td>
<td>33</td>
<td>38</td>
</tr>
<tr>
<td></td>
<td>0.5</td>
<td>78.6</td>
<td>1.3</td>
<td>9.1</td>
<td>10.4</td>
</tr>
<tr>
<td></td>
<td>11.8</td>
<td>16.2</td>
<td>9.3</td>
<td>19.6</td>
<td>12.1</td>
</tr>
<tr>
<td>Rented from</td>
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<td>185</td>
<td>4</td>
<td>27</td>
<td>47</td>
</tr>
</tbody>
</table>

Thousand households/row percentage/column percentage.
<table>
<thead>
<tr>
<th></th>
<th>HA</th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>4.4</td>
<td>67.0</td>
<td>1.6</td>
<td>9.9</td>
<td>17.1</td>
<td>100.0</td>
</tr>
<tr>
<td></td>
<td>76.9</td>
<td>10.4</td>
<td>8.3</td>
<td>15.9</td>
<td>14.9</td>
<td>11.8</td>
</tr>
<tr>
<td>Total households</td>
<td>16</td>
<td>1,773</td>
<td>53</td>
<td>171</td>
<td>317</td>
<td>2,330</td>
</tr>
<tr>
<td></td>
<td>0.7</td>
<td>76.1</td>
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<td>7.3</td>
<td>13.6</td>
<td>100.0</td>
</tr>
<tr>
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<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
</tr>
</tbody>
</table>

Source: SHCS 2007/09
<table>
<thead>
<tr>
<th>Tenure</th>
<th>Mains gas primary heating</th>
<th>Gas supply but not main heating fuel</th>
<th>No gas supply but in post-code with gas</th>
<th>Not in Postcode with gas</th>
<th>Total households</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Communal system</td>
<td>Individual home system</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Owned with mortgage</td>
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<td>7</td>
<td>14</td>
<td>63</td>
</tr>
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<td>3.2</td>
<td>14.7</td>
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<td>34.9</td>
<td>25.3</td>
<td>26.0</td>
<td>33.4</td>
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<td>24</td>
<td>91</td>
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</tr>
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<td>37.1</td>
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<td>46.4</td>
<td>47.9</td>
</tr>
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<td>Privately rented</td>
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<td>5</td>
<td>16</td>
</tr>
<tr>
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<td>3.0</td>
<td>4.6</td>
<td>14.0</td>
</tr>
<tr>
<td></td>
<td>0.0</td>
<td>9.0</td>
<td>13.2</td>
<td>10.1</td>
<td>8.5</td>
</tr>
<tr>
<td>Rented from LA</td>
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<td>1</td>
<td>6</td>
<td>13</td>
</tr>
<tr>
<td></td>
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<td>82.8</td>
<td>1.0</td>
<td>4.5</td>
<td>9.6</td>
</tr>
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<td></td>
<td>82.8</td>
<td>11.6</td>
<td>5.4</td>
<td>12.0</td>
<td>7.1</td>
</tr>
<tr>
<td>Rented from RSL</td>
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<td>1</td>
<td>3</td>
<td>6</td>
</tr>
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<td>87.3</td>
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<td>3.4</td>
<td>7.3</td>
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<td>7.4</td>
<td>4.0</td>
<td>5.5</td>
<td>3.2</td>
</tr>
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<td>996</td>
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<td>53</td>
<td>190</td>
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<td>2.1</td>
<td>4.1</td>
<td>15.0</td>
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<tr>
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<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
</tr>
</tbody>
</table>

Source: LIWS 2008
Table C.6: Use and availability of mains gas by type of dwelling, Scotland, 2007/09

Thousand households/row percentage/column percentage

<table>
<thead>
<tr>
<th>Dwelling type</th>
<th>Mains gas primary heating</th>
<th>Gas supply but not main heating fuel</th>
<th>No gas supply but in postcode with gas</th>
<th>Not in Postcode with gas</th>
<th>Total households</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Communal system</td>
<td>Individual home system</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>End terrace</td>
<td>0</td>
<td>175</td>
<td>4</td>
<td>10</td>
<td>208</td>
</tr>
<tr>
<td></td>
<td>0.0</td>
<td>84.1</td>
<td>1.8</td>
<td>4.9</td>
<td>100.0</td>
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<td>8.9</td>
</tr>
<tr>
<td>Mid terrace</td>
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<td>255</td>
<td>5</td>
<td>19</td>
<td>29</td>
</tr>
<tr>
<td></td>
<td>0.2</td>
<td>82.7</td>
<td>1.5</td>
<td>6.3</td>
<td>9.3</td>
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<td>4.4</td>
<td>14.4</td>
<td>8.7</td>
<td>11.4</td>
<td>9.1</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>13.2</td>
</tr>
<tr>
<td>Semi detached</td>
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<td>23</td>
<td>64</td>
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<tr>
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<td>80.6</td>
<td>1.3</td>
<td>4.7</td>
<td>13.0</td>
</tr>
<tr>
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<td>8.3</td>
<td>22.3</td>
<td>12.3</td>
<td>13.6</td>
<td>20.2</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>21.1</td>
</tr>
<tr>
<td>Detached</td>
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<td>329</td>
<td>20</td>
<td>12</td>
<td>116</td>
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<td></td>
<td></td>
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</tr>
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<td>13</td>
<td>81</td>
<td>44</td>
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<td></td>
<td></td>
<td>22.7</td>
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<td>Converted flat</td>
<td>0</td>
<td>26</td>
<td>0</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
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<td>89.2</td>
<td>0.1</td>
<td>6.2</td>
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</tr>
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</tr>
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<td>0.3</td>
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<td>0.4</td>
</tr>
<tr>
<td>------------------</td>
<td>-----</td>
<td>-----</td>
<td>-----</td>
<td>-----</td>
<td>-----</td>
</tr>
<tr>
<td>Low rise, PB flat</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>203</td>
<td>5</td>
<td>20</td>
<td>13</td>
<td></td>
</tr>
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<td>1.0</td>
<td>83.4</td>
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<td>8.1</td>
<td>5.5</td>
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<td>15.5</td>
<td>11.5</td>
<td>9.2</td>
<td>11.5</td>
<td>4.3</td>
<td>10.5</td>
</tr>
<tr>
<td>High rise, PB flat</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>1</td>
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<td>1</td>
<td>3</td>
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<td>41</td>
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<td>Total households</td>
<td>16</td>
<td>1,773</td>
<td>53</td>
<td>171</td>
<td>317</td>
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<td>76.1</td>
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<td>7.3</td>
<td>13.6</td>
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<td>100.0</td>
<td>100.0</td>
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</tr>
</tbody>
</table>

Source: SHCS 2007/09
## Table C.7: Use and availability of mains gas by type of dwelling, Wales, 2008

<table>
<thead>
<tr>
<th>Dwelling type</th>
<th>Mains gas primary heating</th>
<th>Gas supply but not main heating fuel</th>
<th>No gas supply but in postcode with gas</th>
<th>Not in Postcode with gas</th>
<th>Total households</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Communal system</td>
<td>Individual home system</td>
<td>Gas supply but not main heating fuel</td>
<td>No gas supply but in postcode with gas</td>
<td>Not in Postcode with gas</td>
</tr>
<tr>
<td>End terrace</td>
<td>0</td>
<td>116</td>
<td>3</td>
<td>4</td>
<td>9</td>
</tr>
<tr>
<td></td>
<td>0.0</td>
<td>87.5</td>
<td>2.0</td>
<td>3.4</td>
<td>7.2</td>
</tr>
<tr>
<td></td>
<td>0.0</td>
<td>11.6</td>
<td>9.9</td>
<td>8.5</td>
<td>5.0</td>
</tr>
<tr>
<td>Mid terrace</td>
<td>1</td>
<td>243</td>
<td>6</td>
<td>8</td>
<td>9</td>
</tr>
<tr>
<td></td>
<td>0.4</td>
<td>90.8</td>
<td>2.4</td>
<td>3.2</td>
<td>3.2</td>
</tr>
<tr>
<td></td>
<td>31.4</td>
<td>24.4</td>
<td>24.2</td>
<td>16.1</td>
<td>4.6</td>
</tr>
<tr>
<td>Semi detached</td>
<td>0</td>
<td>304</td>
<td>6</td>
<td>7</td>
<td>36</td>
</tr>
<tr>
<td></td>
<td>0.0</td>
<td>86.1</td>
<td>1.7</td>
<td>2.0</td>
<td>10.1</td>
</tr>
<tr>
<td></td>
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<td>30.5</td>
<td>23.5</td>
<td>13.3</td>
<td>18.9</td>
</tr>
<tr>
<td>Detached</td>
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<td>164</td>
<td>5</td>
<td>13</td>
<td>81</td>
</tr>
<tr>
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<td>4.8</td>
<td>30.9</td>
</tr>
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<td>16.4</td>
<td>18.0</td>
<td>23.8</td>
<td>42.6</td>
</tr>
<tr>
<td>Bungalow</td>
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<td>87</td>
<td>6</td>
<td>10</td>
<td>44</td>
</tr>
<tr>
<td></td>
<td>0.0</td>
<td>59.0</td>
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<td>7.1</td>
<td>30.1</td>
</tr>
<tr>
<td></td>
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<td>8.7</td>
<td>21.2</td>
<td>19.9</td>
<td>23.3</td>
</tr>
<tr>
<td>Converted flat</td>
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<td>17</td>
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<td>3</td>
<td>2</td>
</tr>
<tr>
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<td>3.7</td>
<td>11.7</td>
<td>8.3</td>
</tr>
<tr>
<td></td>
<td>0.0</td>
<td>1.7</td>
<td>3.1</td>
<td>4.9</td>
<td>1.0</td>
</tr>
<tr>
<td>Low rise, PB flat</td>
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<td>63</td>
<td>0</td>
<td>6</td>
<td>8</td>
</tr>
<tr>
<td></td>
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<td>79.4</td>
<td>0.0</td>
<td>7.7</td>
<td>9.9</td>
</tr>
<tr>
<td></td>
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<td>6.3</td>
<td>0.0</td>
<td>11.5</td>
<td>4.1</td>
</tr>
<tr>
<td>Low rise, PB flat</td>
<td>0</td>
<td>3</td>
<td>0</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>0.0</td>
<td>63.4</td>
<td>0.0</td>
<td>19.5</td>
<td>17.1</td>
</tr>
<tr>
<td></td>
<td>0.0</td>
<td>0.3</td>
<td>0.0</td>
<td>2.0</td>
<td>0.5</td>
</tr>
<tr>
<td>Total households</td>
<td>3</td>
<td>996</td>
<td>26</td>
<td>53</td>
<td>190</td>
</tr>
<tr>
<td></td>
<td>0.3</td>
<td>78.6</td>
<td>2.1</td>
<td>4.1</td>
<td>15.0</td>
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<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
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</tbody>
</table>

Source: LIWS 2008
### Relevant sample sizes

#### Table C.8: Sample sizes for Tables 1 to 3, re. Row percentages

<table>
<thead>
<tr>
<th>Location</th>
<th>England</th>
<th>Wales</th>
<th>Scotland</th>
</tr>
</thead>
<tbody>
<tr>
<td>Urban area &gt; 10,000 population</td>
<td>EHS 2008 580</td>
<td>LIWS 2008 44</td>
<td>SHCS 2007/09 Urban area 527</td>
</tr>
<tr>
<td>Town and Fringe</td>
<td>93</td>
<td>22</td>
<td>Rural Area 88</td>
</tr>
<tr>
<td>Village</td>
<td>72</td>
<td>27</td>
<td></td>
</tr>
<tr>
<td>Hamlet or isolated dwelling</td>
<td>23</td>
<td>16</td>
<td></td>
</tr>
<tr>
<td>Total households</td>
<td>768</td>
<td>109</td>
<td>Total Households 615</td>
</tr>
</tbody>
</table>

#### Table C.9: Sample sizes for Tables 1 to 3, re. Column percentages

<table>
<thead>
<tr>
<th>Survey</th>
<th>LPG &amp; Bot. gas</th>
<th>Heating Oil</th>
<th>Solid fuel</th>
<th>Electric heating</th>
<th>Total Households</th>
</tr>
</thead>
<tbody>
<tr>
<td>EHS 2008</td>
<td>19</td>
<td>74</td>
<td>68</td>
<td>607</td>
<td>768</td>
</tr>
<tr>
<td>SHCS 2007/09</td>
<td>9</td>
<td>34</td>
<td>26</td>
<td>546</td>
<td>615</td>
</tr>
<tr>
<td>LIWS 2008</td>
<td>9</td>
<td>32</td>
<td>20</td>
<td>48</td>
<td>109</td>
</tr>
</tbody>
</table>

#### Table C.10: Sample sizes for Tables 4 and 5, re. Row percentages

<table>
<thead>
<tr>
<th>Tenure</th>
<th>Scotland</th>
<th>Wales</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>SHCS 2007/09</td>
<td>LIWS 2008</td>
</tr>
<tr>
<td>Owned with mortgage</td>
<td>3,263</td>
<td>827</td>
</tr>
<tr>
<td>Owned outright</td>
<td>2,778</td>
<td>964</td>
</tr>
<tr>
<td>Privately rented</td>
<td>831</td>
<td>251</td>
</tr>
<tr>
<td>Rented from LA</td>
<td>1,461</td>
<td>451</td>
</tr>
<tr>
<td>Rented from RSL/HA</td>
<td>1,061</td>
<td>248</td>
</tr>
<tr>
<td>Total households</td>
<td>9,394</td>
<td>2,741</td>
</tr>
</tbody>
</table>
Table C.11: Sample sizes for Tables 6 and 7, re. Row percentages

<table>
<thead>
<tr>
<th>Dwelling type</th>
<th>Scotland</th>
<th>Wales</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>SHCS 2007/09</td>
<td>LIWS 2008</td>
</tr>
<tr>
<td>End terrace</td>
<td>859</td>
<td>292</td>
</tr>
<tr>
<td>Mid terrace</td>
<td>1,231</td>
<td>579</td>
</tr>
<tr>
<td>Semi detached</td>
<td>2,097</td>
<td>754</td>
</tr>
<tr>
<td>Detached</td>
<td>2,270</td>
<td>519</td>
</tr>
<tr>
<td>Tenement/Bungalow</td>
<td>1,745</td>
<td>331</td>
</tr>
<tr>
<td>Converted flat</td>
<td>123</td>
<td>40</td>
</tr>
<tr>
<td>Low rise, PB flat</td>
<td>941</td>
<td>214</td>
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<tr>
<td>High rise, PB flat</td>
<td>128</td>
<td>12</td>
</tr>
<tr>
<td>Total households</td>
<td>9,394</td>
<td>2,741</td>
</tr>
</tbody>
</table>

Table C.12: Sample sizes for Tables 4 to 7, re. Column percentages

<table>
<thead>
<tr>
<th>Survey</th>
<th>Mains gas primary heating</th>
<th>Gas supply but not main heating fuel</th>
<th>No gas supply but in postcode with gas</th>
<th>Not in postcode with gas</th>
<th>Total households</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Communal system</td>
<td>Individual home system</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SHCS 2007/09</td>
<td>82</td>
<td>6,707</td>
<td>317</td>
<td>615</td>
<td>1,673</td>
</tr>
<tr>
<td>LIWS 2008</td>
<td>11</td>
<td>2,144</td>
<td>51</td>
<td>109</td>
<td>426</td>
</tr>
</tbody>
</table>
D. GAS DISTRIBUTION AND CONNECTIONS IN THE UK

D.1 Gas distribution is the process whereby gas is taken from the high pressure transmission system and distributed through low pressure networks of pipes to industrial complexes, offices and homes.\(^{18}\)

D.2 There are differences in the gas distribution markets in GB and NI, which are also separately regulated. This annexe therefore describes each market separately.

GB gas distribution

Overview

D.3 GB receives natural gas from the North Sea and at one time was an exporter of gas to Europe from these supplies. This has now changed due to the decline of North Sea supplies and 10 per cent of GB gas supply is now imported.\(^{19}\)

D.4 Eight Gas Distribution Networks (GDNs) operate in GB, each covering a separate geographical region. National Grid Gas plc (National Grid) originally owned all eight, but sold four of its gas distribution networks in 2005. National Grid retains ownership of four GDNs; Scotia Gas Networks (SGN) owns two (Southern Gas Networks and Scotland Gas Networks); and Northern Gas Networks (NGN) and Wales & West Utilities (WWU) own one each. Essentially, the GDNs are natural monopolies and are therefore regulated by the Office of Gas and Electricity Markets (Ofgem) to protect consumers from potential abuse of monopoly power.

D.5 The map below highlights the geographical regions of the GDNs. The East of England, London, North West England, and the West Midlands

\(^{18}\) Extract from the Ofgem website: [www.ofgem.gov.uk/Networks/GasDistr/Pages/Gasdistr.aspx](http://www.ofgem.gov.uk/Networks/GasDistr/Pages/Gasdistr.aspx)

\(^{19}\) [www.gas-guide.org.uk/science.html](http://www.gas-guide.org.uk/science.html)
are covered by National Grid; Scotland by Scotland Gas Networks (SGN); the South of England by Southern Gas Networks; the North of England by NGN and Wales & West by WWU.

**Figure D.1: Map of GDN regions**

D.6 In addition to the GDNs, IGTs can provide gas connections and own and operate gas networks. There are currently six active IGT groups/businesses in the UK. They are connected directly to the GDN through a Connected System Entry Point (CSEP) or indirectly to the GDN through another IGT.21

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21 Gas and Electricity Connections Industry Review 2009-10 www.ofgem.gov.uk/Networks/Connectns/ConnIndRev/Pages/ConnIndRev.aspx
D.7 It is estimated that approximately 1.35 million connections have been made to an IGT network, of which 98 per cent are believed to be domestic. Domestic, industrial and commercial premises are all connected to IGT networks; however the new housing market constitutes the largest share of the market.

D.8 In order to be able to distribute gas on the distribution systems, a GDN and IGT must hold a licence. The licences contain conditions which among other things limit the amount of revenue which these companies can recover from their customers. The licences are administered by Ofgem.

Connections and Charges

D.9 Within GB, GDNs are required to install a new connection to individual premises for domestic use where the connection is anticipated to consume 73,200 kilowatt hours (kWh) per annum or less and is situated within 23 metres of one of the network’s relevant mains.

D.10 Domestic customers seeking a connection may be eligible for a standard charge if the following criteria are met:

22 Data from Xoserve Ltd.

5 Extract from the Ofgem website: www.ofgem.gov.uk/Networks/GasDistr/Pages/Gasdistr.aspx

23 GDN websites:
www.sgn.co.uk/ScotiaGas/uploadedFiles/Gas_Connections/Charges/StandardChargesS
www.sgn.co.uk/ScotiaGas/uploadedFiles/Gas_Connections/Charges/StandardChargesSouthernGasNetworks.pdf
www.northerngasnetworks.co.uk/cms/564.html
www.wwutilities.co.uk/Content/Publications/pdf/Connections_and_other_distribution_services_charges_August_2011.pdf
• The connection must operate at a pressure equal to or less than two barg, 24 with no engineering difficulties or other obstacles present that would result in more than 23 metres of pipe being laid to the premises boundary.

• The service will terminate no more than 3 metres above ground level.

• The meter is sited at the front wall of the property or no more than 2 metres along the side wall of the property.

• The individual property does not form part of a multiple development.

• The property is used or proposed to be used mainly or wholly for domestic purposes.

• There is no existing gas supply to the property.

• The person requesting the connection is the owner or occupier of the premises.

D.11 For connections that meet the above conditions, standard connection charges are set according to the same methodology across all networks. However, due to variances in the underlying input variables, the actual amounts charged vary by network area as shown in Table D.3 and are reviewed on an annual basis.

D.12 Customers can elect to commission their own works in respect of excavation and reinstatement of the required trench for installation of the new gas service on private land, or for the GDN to carry out such works; and the cost will vary accordingly.

D.13 Other exceptional circumstances may arise where the proposed pipework encroaches on a third party’s property. In these cases, associated extra costs may be borne by the customer, developer or licensed gas supplier.

24 This refers to a bar gauge pressure reading.
### Table D.2: Standard connection charges by GDN region

<table>
<thead>
<tr>
<th>GDN</th>
<th>Inc excavation and reinstatement</th>
<th>Excavation and reinstatement</th>
</tr>
</thead>
<tbody>
<tr>
<td>National Grid – North West</td>
<td>£518</td>
<td>£215</td>
</tr>
<tr>
<td>National Grid – West Midlands</td>
<td>£659</td>
<td>£275</td>
</tr>
<tr>
<td>National Grid – East of England</td>
<td>£604</td>
<td>£265</td>
</tr>
<tr>
<td>National Grid – London</td>
<td>£946</td>
<td>£436</td>
</tr>
<tr>
<td>Scotland Gas Network</td>
<td>£541</td>
<td>£388</td>
</tr>
<tr>
<td>Southern England</td>
<td>£721</td>
<td>£418</td>
</tr>
<tr>
<td>Inner M25</td>
<td>£828</td>
<td>£434</td>
</tr>
<tr>
<td>Northern Gas Networks</td>
<td>£596</td>
<td>£340</td>
</tr>
<tr>
<td>Wales and West Utilities</td>
<td>£564</td>
<td>£456</td>
</tr>
</tbody>
</table>

Source: GDN websites

#### D.14 Costs are however lower than shown above for National Grid and NGN where zero horizontal length applies.

#### D.15 If the eligibility criteria in paragraph D.13 are not met, connection is at the relevant GDN’s or IGT’s discretion and customers are subject to bespoke connection charges, whereby they are charged the full capital costs of connection which can be significantly higher than the amounts in Table D.2.

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25 As shown in the prior footnote.

26 This refers to where an excavation will not occur on private land and where the customer occupies a property that fronts directly onto the street so that no more than 3 metres of above ground pipework will be installed.
Assisted Connections

D.16 A Fuel Poor network extension scheme applies in GB, which aims to enable vulnerable domestic customers to switch to natural gas by helping towards the costs of connecting to the gas network. The scheme involves GDNs partnering with other organisations to provide discounted or free gas connections to those classified as fuel poor.

D.17 Essentially, the scheme enables vulnerable customers to switch to cheaper fuel alternatives than electricity and oil to help alleviate fuel poverty. Funding is provided to the GDNs so they can offer a discount or free charge connection to fuel poor customers, equivalent to the net present value (NPV) of the net transportation revenue it expects to receive from the new customer. In the majority of cases this discount would cover the cost of connection. However, where the cost of the work involved to set up the connection exceeds the value of future income, customers must make a contribution.

D.18 The scheme is only applicable for existing houses that have no gas supply at present and can be used for connecting single properties, as well as villages and flats, to the gas network.

D.19 The scheme was brought in at the Gas Distribution Price Control for the period 1 April 2008 to 31 March 2013 which sets the allowance a network company can recover from its customers through energy bills. Additionally, a discretionary reward scheme operated by Ofgem aims to encourage and reward leading performance of network companies in specific areas of service, including those that facilitate and increase the affordability of network extensions for fuel poor customers.27

D.20 In order to be eligible for funding towards the cost of a gas connection, at least one of the following criteria must be satisfied:

27 Refer to the Ofgem website for more details: www.ofgem.gov.uk/Pages/MoreInformation.aspx?docid=302&refer=Networks/GasDistr/QoS
Reside within the 20 per cent most deprived areas in the UK.\textsuperscript{28}

Are eligible for measures under Warm Front (England), Home Energy Efficiency Scheme (Wales), or the Energy Assistance Package (Scotland).

Fall within the Priority Group (low income households and over 70 years of age) for measures under the Carbon Emissions Reduction Target (CERT).\textsuperscript{29}

Are in fuel poverty based on the standard government definition.\textsuperscript{30}

D.21 Ofgem is currently reviewing this scheme as part of the next gas distribution price control, which will commence in April 2013.

Connections and plans for extension

D.22 A total of 158,889 GB connections were made in 2009/10. Around 78,000 of these were connections to GDN networks and around 81,000 of these were connections to IGT networks.

D.23 Of the 2009/10 connections, 5,672 were fuel poor connections.\textsuperscript{31} The initial expectation for this scheme was to connect 20,000 fuel poor

\textsuperscript{28} This is measured using the Government’s Index of Multiple Deprivation1 (IMD), when measured at the Lower Level Super Output Areas (LOSA). The IMD is defined separately for England, Scotland and Wales, however each index is based on the same principles. Income, employment, education and health can be identified and measured. This can then be used to provide an overall calculation of deprivation which is used to give the area a deprivation level.

\textsuperscript{29} These have been put in place to try to meet the Kyoto emissions targets that have been set for the UK.

\textsuperscript{30} This is defined as spending more than 10 per cent of disposable income on all household fuel use to maintain a satisfactory heating regime.
customers the period 2008-2013. As shown in Table D.3, figures connected to date have so far exceeded expectations and the majority of the fuel poor connections to date have been one-off connections rather than a project to connect a community.

Table D.3: Total number of fuel poor network extensions connections in 2009-2010

<table>
<thead>
<tr>
<th>GDN</th>
<th>Type of Connectivity</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>One-off</td>
<td>Community</td>
</tr>
<tr>
<td>National Grid</td>
<td>3386</td>
<td>358</td>
</tr>
<tr>
<td>Northern Gas</td>
<td>-</td>
<td>718</td>
</tr>
<tr>
<td>Scotia</td>
<td>654</td>
<td>369</td>
</tr>
<tr>
<td>Wales and West</td>
<td>145</td>
<td>42</td>
</tr>
<tr>
<td>Total</td>
<td>4185</td>
<td>1487</td>
</tr>
</tbody>
</table>

Source: Ofgem Connections Industry Review 2010-2011, March 2011\(^ {32}\) (extract from Table 2.7).

D.24 Table D.4 below shows data separately provided by each GDN for the estimated number of connections up to 2010/2011 and plans for future connections under the fuel poor network extension scheme.

31 [www.ofgem.gov.uk/Networks/Connectns/ConnIndRev/Documents1/CIR%2009-10.pdf](http://www.ofgem.gov.uk/Networks/Connectns/ConnIndRev/Documents1/CIR%2009-10.pdf) p. 20. This document shows that the total number of 2009-2010 connections compares to 258,826 in 2007-2008. Paragraph 2.22 also states that 'GDN networks account for a much higher proportion of new/modified connections to existing domestic premises, whereas new connections tend to be on IGT networks and are delivered by IGTs or their affiliates. The opposite is true for new domestic premises.'

Table D.4: Number of new connections available under the fuel poor network extension scheme

<table>
<thead>
<tr>
<th>GDN</th>
<th>2010/11 (Cumulative total – estimated)</th>
<th>2011/12</th>
<th>2012/13</th>
</tr>
</thead>
<tbody>
<tr>
<td>National Grid</td>
<td>8,454</td>
<td>4,546</td>
<td>4,150</td>
</tr>
<tr>
<td>Northern Gas</td>
<td>781</td>
<td>1,275</td>
<td>1,275</td>
</tr>
<tr>
<td>Scotia</td>
<td>6,878</td>
<td></td>
<td>3,122</td>
</tr>
<tr>
<td>Wales and West</td>
<td>1,738</td>
<td>1,500</td>
<td>unavailable</td>
</tr>
</tbody>
</table>

Source: OFT analysis of submissions made by the GDNs under Ofgem’s Discretionary Reward Scheme 2010-11 as published on the Ofgem website. These submissions include actual and forecasted data and data for 2010/2011 may be based in part on quotes not actual connections. More information about each GDN’s activities under this scheme can be found in their submissions.

NI gas distribution

Overview

D.25 Natural gas was introduced into NI in 1996, upon the completion of the undersea Scotland and NI Pipeline (SNIP) connecting the two countries. Gas is available around the entry point of the SNIP (in the Greater Belfast and Larne area) and in 10 towns along the South-North and North-West pipelines that connect to the SNIP, covering areas as far as Londonderry and Armagh as shown in Figure D.5.

D.26 The NI distribution system is comprised of two networks – the Phoenix Natural Gas network (PNG) and the firmus energy (firmus) network.

- PNG operates in the Greater Belfast and Larne area.
- firmus serves the 10 towns along the South-North and North-West Pipelines.
D.27 The PNG and firmus networks are regulated by the NI Authority for Utility Regulation (the Utility Regulator), whose duties include:

- Promotion of the development and maintenance of an economic, efficient and co-ordinated gas industry.
- Protection of the interests of gas consumers with regard to price and quality of service.

The Utility Regulator issues and maintains licences for gas, electricity and water companies to operate in NI and enforces the conditions of these licences.33

**Connections and charges**

D.28 PNG and firmus have obligations to connect properties to their network, conditional upon there being a suitable connectable gas main within 50

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33 Utility Regulator website: [www.uregni.gov.uk/about_us/what_we_do](http://www.uregni.gov.uk/about_us/what_we_do)
metres of the property and expected consumption not exceeding 73,200 kWh per annum.34

D.29 PNG has been running a scheme that offers free first connections to any domestic properties within 50 metres of a connectable gas main, irrespective of household characteristics or income. However, charges will apply to any post-connection work required, such as the relocation of a gas meter on the property.35 Other exceptional circumstances may arise where the proposed pipework encroaches onto a third party’s property. In such instances, the associated extra costs may be borne by the customer, developer or licensed gas supplier. Any additional costs associated with a service length over 50 metres are chargeable.36

D.30 firmus allow properties within 30 metres of a readily connectable gas main to be offered a gas service and meter at no charge. This is for a basic service and if additional work is required, charges will apply. Properties greater than 30 metres from a readily connectable main will be subject to an economic appraisal. Where connecting these properties does not prove to be economic, firmus may request a contribution from the customer.37

34 www.phoenixnaturalgas.com/naturalgas/transportation-services/connection-policy


35 www.phoenixnaturalgas.com/naturalgas/latest-offers/offer/2/free-connection

36 See Schedule 1 of the Connection Policy

www.phoenixsupplyni.com/fs/doc/Phoenix%20Natural%20Gas%20Connection%20Policy%20Approved%202012%202%202%2010.pdf

37 firmus distribution connection policy
Assisted Connections

D.31 Research conducted by the Energy Saving Trust (EST)\textsuperscript{38} found that within NI, homeowners’ current levels of satisfaction with their heating systems – mainly heating oil – is very high and that significant incentives and awareness raising of alternatives, such as gas, would be needed to encourage conversion to gas.

D.32 Both firmus and PNG have different schemes in place, subject to eligibility criteria, that help assist customers in making the connection and switch to natural gas. Some of the funding for this comes from The NI Sustainable Energy Programme (NISEP). This programme, previously called the Energy Efficiency Levy (EEL) was introduced in 1997 in order to implement energy efficiency schemes for domestic and non-domestic customers with the aim of reducing carbon emissions. Consultations in 2002 resulted in 80 per cent of the funding being targeted at assisting vulnerable customers to obtain energy efficiency measures and from 2009 the programme opened to applications from gas suppliers. NISEP funding is bid for on an annual basis and therefore schemes have a limited budget and are not guaranteed to run each year.

D.33 Under the NISEP funding, firmus currently (2011-12) administers two ‘Toasty Homes’ schemes providing assistance to low-income customers connecting to natural gas, who are within 30 metres of an existing gas main and have no heating, LPG, solid fuel or old oil heating systems.\textsuperscript{39} One scheme provides customers with a fully-funded heating system and a grant of up to £800 for insulation. Eligible households for this scheme are: single person households earning less than £20,000 gross and a couple or single parent family earning up to £27,000. For households that can afford to pay some of the costs, firmus also administers a cash-back scheme offering a grant of £1,500 towards the cost of a heating system and £800 towards the insulation costs. The income levels for

\textsuperscript{38} Energy Savings Trust: ‘Low carbon heat options off NI’s gas network’ Summary report.

\textsuperscript{39} See www.firmusenergy.co.uk
this scheme are £24,000 for a single person household and £35,000 for a couple or single parent family.

D.34 Phoenix offer free connections to gas mains to customers who have a connectable main outside their premises. In addition to this, customers may qualify for the 'Snug plus' scheme under the NISEP funding. The 2011-12 scheme provides a package which includes a £1,500 grant towards the cost of installing natural gas heating as well as up to £800 towards insulation and free connection to the natural gas network. The scheme is designed for homeowners or private rented tenants with Economy 7 or solid fuel heating, or without any central heating at all. Customers eligible are single person households with an annual gross income of less than £22,000; a couple or single parent family with an annual gross income of less than £30,000; or a single person/couple over 65 years of age with an income of less than £35,000.40

Connections

D.35 Figure D.6 shows the evolution in connections for both PNG and firmus and forecast data for firmus. Forecast data for PNG has not yet been published.

40 www.phoenixnaturalgas.com/naturalgas/latest-news/item/13/race-is-on-for-homeowners
Future extension and development

D.36 The Department of Enterprise, Trade and Investment NI (DETINI) has published a Strategic Energy Framework 2010\textsuperscript{41} detailing NI’s energy future over the next 10 years. The framework illustrates the key energy goals in terms of building competitive markets, ensuring security of supply and enhancing sustainability. It aims to agree a strategy to incentivise gas connections and increase gas uptake in existing and future licensed areas.

D.37 DETINI has also considered the possibility of grid extension and seeks to encourage extension of the natural gas network, where it is technically possible and economically feasible to enhance diversity of fuel supply and customer choice, and bring about reductions in CO2 emissions, as

part of a low carbon energy strategy’. Increasing the number of connected gas customers would also help to spread the cost of the overall network across more customers.

D.38 Some of the key remaining areas of NI in which the gas network might be further developed include a number of towns in the West and North West of NI. The jointly commissioned 2010 study 'Potential Extension of Natural Gas and Related Services in NI', by DETINI and the Utility Regulator, examines a number of options for extending gas to the remaining towns in the West and North West of NI.

D.39 The study estimated the cost of providing new gas transmission networks to the towns to be around £75 million. Additionally, the respective gas distribution networks required to connect the gas to individual premises were estimated to cost at least £26 million.

D.40 In June this year, DETINI issued a consultation seeking the views of key stakeholders and the wider community on a range of issues pertaining to the potential for extending the natural gas network to new areas. The consultation closed at the end of September 2011.

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44 This consultation may be viewed at www.detini.gov.uk/deti-energy-index.htm
HEATING OIL – PRODUCT DESCRIPTION

E.1 There are two types of heating oil used in the UK: kerosene and gas oil. Kerosene is the most commonly used for heating domestic homes.

E.2 **Kerosene** is a thin clear liquid and may also be known as 28 second burning oil, burning oil and standard kero. The main variants for the purposes of our study are heating oil and jet kerosene, although it is also used in paints, cleaners, pesticides, and as fuel for stoves, heaters and lamps.\(^{45}\) Variants of kerosene primarily differ by sulphur content, as described in more detail in paragraph E.12.

E.3 In the UK, quality specifications for heating oil kerosene are defined by BS 2869 – Specification for fuel oils for agricultural, domestic and industrial engines and boilers, under which kerosene is Class C.

E.4 Many heating oil distributors also sell 'premium' kerosene, which contains additives to improve boiler efficiency and reduce the build-up of sludge and carbon. Additives can also be bought separately and added to standard kerosene.

E.5 **Gas oil** is also known as red diesel or 35 second burning oil, and is defined as Class D under BS 2869. Dye is added to distinguish it from diesel that is used for road vehicles and which is therefore taxable. Gas oil tends to be mainly for agricultural or light industrial use.

The refining process

E.6 Crude oil is refined to produce an array of products, such as LPG, petrol, diesel, kerosene, gas oil, and residues such as bitumen. The distillation process yields a range of products, of which kerosene is only one. Kerosene cannot be produced in isolation and makes up around 16 per cent of the yield from a barrel of crude oil.\(^{46}\)

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\(^{45}\) [www.hpa.org.uk/web/HPAwebFile/HPAweb_C/1202487083464](http://www.hpa.org.uk/web/HPAwebFile/HPAweb_C/1202487083464)

\(^{46}\) UK Refineries. Data provided by the International Energy Agency.
E.7  Figure E.1 illustrates the typical refining process.

**Figure E.1: The refining process**

![Diagram of the refining process]

Source: UKPIA Statistical Review 2011

E.8  Crude oil is boiled in a fractioning column, which breaks the crude down into more useful components. The crude oil enters the crude distillation unit near the bottom and is heated to around 380°C. As vapours rise up the column, they are cooled by a downward flow of liquid and condense at different points, so that fractions with different boiling points are drawn off at different levels in the column. These fractions include:

- **Light distillates** – lighter, low boiling point gases such as propane and butane which rise to the top of the fractioning column and are produced at the end.

- **Middle distillates** – produced at the midpoint of the distillation process. This group of products includes kerosene and gas oil.
E.9 Heavy distillates – heavier, higher boiling point products produced at the bottom of the column at the beginning of the distillation process, such as fuel oil.47

E.10 The products obtained are then sent on to other refinery units for further processing. The liquid residue left at the bottom requires further processing or cracking to be turned into other products.

E.11 As Figure E.1 shows, the kerosene stream passes through the merox unit which cleans and removes sulphur compounds using a caustic wash. The diesel/heating oil (gas oil) stream passes through the hydrotreater unit, which cleans and removes sulphur compounds using hydrogen and a catalyst. De-sulphurisation occurs to reduce the sulphur content to the required levels.

E.12 On 1 January 2008, an EU Directive48 banned the use of petroleum derived liquid fuels with a sulphur content exceeding 0.1 per cent (excluding jet fuel, which remains at 0.3 per cent), which required a reduction of the sulphur content of heating oil kerosene from 0.2 per cent. Previously the sulphur content specifications for jet kerosene and heating oil kerosene were more similar, meaning the products were more likely to be interchangeable (sometimes known as 'Dual Purpose Kerosene' or 'DPK'). However the new regulations mean that the difference between the two is greater, so it is less likely that jet kerosene will meet the specification for heating oil kerosene. Therefore, heating oil effectively has to be produced and stored as a separate grade to jet kerosene and they are no longer interchangeable.

48 The requirement is contained within the 1999 EU Sulphur Content of Liquid Fuel Directives, as amended by the 2005 Sulphur Content of Marine Fuels Directive. In England and Wales, the Directive is implemented under The Sulphur Content of Liquid Fuels (England and Wales) Regulations 2007.
F.1 This annexe looks at each stage of the supply chain for heating oil in the UK in more detail, then considers resilience and possible capacity restraints, and the implications these may have for the downstream heating oil retail sector in the UK.

F.2 The different stages in the supply chain are set out in Figure F.1.

**Figure F.1: UK heating oil supply chain**

Source: OFT analysis
Stage 1 – From source to refineries or coastal import terminals

F.3 Heating oil is obtained either through production from crude oil at UK refineries, or import of the finished product into UK coastal terminals. This section explains how crude oil is brought into the UK and describes the existing network of refineries and coastal terminals in the UK.

Crude oil source

F.4 Crude oil is transported from oil fields through a network of pipelines or by boat to refineries. The majority comes by sea tanker, with only Grangemouth refinery now being fed by pipeline. About 80 per cent of UK refinery crude throughput is from the North Sea (UK and Norway). Of the crude oil processed at UK refineries, about 6.6 per cent comes from Russia and the Middle East and about eight per cent comes from Africa. The UK also imports finished products from various countries including the Netherlands, Singapore and India.

Refineries and coastal terminals

F.5 There are currently eight operational fuel refineries in the UK, although since EU regulations in 2008 required a reduction of the sulphur content of some fuels, ExxonMobil at Fawley no longer produces kerosene specifically for heating oil.

F.6 Figure F.2 below shows the location and ownership of UK refineries.

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49 The Forties pipeline is owned by BP and runs into the processing facilities at BP Kinneil, Grangemouth. The Norpipe pipeline previously ran into the Petroplus Teeside refinery, which now operates only as a terminal.
50 UKPIA Statistical Review 2011
51 UKPIA Statistical Review 2011
52 Downstream oil – short term resilience and longer term security of supply Deloitte p2.
53 See Annexe E for more detail.
Refineries are situated on the coast for ease of delivery, and they also have import terminals or jetties located nearby so that crude oil and finished products can be imported and exported by sea. Refineries will also have a road-loading terminal, where some distributors' tankers fill up from the racks to take to their depots or deliver direct to customers. NI does not have any refineries, so all heating oil is transported by sea to one of the three terminals in Belfast or one in Derry.

In addition, there are over 16 independently owned and operated sea-fed coastal oil storage terminals which have encouraged the emergence of trading groups who rent storage space at these coastal terminals in order to import products from non-UK markets.

Access to third parties is usually given via exchange contracts; these are reciprocal agreements between oil companies that they can collect oil from another company’s refinery or terminal, based on annual agreed

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54 *Downstream oil – short term resilience and longer term security of supply* Deloitte p42.
quantities of each grade of fuel. These reduce the cost of delivering product to areas remote from a company’s manufacturing facilities, and Wood Mackenzie estimate that exchange contracts could account for 35-40 per cent of the UK market.55

Stage 2: Moving product to terminals

F.10 This stage concerns the onwards distribution of the product from refineries or coastal terminals to other terminals (either inland or elsewhere on the coast).

F.11 There are around 50 major terminals in the UK.56 Some, as described in stage 1, are situated on the coast often close to refineries, and receive imports from abroad; but also receive onward deliveries by sea from other coastal terminals in the UK. Other terminals are situated inland and are sometimes referred to as distribution terminals. The major oil companies own many of the terminals, although several have moved into a joint venture. Some distributors also own terminals.

F.12 Product can be moved to terminals by pipeline (51 per cent), sea (34 per cent) or rail (15 per cent).57

Pipelines

F.13 There is an extensive network of private and Government owned oil pipelines in the UK, with around 3000 miles currently in use. The major oil companies own many of the pipeline assets, sometimes as a joint venture. The Government Pipelines and Storage System (GPSS) is used by the Ministry of Defence for transporting jet fuel. Pipelines tend to be multi-product, although some are designated for aviation fuel and supply direct to an airport.58

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55 UK Downstream Oil Infrastructure Wood Mackenzie p25.
Figure F.3 illustrates the privately owned oil pipelines in England and Wales. Those that currently carry heating oil are the 'Mainline' pipeline and the United Kingdom Oil Pipelines (UKOP).\(^{59}\) Note that Valero UK Ltd completed the acquisition of Chevron Ltd on 1 August 2011.

**Figure F.3: Privately owned pipelines in England and Wales**

Source: UKPIA Statistical Review 2011

**Sea and rail**

F.15 Product can also be moved by sea tanker or by rail.

F.16 There are around 20 sea-fed terminals around the UK, including those at refineries.

F.17 In addition, four refineries can receive product by rail and there are about eight terminals with a rail feed.\(^{60}\) However, we have been told that rail is now less popular as a method for moving product because it is more expensive versus pipelines, compounded by the contraction of the rail

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\(^{59}\) DECC

\(^{60}\) DECC
network and difficulty in scheduling as a result of increasing passenger numbers.

**Stage 3: Road distribution to customers (retail)**

F.18 Distributors collect heating oil from terminals in trucks (buying 'ex-rack'). They can either transport this heating oil to depots or direct from the terminal to end customers, or may use a combination of both methods. Some distributors have product delivered to their depots by a wholesaler or an independent transport company.

- Many distributors have their own depots which have oil storage for about 1.5 – three days depending on the time of year. The distributors can then deliver from the storage depot to end customers. However, smaller distributors, and most distributors in NI, do not tend to have storage facilities. Reasons for this may include difficulties in getting planning consents or meeting other regulatory requirements for storage, and the ongoing cost of upkeep.

- Distributors can travel to the terminal each morning to buy what they need to deliver that day, then re-fill directly from the terminal as necessary. Some distributors consider that this approach reduces the risk presented by volatile oil prices.

F.19 The company owning the terminal may also supply direct to the customer.

**Supply constraints and resilience**

**Infrastructure**

F.20 As described above, the supply chain is heavily dependent on a capital-intensive infrastructure network of refineries, terminals and depots for the production and storage of fuels such as heating oil. Constraints such as planning restrictions and the necessary scale of operations relative to market size mean only limited infrastructure in some geographies and stages of the supply chain.
The UK refineries are long established and hence are likely to require significant investment to upgrade. They are also less efficient and less cost effective compared to more recently built refineries elsewhere.  

The UK pipeline infrastructure is extensive but old, and operating near to capacity, which could make it vulnerable to interruptions. The careful scheduling needed to prevent contamination in multi-product pipelines can also make them inflexible to short term changes in requirements.

We heard some suggestions that there may be a shortage of heating oil capacity at terminals, partly driven by planning, major hazards policy, safety and other regulatory requirements necessary at such sites (particularly following the explosions and fire at the Buncefield depot in 2005), which raise costs and reduce the attractiveness of investment. Rationalisation of distribution terminals is likely, which could lead to geography-specific tightening of supply if closures happen piecemeal.

The limited quantity and the aging nature of existing infrastructure contribute to capacity constraints during times of peak demand and the seasonality of the retail business exacerbates this issue. For retailers, the incentives are limited for investment in increasing storage or truck numbers to deal with winter peaks, because this specialist capacity must be retained throughout the year and would be underused outside of cold periods.

These existing supply constraints do not appear likely to reduce significantly in the future. There are substantial capital costs associated with the upgrading of infrastructure. The UK is a relatively high cost and mature market, with other markets such as Asia offering prospects of higher growth and profitability. In a highly global industry such as oil refining, this makes it less likely that investment will be committed to

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61 Downstream oil – short term resilience and longer term security of supply Deloitte p8
62 Downstream oil – short term resilience and longer term security of supply Deloitte p44
63 The Control of major accident hazards Regulations 1999 (COMAH) aims to prevent and mitigate the effects of major accidents involving dangerous substances.
64 DECC
the UK in preference to other markets. Indeed, a number of oil majors are exiting the UK refining market (for example, Shell recently sold its Stanlow refinery to Essar Energy and Valero UK Ltd has acquired the Pembroke refinery from Chevron). This creates additional uncertainty over future supply as the new owners may decide to adopt different production strategies.

F.26 Nevertheless, alongside this we have also heard examples of new entrants building capacity (and driving competition) – for example Greenergy’s investment in a terminal in Plymouth and investment at the Vopak terminal at Sea Sands, including proposals for a new inland rail distribution system. LSS opened a new Londonderry terminal in 2006.65

F.27 Furthermore, we note that alleviating production and storage capacity constraints alone would not necessarily smooth supply in peak periods, as we heard that the main constraints at such times are the number of drivers and tankers.

F.28 Wood Mackenzie66 raise a potential competition issue with regard to the use of pipelines by third parties. Whilst it is theoretically possible for a third party to ship product through the pipelines, in reality factors such as the limited ingress and exit points, a lack of data transparency regarding spare capacity, and pipeline owners being allowed to set any shipping tariffs, may make this difficult and create barriers to new entrants. However, we note this has not been raised with us by any stakeholders during our study.

**Imbalances in supply and demand**

F.29 For technical reasons, there is limited ability for production to respond to significant changes in demand. Shortfalls must be made up from imports, which have a response lag due to shipment times. These factors, combined with the limited inventory levels held (due to limited storage capacity and pricing risks), create challenges for distributors

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65 *UK Downstream Oil Infrastructure* Wood Mackenzie p47.
66 *UK Downstream Oil Infrastructure* Wood Mackenzie.
readily to cope with short-term demand spikes significantly exceeding anticipated levels, such as last winter.

F.30 Other market trends and developments also contribute to challenges in balancing supply and demand for heating oil in the UK:

- At the refinery level, demand shifts over the last 10 to 15 years mean that the UK’s refineries now produce a surplus of petrol and fuel oil but relatively small amounts of middle distillates (including kerosene used for home heating oil). Whilst most short-falls are met by imports, forecast demand scenarios show a growing supply deficit for UK production of middle distillates. This, combined with the need for major investment if changes to production patterns are to be achieved, creates some potential risks to supply resilience.67

- Anecdotally, we understand that changes in sulphur specification that have made kerosene used for jet fuel and kerosene used for heating oil less likely to be interchangeable, have also made heating oil kerosene less attractive to producers given the higher global demand for jet fuel kerosene relative to heating oil kerosene and the costs of separate production, storage and transportation. We have heard that this factor may have affected production volumes of heating oil kerosene in the UK, with one refinery ceasing regularly to supply it in favour of focusing on the production of jet fuel kerosene. Most of Continental Europe uses gas oil for heating rather than kerosene, which further limits demand for heating oil kerosene. It is not clear whether reduced supply has been a factor in increasing the costs of heating oil kerosene.

Other resilience risks

F.31 Other potential risks to supply resilience include:

- Interruptions to the supply of crude oil to refineries, for example because of damage to pipelines from oilfields, geopolitical

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67 UK Downstream Oil Infrastructure Wood Mackenzie p7.
interruptions, bad weather, or other transportation or technical problems.

- UK refinery or import terminal closures due to industrial action, technical malfunction, financial failure or terrorist attack. Major accidents are also a factor, such as the incident at Buncefield.

**Oil stocking policy**

**F.32** DECC also has the UK policy lead for the operation of oil stocking policy. As a member state of the EU and the International Energy Agency (IEA), the UK is required to hold emergency oil stocks for use in an oil supply disruption. The EU obligation is set as 67.5 days’ average daily national consumption and the IEA obligation is calculated as 90 days of net-imports. The same stocks can be used to meet both obligations.  

**F.33** The current EU obligation (2006/67/EC) applies to three product categories – light distillates (motor gasoline), middle distillate (kerosene and gas/diesel oil) and heavy distillates (fuel oil). The IEA obligation applies to all petroleum products, including crude oil. The EU obligation is currently greater than the IEA obligation as indigenous UK crude oil production reduces the UK net-imports.

**F.34** The UK meets these obligations by directing companies that supply petroleum products to the inland UK market to hold minimum levels of stocks in each product category. Stock does not have to be kept within the UK, but can be held by the obligated company or a third party in another EU member state, provided a bilateral agreement is in place. The UK’s overall oil stocks are substantially above the IEA and EU requirements, and stand at over 80 days of consumption.

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68 [www.decc.gov.uk/en/content/cms/meeting_energy/int_energy/oil_stock/oil_stock.aspx](http://www.decc.gov.uk/en/content/cms/meeting_energy/int_energy/oil_stock/oil_stock.aspx)

Obligated companies do not have a specific obligation to hold minimum levels of heating oil stocks but instead are required to hold middle distillates stocks that may be held as finished product (although not necessarily heating oil) or in the form of crude oil. The stock obligations policy is primarily aimed at responding to international oil supply disruptions, but it can also be used domestically. However, domestic scenarios tend to result from distributional disruptions and stocks would likely be affected by the same distributional problems.

**Potential impact of upstream supply risks on the downstream retail business**

Disruption at a UK refinery and/or coastal terminal could cause significant disruption to heating oil supply. Deloitte estimate that two thirds of refined product imports enter the UK through terminals attached to refineries, so if a refinery closed or was disrupted, it might affect not only production at that refinery but also the availability of imported product. This would have a significant impact, both locally and nationally.70

Some consumer groups and others we spoke to raised specific concerns about the relatively low stocks of oil held in NI, with sea-fed terminals operating on a 'just-in-time' basis that could cause difficulties in poor weather if boats are unable to deliver. We note that firms responding to our information request did not identify this as an issue last winter.

Furthermore, road transport of heating oil to distributor depots and on to the final consumer is highly susceptible to bad weather, as experienced during winter 2010/11.

The limited number of infrastructure points and their variable dispersion across the UK mean that, in some areas, any disruption could potentially cause an immediate significant tightening of supply in the local area due to a lack of readily accessible alternative supply points.

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70 *Downstream oil – short term resilience and longer term security of supply* Deloitte p63.
Upstream supply conclusions

F.40 Upstream supply is not the focus of our study. Therefore, we have not looked at competition or consumer issues at this level of the industry and so we are not able to comment on whether we would give a 'clean bill of health'. However, we have emphasised elsewhere the necessity for competitive behaviour and diversity of ownership\(^{71}\) in infrastructure – for example the OFT recently considered competition issues in rail petroleum haulage\(^{72}\) and, in two recent fuel distribution mergers, accepted divestments.\(^{73}\)

F.41 We also note that resilience and security of supply is the responsibility of DECC, which, through the Downstream Oil Industry Forum, is proactively monitoring this by working with industry to monitor and address resilience issues.\(^{74}\)

F.42 However, an understanding of upstream supply remains important in the context of this study, because supply risks do exist (as set out in this annexe) that can significantly affect distributors' businesses and negatively impact the experience of end consumers. These are factors that distributors must cope with to the best of their ability but have a limited ability to influence. For example, during December 2010 problems were experienced at various terminals and refineries around the UK. Examples include Grangemouth refinery being unable to function correctly due to cold temperatures, resulting in shutdowns; terminals such as Dalston, Nottingham, Kingsbury, Bramhill and Cardiff experiencing supply problems due to severe weather, resulting in

\(^{71}\) Considered recently in *Infrastructure ownership and control stock-take*, OFT 2010.

\(^{72}\) [www.oft.gov.uk/OFTwork/competition-act-and-cartels/ca98/decisions/dbs](http://www.oft.gov.uk/OFTwork/competition-act-and-cartels/ca98/decisions/dbs)


\(^{74}\) For more information, see: [www.decc.gov.uk/en/content/cms/meeting_energy/en_security/downstream_oil/improving/improving.aspx](http://www.decc.gov.uk/en/content/cms/meeting_energy/en_security/downstream_oil/improving/improving.aspx)
restricted allocations and periods of no supply, and closure of the rail line from Immingham terminal causing supply problems at other terminals.\textsuperscript{75}

F.43 Consequently, it is necessary to assess the distribution business within the context of the wider supply chain.

\textsuperscript{75} OFT information request responses from firms
G  FURTHER ANALYSIS OF HEATING OIL PRICES

Introduction

G.1 This annexe describes the analysis conducted to investigate the relationship between temperature and the retail price of heating oil. It also describes the analysis carried out to see whether positive changes in the price of crude oil are passed through faster to the price of heating oil than negative changes.

Data

G.2 The analysis described here is based on the following monthly data for February 2000 to April 2011 (prices are in constant 2010 pounds):

- Retail prices of heating oil (pence/litre): average prices in England, Scotland, Wales and NI, collected by the ONS on one day each month, but not published due to small sample sizes for NI and Scotland.
- Crude oil prices (pence/litre): Brent crude prices for the day on the month matching the retail data, from Platts.
- Average temperatures in month: data for England, Scotland, Wales, and NI, from the Met Office.

G.3 Country-level (as opposed to UK) data was used as it was the smallest geography for which both pricing and locally varying temperature data was available. The Brent crude figures reflect international (rather than local) trading prices.

Methodology

G.4 Linear regression analysis was used to test the hypothesis that lower temperatures lead to higher prices, because they lead to increased demand. Low temperatures may also (as last winter) increase the cost of delivering heating oil – a supply-side effect – which may also lead to an increase in prices.
Importantly, temperature is an exogenous factor. Thus, including temperature as an explanatory variable that captures the effect of demand should not lead to the usual identification problem that may arise if quantity were used instead.\(^\text{76}\)

The analysis was conducted separately for each of England, Wales, Scotland, and NI because only one time series was available for the Brent crude oil price (reflecting international trading prices). In the following, we present the results for England. Overall, the results for Wales, Scotland, and NI are very similar to these for England. Where there is some slight difference from the results for England, this has been noted in a footnote.

Initial inspection of prices and temperature shows little correlation between the two (see Figure G.1 and paragraph 4.177 of Chapter 4 of the main report on the lack of strong seasonality in prices).

\(^{76}\) The identification problem refers to not being able to distinguish between shifts in supply and demand if only equilibrium points resulting from the interaction of supply and demand were observed (that is, if only price and quantity were observed). This is discussed in more detail in paragraph G.8.
The reason for this apparent lack of a relationship may be that the price of heating oil is a function of the price of Brent crude oil as well, while this figure does not control for the effect of the crude oil price on the price of heating oil. That is, the price of heating oil is a function of both supply and demand, whereas the graph above only displays the equilibrium points resulting from the interaction of supply and demand. In the regression analysis below, we control for shifts in both demand and supply. Thus, in the regression analysis we include the price of crude oil, in order to estimate the effect of temperature on price, after controlling for the main driver of price. We use Brent crude oil price as an explanatory variable, rather than wholesale kerosene; the latter is a product further down the supply chain that is likely to incorporate some of the effects of temperature that we are looking to isolate.

As a preliminary step, we examined graphs of the two prices over time and of the price of heating oil and temperature over time. Figure G.2
below shows the retail price of heating oil and the crude oil price over time. We can observe that the two are highly correlated. However, we can also observe peaks in the price of heating oil that are not present in the price of crude oil (for example, in the winters of 2000, 2001, 2002, 2004, 2005, 2009, and 2010, circled in the figure below; for example, winter of 2000 denotes the winter beginning in December 2000).

**Figure G.2: Retail price of heating oil and Brent crude oil price over time (England)**

![Retail price of heating oil and Brent crude oil price over time](image)

Source: OECD (Brent crude oil price), ONS (retail price of heating oil)

G.10 Figure G.3 below shows the retail price of heating oil and the average temperature plotted over time. We observe that many of the peaks in the price of heating oil that are not due to peaks in the price of crude oil are correlated with the low average temperature during winter, although some of the peaks occur slightly before the respective trough for temperature.
Figure G.3: retail price of heating oil and average temperature over time (England)

Source: Met Office (average temperatures), ONS (retail price of heating oil)

G.11 Next, we carried out a simple regression in levels, using the following specification. The results are given in Table G.4.

\[ \text{Price(heating oil)} = \alpha + \beta \times \text{price(Brent crude)} + \gamma \times \text{Temperature} + \varepsilon \]
Table G.4: Regression in levels

<table>
<thead>
<tr>
<th></th>
<th>England</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dependent variable: Retail</td>
<td></td>
</tr>
<tr>
<td>price of heating oil</td>
<td>A</td>
</tr>
<tr>
<td>Price of Brent crude</td>
<td>1.11***</td>
</tr>
<tr>
<td></td>
<td>(0.03)</td>
</tr>
<tr>
<td>Temperature</td>
<td>-0.17***</td>
</tr>
<tr>
<td></td>
<td>(0.05)</td>
</tr>
<tr>
<td>Constant</td>
<td>10.49***</td>
</tr>
<tr>
<td></td>
<td>(0.75)</td>
</tr>
<tr>
<td>Observations</td>
<td>135</td>
</tr>
<tr>
<td>R-squared</td>
<td>0.94</td>
</tr>
<tr>
<td>Adj. R-squared</td>
<td>0.94</td>
</tr>
</tbody>
</table>

Standard errors in parentheses.

*, **, and *** indicate that a given coefficient is statistically significantly different from zero at the 90 per cent, 95 per cent and 99 per cent level of confidence, respectively.

Source: OFT analysis

G.12 The results imply that, holding the price of Brent crude constant, a 10 degree decrease in temperature is associated with a 1.7 p/litre increase in the retail price of heating oil. The coefficients on the explanatory variables are highly statistically significantly different from zero using a two-sided t-test. The R-squared of the regression is also very high.\(^77\)

G.13 However, Figure G.2 implies that there may be potential problems with this simple regression in levels because each of the two price variables may not be covariance stationary (we abbreviate covariance stationary to stationary below and use nonstationary to refer to processes that are not stationary).\(^78\) Using the levels of nonstationary variables in an

\(^77\) The results for Scotland, Wales, and NI are similar to these for England, though the effect of temperature is estimated as negative but not significantly different from zero for NI.

\(^78\) In other words, the price of heating oil may not be covariance stationary because it may not have a constant mean or a constant variance, and/or may not have a constant covariance
ordinary least squares regression may lead to overstated significance levels and R-squared.\textsuperscript{79}

G.14 Thus, before proceeding further with the regression analysis, we examined the individual time series for the two prices. Specifically, we tested each of the prices for nonstationarity, which is known as testing for the presence of a unit root. The tests were conducted for each price separately, using the specification $P_t = \alpha + \rho P_{t-1} + \varepsilon_t$. Thus, testing for unit root in this case means testing the null hypothesis that a variable's first-order autocorrelation coefficient $\rho$ is equal to 1 (which implies that the variable is nonstationary). The alternative hypothesis is that $\rho$ is strictly less than 1 (which implies stationarity). If a variable has a unit root, shocks to that variable persist over time rather than dissipating relatively quickly. As stated above, including the levels of nonstationary variables in regressions can lead to overstated significance levels and R-squared.

G.15 We found that the null hypothesis that a unit root is present in the price of heating oil cannot be rejected. Similarly, the null hypothesis that a unit root is present in the price of crude oil cannot be rejected. A solution to this issue is to use the change (that is, difference) between time periods for a given variable.\textsuperscript{80} In particular, after differencing (taking the difference on the previous month), further unit root tests (conducted in a similar way to the ones above) on each of the two differenced variables confirm that each of the two is stationary. Thus, we can include the differences of these variables in regressions.


G.16 However, in addition, we also expect the price of heating oil and the price of crude oil to be cointegrated (that is, a linear combination of the two variables to be stationary), due to the fact that crude oil is an input for heating oil. Testing for cointegration (a unit root test as above, but with different critical values) using the residuals from a regression of the price of heating oil on the price of crude oil and a constant reveals that the two prices are indeed cointegrated. In particular, these residuals are stationary. Thus, there is a long-run relationship between the two variables. The R-squared for the long-run relationship between the two variables is 0.93, implying that, in the long run, 93 per cent of the variation in the price of heating oil is explained by the price of crude oil.

G.17 Since the residuals from the cointegrating equation are stationary, we can also include them as an additional explanatory variable in the specification estimated in differences. In particular, we include a one-month lag of these residuals as an error-correction term in the main regression described further below.

G.18 Next, we looked at a plot over time of temperature and the residuals from the long-run relationship (see Figure G.5). From this plot, it is even easier to see the correlation between the peaks of the residuals and the troughs of the temperature (circled in the figure), and similarly between the troughs of the residuals and the peaks of the temperature. A regression of the residuals on temperature and a constant yields, as expected, a negative coefficient on temperature.
A more formal way to look at the relationship between temperature and the price of heating oil, given the cointegration of the prices of heating oil and crude oil, is to estimate an error-correction model. Thus, the main regression was carried out using differences in variables (that is, changes on the previous month). The dependent variable was the change in the retail price of heating oil, while the explanatory variables were the change in the crude oil price, the change in temperature, and the one-period lag of the residuals from the cointegrating equation (as an error-correction term). The error-correction term accounts for the long-run relationship between the price of heating oil and the price of crude oil.

Using a similar model (with no error-correction term), we also investigated whether positive changes in the price of crude oil are passed through to the price of heating oil faster than negative changes in the price of crude oil.
Results

G.21 The regression results for England are shown in Table G.6. The main specification (B) is as follows:

\[
\text{Change\_in\_Price(heating\ oil)} = \alpha + \beta \times \text{Change\_in\_Price(Brent\ crude)} + \delta \times (\text{Error-correction\ term}) + \gamma \times \text{Change\_in\_Temperature} + \varepsilon,
\]

where the error correction term is equal to the residuals from the cointegrating equation; that is, the error correction term is equal to \(\text{Price(heating\ oil)} - \text{estimated\ constant} - (\text{estimated\ coefficient}) \times \text{Price(Brent\ crude)}\), where the estimated constant and estimated coefficient are from the cointegrating equation.

---

81 The results for Scotland, Wales and NI are similar, though the effect of temperature is estimated as negative but not significantly different from zero for Scotland and NI. This may be due to not enough variation in the data to estimate the effect.
### Table G.6: Error-correction model

<table>
<thead>
<tr>
<th></th>
<th>England</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Dependent variable: Change</strong></td>
<td></td>
</tr>
<tr>
<td>in retail price of heating oil</td>
<td></td>
</tr>
<tr>
<td>Change in Brent crude price</td>
<td>0.88***</td>
</tr>
<tr>
<td>(0.09)</td>
<td></td>
</tr>
<tr>
<td>Error-correction term</td>
<td>-0.30***</td>
</tr>
<tr>
<td>(0.06)</td>
<td></td>
</tr>
<tr>
<td>Change in temperature</td>
<td>-0.18***</td>
</tr>
<tr>
<td>(0.06)</td>
<td></td>
</tr>
<tr>
<td>Constant</td>
<td>0.05</td>
</tr>
<tr>
<td>(0.16)</td>
<td></td>
</tr>
<tr>
<td>Observations</td>
<td>134</td>
</tr>
<tr>
<td>R-squared</td>
<td>0.53</td>
</tr>
<tr>
<td>Adj. R-squared</td>
<td>0.52</td>
</tr>
</tbody>
</table>

Standard errors in parentheses.

*, **, and *** indicate that a given coefficient is statistically significantly different from 0 at the 90 per cent, 95 per cent and 99 per cent level of confidence, respectively.

Source: OFT analysis

G.22 The estimates of the coefficients have the expected signs and are significantly different from zero at the 99 per cent level of confidence.

G.23 Holding other factors constant, on average, a 10 pence increase in the change of the price of Brent crude is associated with an 8.8 pence increase in the change of the retail price of heating oil (a pass-through rate that is not significantly different from 100 per cent). This is in line
with evidence from elsewhere,⁸² that products involving high-frequency price-adjustment have high pass-through rates.

G.24 Holding other factors in regression B constant, on average, a 10 degree Celsius decrease in the change of the average monthly temperature is associated with an approximately 1.8 p/litre increase in the change in the retail price of heating oil.

G.25 The coefficient on the error-correction term is negative, as expected. It shows that, for example, if the price of heating oil was relatively high, so that the error-correction term for month t was greater than zero, then in month t+1 the change in the price of heating oil will be negative in order for it to adjust towards the long-run equilibrium relationship with the price of crude oil, holding other factors constant.

G.26 Furthermore, a plot of standardised residuals from regression B shows the largest residual is in December 2010 (see Figure G.7). This may reflect the unusual supply constraints experienced during the period, as well as the unusually high volumes demanded (see paragraph 4.117 of Chapter 4 of the main report). However, in any given set of data we would expect some residuals to be relatively extreme, and the December 2010 residual is relatively close in value to a number of other seen in the data – suggesting that, controlling for the factors in the regression, the retail price in December 2010 was high but not extraordinarily so.⁸³

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⁸³ For NI, we do not observe a large standardised residual for December 2010.
In addition, we also investigated whether positive changes in the price of crude oil are passed through to the price of heating oil faster than negative changes. Table G.8 shows the results of the same specification as specification B in Table G.6, but without an error-correction term and adding an interaction term between the change in the price of crude oil and a dummy variable for whether the change in the price of crude oil was positive (specification C below). This specification is similar to one of the specifications used by Pelzman 2000 (Prices rise faster than they fall, Journal of Political Economy, Vol. 108, No. 3, pp. 466-502).
Table G.8: Investigating positive versus negative changes in Brent crude price

<table>
<thead>
<tr>
<th></th>
<th>England C</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dependent variable: Change in retail price of heating oil</td>
<td></td>
</tr>
<tr>
<td>Change in Brent crude price</td>
<td>1.00***</td>
</tr>
<tr>
<td></td>
<td>(0.16)</td>
</tr>
<tr>
<td>(Dummy for positive change) * (change in Brent crude price)</td>
<td>-0.13</td>
</tr>
<tr>
<td></td>
<td>(0.29)</td>
</tr>
<tr>
<td>Change in temperature</td>
<td>-0.20***</td>
</tr>
<tr>
<td></td>
<td>(0.07)</td>
</tr>
<tr>
<td>Constant</td>
<td>0.13</td>
</tr>
<tr>
<td></td>
<td>(0.29)</td>
</tr>
<tr>
<td>Observations</td>
<td>134</td>
</tr>
<tr>
<td>R-squared</td>
<td>0.44</td>
</tr>
<tr>
<td>Adj. R-squared</td>
<td>0.42</td>
</tr>
</tbody>
</table>

Standard errors in parentheses.

*, **, and *** indicate that a given coefficient is statistically significantly different from zero at the 90 per cent, 95 per cent and 99 per cent level of confidence, respectively.

Source: OFT analysis

G.28 The results in specification C imply that there is no significant difference between the rate of pass-through for positive changes in the price of crude oil and that for negative changes in the price of crude oil.
H AGREEING PRICES WITH CUSTOMERS

H.1 Concerns have been raised during our study about the manner of indicating prices for domestic heating oil. Heating oil prices change frequently at the wholesale and retail level, so the methods used for setting and agreeing prices must be able to deal with these eventualities. But they must also comply with consumer protection law, which sets out a number of clear requirements.

H.2 Briefly, we describe some of the key elements of the consumer protection regime.

Consumer Protection from Unfair Trading Regulations 2008 (CPRs)

H.3 The CPRs outlaw misleading or aggressive practices, or those that contravene the requirements of professional diligence, which are likely to make consumers make a different decision. For an introduction to the regulations, see BERR (2008), Guidance on the Consumer Protection from Unfair Trading Regulations 2008.

H.4 The CPRs require that firms provide either a firm price, or a clear pricing methodology, since failure to do so would be a misleading omission or action and affect consumers’ decisions.

Unfair Terms in Consumer Contracts Regulations 1999 (UTCCRs)

H.5 The UTCCRs prohibit contractual terms that create a significant imbalance between the firm and the consumer.

References:


86 This view was supported by the finding in Carmarthenshire County Council v. GB Oils Limited (trading as OJ Williams), Ammanford Magistrates Court, 15 August 2011.

H.6 Some information on how the UTCCRs relate to price changes is provided in OFT 311: *Unfair Contract Terms Guidance.*

**The Consumer Protection (Distance Selling) Regulations 2000 (DSRs)**

H.7 The DSRs are designed to protect consumers who are not physically present with the seller at the time of purchase. For an introduction, see OFT 698: *A guide for businesses on distance selling.*

**The Price Marking Order 2004 (PMO)**

H.8 The PMO sets out requirements about how prices are communicated to consumers. BERR has published some guidance on the order.

H.9 The Department for Business, Innovation and Skills (BIS) has also produced more general guidelines on good practice in giving information about prices.

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I THE COMPETITION COMMISSION BULK LPG ORDERS

Background

I.1 Following a Market Investigation Reference (MIR) by the OFT in July 2004, in June 2006 the Competition Commission (CC) published a report on the UK domestic bulk LPG market, finding that there were features of the market which adversely affected competition.93 To address these features the CC made two Orders:

- The Domestic Bulk Liquefied Petroleum Gas Market Investigation (Metered Estates) Order 2009 (the 2009 Order).95

Key features of the Competition Commission Orders

I.2 The 2008 Order relates only to individual tank customers. It was made by the CC on 13 October 2008 and came into force on 13 April 2009.

I.3 The key features of the 2008 Order include:

- That the maximum length of any exclusivity period in a contract must not exceed 24 months; and that any contractual notice period for termination must not exceed 42 days.
- The obligation for a supplier to transfer the existing tank and associated pipe work at the customer’s premises into the ownership of a new supplier, upon request by a customer when giving notice of

93 Published at www.competition-commission.org.uk/rep_pub/reports/2006/514lpg.htm
94 Published at www.competition-commission.org.uk/inquiries/current/gas/lpg_order_final.pdf
95 Published at www.competition-commission.org.uk/inquiries/current/gas/notice_order_metered_estates.pdf
an intention to switch suppliers (‘tank transfer’). However, a new supplier is not obliged to purchase the existing supplier’s tank as long as he notifies the customer of his decision and the reasons why.

- If an existing supplier and a new supplier cannot agree on the price to be paid for an existing tank then the price shall be determined by a tank valuation formula as specified in the Order.

- If a customer does not want a tank transfer, he can request the existing tank to be removed (uplifted) when giving notice and the existing supplier shall be obliged to do so at no cost to the customer. The new supplier will then be responsible for installing a new tank.

- Time limits apply to various stages of the switching process. For example, the period of time between the existing supplier receiving notice of termination and tank transfer and reaching agreement with the new supplier regarding the transfer must not exceed 42 calendar days.

- The trade association and individual suppliers must provide information to customers to facilitate switching.

- Suppliers must provide information about customers’ switching and termination rights with contract documentation and must send a ‘wake-up’ letter to customers informing them when they enter the period within which they can give notice of termination of a contract. Suppliers are also obliged to provide a telephone enquiry point to enable potential new customers to request quotes for the supply of domestic bulk LPG.

- The trade association is similarly obliged to provide information about the Orders and the switching process on its website.
• All LPG suppliers are obliged to provide the OFT with information concerning the number of customers that have switched away from and to them annually.  

I.4 The 2009 Order was made on 6 May 2009 and came into force on 6 November 2009. This Order provides rights to customers on a metered estate broadly similar to those with dedicated tanks.

**OFT role and activities undertaken since the inception of the Orders**

I.5 Under section 162(2)(a) of the Enterprise Act 2002 the OFT has a duty to keep under review compliance with undertakings and Orders made following an MIR.

I.6 In carrying out this role in relation to domestic bulk LPG the OFT works with key players in the industry, including the trade association for LPG suppliers (UKLPG), to raise awareness of LPG suppliers’ obligations under the Orders as well as assisting consumers, who may be affected by the Orders, to understand their rights.

I.7 Throughout the implementation phases of the Orders the OFT worked closely with UKLPG and its members to iron out queries suppliers had about the requirements of the Orders such as the interpretation of tank formula inputs. The OFT has also been in regular contact with the industry via UKLPG to gauge how well the switching process has been working.

I.8 Since the introduction of the 2008 Order the OFT has received queries from LPG customers concerning the switching process. The OFT has published advice on both the Consumer Direct and the OFT website in the form of frequently asked questions on how consumers can switch.

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96 Further details of the information required from LPG suppliers annually can be found at Schedule 3 of the 2008 Order and Schedule 2 of the 2009 Order.

supplier, taking on board queries received in the early stages after the Orders took effect.

I.9 The OFT sought information from suppliers to ensure that the Order was being complied with and, in the process, revised the published advice to consumers on the practicalities of the switching process.

I.10 The number of queries about either Order has declined over time as the Orders have bedded down and as consumers have become increasingly aware of their rights under both Orders. However the OFT continues to monitor, update the FAQs and answer queries related to the Orders.

I.11 The OFT also has responsibility for:

- Updating the figures used for the tank valuation formula in the 2008 Order using published steel price indices and RPI. It publishes and notifies LPG suppliers each April of a revalorised value of the formula inputs, including average tank prices. The OFT must also recalculate the input values of the formula every three years by obtaining tank prices paid by LPG suppliers for the previous 12 months. It will be doing this in 2012.

- Collecting annual switching statistics from LPG suppliers for both metered and non-metered estates.
  - For the 2008 Order: The first set of statistics covered the period 14 April 2009 to 31 May 2009. The second set of statistics covered the period 1 June 2009 to 31 May 2010 and this continues annually.
  - As the 2009 Order was introduced at a later stage, the first set of statistics covered the period 6 November 2009 to 31 May 2010. The second set of statistics covered the period 1 June 2010 to 31 May 2011 and this continues annually.
J LPG INPUT COSTS

J.1 LPG is internationally traded, so the wholesale price reflects international supply and demand. The internationally traded price of LPG is monitored by organisations such as Argus and Platts.

J.2 Figure J.1 shows a traded LPG (propane)\(^\text{98}\) price for North-West Europe over the past five years, against crude oil prices.

Figure J.1: Crude oil and LPG prices

![Crude oil and LPG prices chart](chart.png)

Source: Bloomberg

J.3 We note some similarities with trends in the price of heating oil:

- Overall, an increasing trend is clearly discernible.
- As the CC Report noted,\(^\text{99}\) wholesale crude oil and LPG prices are highly correlated.

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\(^{98}\) Propane gas is the basis gas for bulk LPG. References in this annexe to LPG are to LPG in the form of propane gas. The traded price is estimated from prices faced by market participants.

\(^{99}\) Refer to Appendix I of the CC Report for more details of LPG pricing.
There was a notable spike in the traded price of LPG in December 2010, driven only in part by the Brent price. This may reflect the same factors (winter demand) underlying the spike in the price of heating oil. The industry has also suggested that spikes in prices may be driven by speculative pressures.
K COMPETITION CASES RELATING TO CYLINDER LPG

K.1 A number of European competition authorities have previously considered cylinder LPG markets. These cases include investigations by the Irish Competition Authority (2005, reviewed 2010), the OFT (2002) and the Monopolies and Mergers Commission (MMC) in 1981.

K.2 In 2008, the Scottish Court of Session also heard a case brought by Calor Gas Limited relating to the alleged breach of a vertical agreement by a cylinder LPG dealer it had previously supplied.

K.3 For reference, this annexe sets out further details of each case below.

K.4 In March 2005, the Irish Competition Authority published a Declaration limiting exclusive purchasing agreements in the cylinder LPG market to two years, such that complying fully with the terms of the Declaration allows suppliers of cylinder LPG a safe harbour from prosecution under competition law. The Authority issued this Declaration following a review of how this market has worked over a ten-year period between 1994 & 2004, which noted that an apparent decline in competition in the cylinder LPG market after 1999 coincided with the expiry of a 1994 Decision by the Authority designed to counter the anti-competitive effects of five-year exclusive dealer agreements under which a retail outlet can sell only one brand of cylinder LPG. The Authority consulted on this Declaration in 2010 and left it unchanged.

K.5 In 2008 the Scottish Court of Session heard the case of Calor Gas Limited v. Express Fuels (Scotland) Limited and D Jamieson & Son Limited. Calor sought damages from the defendants for loss of business following the termination of a vertical agreement with Calor, and permanent interdict preventing continued breach of the terms of the agreement. The Court considered that, ‘given Calor’s very substantial share of the cylinder LPG market, the relevant restrictions in the

agreement were not compliant with Article 81(1) of the EU Treaty in that, both cumulatively and individually, they amounted to a significant restriction on competition in what was, and still is, a mature market.101

K.6 The OFT launched an investigation into Calor Gas NI Ltd (CGNI) in June 2002 under the Competition Act 1998.102

- The OFT was investigating CGNI’s network of agreements with dealers and stockists, which originally ran for five years. The OFT believed that – with CGNI as the dominant supplier in NI – the length of the contracts may have had an anti-competitive effect by creating a barrier to entry for new suppliers and limiting the expansion of existing small scale suppliers. CGNI gave assurances that it would limit the length of its exclusive purchasing agreements for cylinder LPG to no more than two years duration.

- As a result of these assurances, the OFT decided to close its investigation without reaching a conclusion on whether CGNI had abused its dominant position. During the course of the investigation the OFT found no evidence that CGNI had intended to abuse its dominant position in the market.

K.7 The MMC investigated the bottled LPG market in 1981.103 The MMC concluded that a monopoly position was held by Calor but that it did not operate against the public interest. However, a couple of related practices did: requiring distributors to buy appliances only through Calor; and the practice whereby distributors were prevented from handling other suppliers’ LPG cylinders for various periods after ceasing to handle Calor’s. As Calor had already ceased both practices by the time the

101 Refer to: www.scotcourts.gov.uk/opinions/2008csoh13.html. By the time the case came to court, Calor had already shortened the exclusivity periods in its standard contracts to two years.


103 Refer to: www.competition-commission.org.uk/rep_pub/reports/1981/fulltext/132c01.pdf
MMC produced its report, the recommendation was that these practices should not be re-introduced.
CURRENT GOVERNMENT SCHEMES RELEVANT TO MICROGENERATION TECHNOLOGIES

Table L.1: Current Schemes

<table>
<thead>
<tr>
<th>Scheme</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Renewable Heat Incentive (RHI)</strong> 2012 – 2020</td>
<td>Aimed at promoting the installation of heat generating technologies, domestic RHI will be implemented in GB in October 2012 (non-domestic since October 2011). As an interim measure, RHI Premium Payments have been available to domestic households from 1 August 2011. Funding for the RHI scheme will come from general taxation. <a href="http://www.decc.gov.uk/en/content/cms/meeting_energy/renewable_ener/incentive/incentive.aspx">www.decc.gov.uk/en/content/cms/meeting_energy/renewable_ener/incentive/incentive.aspx</a></td>
</tr>
<tr>
<td><strong>Feed-In-Tariffs (FIT)</strong> 2010 – expected to operate for a 20 to 25 year period depending on the technology</td>
<td>Introduced in April 2010, the FIT scheme is aimed at supporting uptake of small scale renewable and low-carbon electricity generation technologies. Ofgem will be responsible for the administration of the scheme and the cost of the FIT scheme will be shared among electricity suppliers. <a href="http://www.decc.gov.uk/en/content/cms/meeting_energy/renewable_ener/feeding_tariff/implementation/implementation.aspx">www.decc.gov.uk/en/content/cms/meeting_energy/renewable_ener/feeding_tariff/implementation/implementation.aspx</a></td>
</tr>
<tr>
<td><strong>Green Deal</strong> 2012 – expected to operate for 25 year period</td>
<td>Targeted mainly at wall and loft insulation measures. This scheme aims to provide greater energy efficiency levels for individual households. At present, it is proposed that funding for microgeneration technologies will be made available under Green Deal. <a href="http://www.decc.gov.uk/en/content/cms/tackling/green_deal/green_deal.aspx">www.decc.gov.uk/en/content/cms/tackling/green_deal/green_deal.aspx</a></td>
</tr>
<tr>
<td><strong>NI Renewable Heat Incentive</strong></td>
<td>From 2012, the RHI in NI will provide long-term support for domestic microgeneration installations. The scheme will be administered by Ofgem and will be funded by central Government. Interim funding for domestic heat installations have been available since 1 September 2010 under a Premium Payment scheme that will run until 31 March 2012, with further funding being made available, if necessary, until October 2012. <a href="http://www.detini.gov.uk/the_development_of_the_northern_ireland_renewable_heat_incentive.pdf">www.detini.gov.uk/the_development_of_the_northern_ireland_renewable_heat_incentive.pdf</a></td>
</tr>
<tr>
<td><strong>Carbon Emissions Reduction Target (CERT)</strong></td>
<td>CERT requires all domestic energy providers (with a customer base in excess of 50,000) to reduce carbon emission levels. The main aim of this scheme is to contribute to the UK’s legally binding obligations under the Kyoto agreement. The scheme is administered by Ofgem. Ofgem publishes quarterly updates on microgeneration measures delivered by energy providers under the scheme. <a href="http://www.ofgem.gov.uk/Sustainability/Environment/EnergyEff/Pages/EnergyEff.aspx">www.ofgem.gov.uk/Sustainability/Environment/EnergyEff/Pages/EnergyEff.aspx</a></td>
</tr>
<tr>
<td><strong>Interest Free Loan Scheme (IFLS)</strong></td>
<td>The Scottish Government offers interest free loans (capped at £2,000) to consumers across Scotland to help them install microgeneration technologies. <a href="http://www.scotland.gov.uk/News/Releases/2011/03/11142409">www.scotland.gov.uk/News/Releases/2011/03/11142409</a></td>
</tr>
<tr>
<td><strong>Nyth/Nest</strong></td>
<td>This scheme was launched on 1 April 2011 and is managed by British Gas and EST. The key focus of the Nyth scheme is to tackle fuel poverty in deprived areas of Wales. Microgeneration installations will also be included as part of this initiative. <a href="http://wales.gov.uk/about/cabinet/cabinetstatements/2011/7julycccmeeting/?lang=en">wales.gov.uk/about/cabinet/cabinetstatements/2011/7julycccmeeting/?lang=en</a></td>
</tr>
<tr>
<td><strong>Arbed (Wales' Strategic Energy Performance Investment Programme)</strong></td>
<td>This scheme was established to help improve the energy performance levels of Welsh households. Phase 1 of the scheme has provided energy saving measures in over 6,000 homes in Wales, which included the installation of microgeneration technologies (such as solar PV and heat pumps). Phase II of the scheme is currently underway. <a href="http://wales.gov.uk/topics/environmentcountryside/energy/efficiency/arbed/?lang=en">wales.gov.uk/topics/environmentcountryside/energy/efficiency/arbed/?lang=en</a></td>
</tr>
<tr>
<td><strong>Community Energy Savings Programme</strong></td>
<td>Aimed at households across the UK in areas of low income, the scheme is funded by energy suppliers and electricity generators.</td>
</tr>
</tbody>
</table>
### (CESP)
**2009 – 2012**

DECC sets out the policy framework for CESP and Ofgem administers the scheme and produces regular updates showing the number of microgeneration measures delivered by obligated parties.


### Energy Assistance Package (EAP)
**2009 – 2012**

Administered by the EST (on behalf of the Scottish Government) this initiative helps to reduce fuel bills and improve energy efficiency within homes across Scotland. The scheme covers the installation of a new central heating system, including where appropriate ASHP.

[www.scotland.gov.uk/Topics/Built-Environment/Housing/access/FP/eap/Q/ViewArchived/On](http://www.scotland.gov.uk/Topics/Built-Environment/Housing/access/FP/eap/Q/ViewArchived/On)

Source: DECC, DETINI, NI Executive, Ofgem, Scottish Government, Welsh Government websites and email correspondence
M  ELECTRICITY

M.1 The electricity and gas markets of the UK are regulated by Ofgem in GB and the Utility Regulator in NI.

M.2 The primary objective of both authorities is to protect the interest of consumers by promoting competition where appropriate. Specifically, Ofgem and the NI Utility Regulator:

- Have the sectoral responsibility for monitoring and resolving any competition issues that may arise. Details of current competition issues and cases can be found on their websites.\(^{104}\)

- Administer a consumer protection regime for electricity and gas markets and are responsible for addressing any breaches, as set out on their websites.

M.3 As such, competition and consumer protection arrangements are well-established in these markets and lie outside the scope of our study, which considers electricity only in the context of its relevance as a source of domestic heating for off-grid consumers.

M.4 Detailed information about the UK electricity market is readily available, for example on the regulators' websites,\(^{105}\) and as such we do not propose to discuss the nature and structure of the market in any detail here. Rather, this annexe focuses on our core study interests of mains electricity as a source of heating for off-grid consumers and its potential

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\(^{104}\) Ofgem: [www.ofgem.gov.uk/Pages/OfgemHome.aspx](http://www.ofgem.gov.uk/Pages/OfgemHome.aspx) ; NI Utility Regulator: [www.uregni.gov.uk/](http://www.uregni.gov.uk/)

as an alternative to heating oil and LPG. The role of electricity generated through microgeneration is discussed in Chapter 6 of the main report.

Introduction

M.5 Electricity is an easily accessible but (compared to gas) an expensive means of heating the home. For heating purposes, electricity is typically used to power storage heaters, individual portable heaters or radiators. It is sometimes used as a back-up source of heating but is more commonly used as a main source of heating for many off-grid consumers. In the UK, 2,366,000 households use electricity as a primary source of heating of which approximately 1,919,000 are in England, 354,000 in Scotland, 63,000 in Wales, and 30,000 in NI.106

M.6 While heating oil is the main off-grid fuel used in NI and Wales, in England and Scotland, electricity is the most popular source of heating for off-grid consumers. In terms of the types of properties where electricity use is most concentrated, in England half live in purpose built flats, in Scotland many (38 per cent) live in tenements107 and in Wales many live in bungalows (23 per cent) or purpose built flats (22 per cent). Users are typically concentrated in urban areas and many live in rented properties.

M.7 Table M.1 provides a cross-UK comparison of the proportion of off-grid consumers using electricity as a main source of heating and the most common areas where it is used and types of properties in which users live.

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106 Consumer Focus Report and NI House Conditions Survey 2009.

107 Section 26 of the Tenements (Scotland) Act 2004 defines a tenement as a building or a part of a building which comprises two related flats, or more than two such flats at least two of which (a) are, or are designed to be, in separate ownership; and (b) are divided from each other horizontally.
Table M.1: Off-grid consumers using electricity as a main source of heating, location and tenure

<table>
<thead>
<tr>
<th></th>
<th>Off-grid population using electricity as main source of heating</th>
<th>Main location</th>
<th>Rented</th>
</tr>
</thead>
<tbody>
<tr>
<td>England</td>
<td>62%</td>
<td>Urban</td>
<td>49%</td>
</tr>
<tr>
<td>Scotland</td>
<td>65%</td>
<td>Urban</td>
<td>60%</td>
</tr>
<tr>
<td>Wales</td>
<td>23%</td>
<td>Rural</td>
<td>39%</td>
</tr>
<tr>
<td>NI108</td>
<td>4%</td>
<td>Urban</td>
<td>-109</td>
</tr>
</tbody>
</table>

Consumer Focus Report and NI House Conditions Survey 2009

M.8 Consumers living in urban areas and/or purpose built flats (particularly in rented properties) may not have access to or cannot switch easily to an alternative source of heating. Consequently, they may not be able to take advantage of cheaper options. However, users can make savings by switching between electricity providers.

M.9 Despite the possibility of reducing heating bills by switching within the electricity sector, for domestic consumers, electricity is likely to remain an expensive means of heating the home compared to gas, especially if off-peak tariffs are not used.110 Indeed, given environmental policies to reduce carbon emissions, a number of power plant closures, and

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108 Figures for NI are based on users of electric central heating systems only and do not include use of standalone electric heaters. Note that in the NI House Condition Survey 2009 fuel use is recorded according to central heating (CH) type and there may be additional electric use within the categories CH Dual/Other and Non CH. However, a breakdown of the individual figures is not available.

109 Detailed data on off-grid tenure is not available for NI. However, it is possible to estimate the proportion of households using an off-grid fuel central heating system as their only source of heating that are owner occupied (66 per cent).

110 The relative costs of electricity are discussed later in paragraph M.37. If used on a standard tariff or outside off-peak hours, heating the home through electricity can be more costly than other off-grid sources.
increases in the wholesale price of fossil fuels, higher electricity bills will continue to be a major area of concern.

M.10 In tackling the rising cost of electricity and issues of security of supply, the Government, in the 2011 Electricity Market Reform (EMR) White Paper, sets out its commitment to secure, decarbonise and reduce the cost of electricity supply. However, although absent the EMR average annual household electricity bills in GB are expected to increase by around £200 by 2030, with the EMR bills are still expected to rise by approximately £160.112

M.11 In addition to being expensive relative to gas, electricity is not considered low carbon as it is currently mainly a derivative of fossil fuels and this may affect its role within future Government energy policy. If so, there may be a knock-on effect on consumer outcomes and incentives to use electricity as a main domestic heating source.

M.12 The remainder of this annexe looks at mains electricity as a main source of heating for off-grid consumers and considers the option it presents to users of heating oil and LPG. We will focus on electricity generated through sources other than microgeneration, which is considered in Chapter 6 of the main report. In particular, the following are discussed:

- The main electricity tariffs that users can sign up to within the market.
- The role of electricity as an off-grid heating alternative.
- The experiences of off-grid consumers with electricity for domestic heating use.


112 Figures were obtained from the Electricity Market Reform (EMR) White Paper (2011) www.decc.gov.uk/assets/decc/11/policy-legislation/EMR/2176-emr-white-paper.pdf. Information on the impact on domestic electricity bills in NI was not publicly available at this time.
M.13  We consider that although users of electricity as a main source of heating tend to have little or no alternative sources available to them, they are generally satisfied with the performance. This is helped by the fact that electricity is easily accessible and the market is regulated with well-established consumer protection arrangements. However, although electricity can be cheaper than other off-grid fuels if used during off-peak hours on economy tariffs, it is an expensive means of heating the home compared to gas. It is also relatively more expensive if used at peak times or on standard tariffs. This, along with its greater contribution to carbon emissions than some other off-grid fuels, reduces its appeal as a long term alternative for heating oil and LPG consumers.

**Market overview**

M.14  Electricity generation in the UK increased by 1.2 per cent between 2009 and 2010. In 2010, gas accounted for 46 per cent of generation, coal 28 per cent, nuclear energy 16 per cent and renewables 6.8 per cent. To meet its EU target of generating 15 per cent of gross final energy consumption from renewable sources, the Government has committed to increase the share of electricity generated from renewables to about 30 per cent by 2020. The NI Executive has committed to a non statutory target of 40 per cent of electricity generated from renewables by 2020.

M.15  With the pending closure of old coal and nuclear power stations over the next 10 years, the UK’s generating capacity will be reduced by nearly a quarter. However, by 2050, with the transfer of transport and heating onto the electricity grid, the demand for electricity is expected to double.

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113 Information on the relative carbon emissions is based on data from DECC and was obtained from [www.nef.org.uk/greencompany/co2calculator.htm](http://www.nef.org.uk/greencompany/co2calculator.htm).

114 [www.decc.gov.uk/en/content/cms/meeting_energy/renewable_ener/renewable_ener.aspx](http://www.decc.gov.uk/en/content/cms/meeting_energy/renewable_ener/renewable_ener.aspx)

This means that significant investment is required to build new power stations and upgrade the grid.\textsuperscript{116}

M.16 Domestic consumption, which rose by 0.1 per cent in 2010, accounts for the largest proportion of electricity consumption.\textsuperscript{117} Space heating and water heating combined account for about a third of domestic consumption on average.

Figure M.2: Domestic Electricity Consumption

![Figure M.2: Domestic Electricity Consumption](image)

Source: Energy Consumption in the UK: Domestic data tables 2011\textsuperscript{118}

M.17 The UK energy market was privatised during the 1980s and 1990s and today the domestic market is contested by 13 different active suppliers in GB\textsuperscript{119} and, as of September 2011, three suppliers – Power NI

\textsuperscript{116} www.decc.gov.uk/assets/decc/11/policy-legislation/EMR/2176-emr-white-paper.pdf

\textsuperscript{117} DECC’s Digest of UK Energy Statistics (DUKES) 2011.

\textsuperscript{118} Published by ONS/DECC www.decc.gov.uk/assets/decc/Statistics/publications/ecuk/269-ecuk-domestic-2010.xls

\textsuperscript{119} There are 38 licensed domestic electricity suppliers (and 32 licensed gas suppliers) in the GB market but not all are active.
(formerly NIE Energy), Airtricity and Budget Energy – are active in the NI domestic electricity supply market.120

M.18 Within the current retail market, domestic consumers who do not generate their own electricity (through for instance, microgeneration), can choose between three broad tariff structures in GB: a tariff for a standard meter, Economy 7, and Economy 10.121 Each tariff requires an appropriate corresponding meter. In NI, domestic consumers can choose between an Economy tariff and a non-Economy 7 tariff. As discussed below, the most appropriate tariff will depend on the amount used and the main purpose of the electricity usage.

M.19 With any of these tariffs, there are a variety of ways available to consumers to pay for their electricity usage. In GB, the most common are direct debit, standing order, payment on receipt of bill, and prepayment. In NI, the most common are direct debit, standard credit, and prepayment. In both GB and NI, direct debit is almost always the cheapest method. However, many consumers find using the prepayment method a convenient way to pay for their electricity bills. It allows the user to control usage by paying for electricity before it is used, as opposed to after and can therefore be helpful for budgeting.122

**Tariffs for standard meters (non-Economy 7 tariffs)**

M.20 Tariffs for standard meters are the most common types of tariffs used by households in the UK. Customers on these tariffs will have a standard

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120 However, other suppliers are active in the NI non-domestic electricity supply market.

121 Within these basic tariff structures, consumers have a wide range of choices. For instance, there are hundreds of different standard tariffs available to domestic consumers.

122 In GB, many suppliers add a standing charge to finance and maintain a prepayment meter (which must be paid irrespective of the amount of electricity used). Customers using a prepayment method may also not be entitled to some of the cheapest deals available. This means that these customers may be paying above average cost for their electricity. In NI, prepayment can be cheaper than standard credit (but more expensive than direct debit).
meter installed and electricity units will be charged at the same rate regardless of the time of usage.

M.21 When on a tariff for a standard meter, using electricity as a source of heating (whether through storage or portable heaters) may lead to some customers finding that they have used more energy than they expected or can afford. Tariffs for standard meters are more suitable when electricity is predominantly used for lighting.

**Economy 7 tariffs**

M.22 Economy 7 is the recommended and most popular tariff for those using electricity to heat their homes. It is designed to be used with storage heaters and can significantly reduce the energy bill for users. The tariff structure typically involves two prices – one for the designated seven off-peak hours during the night (usually from 12:30am to 7:30am) and another for during the day. An Economy 7 meter (also known as a variable meter) gives two readings; one for the day (peak) and one for the night (off-peak). Although the off-peak price will be considerably cheaper than the standard day time rate, peak hours during the day can be significantly more expensive than tariffs for standard meters. Therefore, if use is not managed effectively and concentrated in off-peak periods, bills may be greater than those paid by customers on a tariff for a standard meter.\(^{123}\)

M.23 As a general guide, customers would need to use more than 40 per cent of their energy at night to make the tariff cost effective.\(^{124}\) Therefore,


\(^{124}\) According to USwitch, for Economy 7 to be cost effective, users should use more than 40 per cent of their electricity at night [www.uswitch.com/gas-electricity/economy-7/](http://www.uswitch.com/gas-electricity/economy-7/). Which? also estimates that to make savings, users should ensure that about 55 per cent of total consumption is during the seven off-peak hours. [www.which.co.uk/switch/energy-advice/energy-tariffs-explained](http://www.which.co.uk/switch/energy-advice/energy-tariffs-explained)
customers are encouraged to switch on the hot water heater and storage heaters during the off-peak hours. The stored heat and hot water can then be used throughout the day. Customers are generally advised to use timers on their washing machines, dish washers and other appliances and to use these during the off-peak hours.\textsuperscript{125}

M.24 With Economy 7, whilst it is possible to heat hot water and the home throughout the night and early part of the morning, it may not be sufficient to last throughout the day into the evening (that is, until the start of the off-peak period).\textsuperscript{126} This means that users may need to use electricity outside of the off-peak periods, which is likely to lead to higher than expected bills (and increased costs relative to other heating options).

**Economy 10 tariffs**

M.25 Economy 10 is a similar tariff to Economy 7. Whilst Economy 7 provides users with seven hours of off-peak usage, Economy 10 provides 10 off-peak hours – typically three hours in the afternoon, two hours in the evening, and five hours overnight. However, in GB Economy 10 is not widely known or used and is only offered to new customers by two energy companies – EDF and E.ON. Economy 10 is not available in NI.

**Electricity as an off-grid alternative**

M.26 A main advantage of using electricity as a source of heat is that it does not have the same vulnerability of supply issues as road delivered fuels. Electricity is a secure and accessible source of energy. Since it is widely available and accessible, it may be a sensible short-term back up for off-

\textsuperscript{125} For example, [www.uswitch.com/gas-electricity/economy-7/](http://www.uswitch.com/gas-electricity/economy-7/), [www.energychoices.co.uk/economy-7-ask-our-expert.html](http://www.energychoices.co.uk/economy-7-ask-our-expert.html)

\textsuperscript{126} This might be especially problematic for larger families in that there may not be sufficient off-peak time for everyone to have a shower in the morning or enough water left for showers or baths in the evening.
grid consumers (that is, by using portable room heaters to supplement other fuels).

M.27 Switching to electricity can be relatively inexpensive. Electricity is available almost everywhere in the UK and compared with gas central heating, electric storage heaters are cheaper and do not require pipe work or a flue. Moreover, storage heaters do not need to be serviced annually and require little maintenance. For off-grid consumers wishing to switch to electricity using storage heaters, the cost of installation is about £2,000 for a three bedroom house and the replacement cost of a single storage heater is about £300.127 Users also have a choice between several suppliers and switching to make savings is easy.128

M.28 However, electricity may not always meet the heating needs of the household. Storage heaters using an Economy 7 tariff may not provide sufficient heating or hot water throughout the day. This means that outside the off-peak hours, users may need to top up using individual electric heaters. If used outside off-peak hours or with a tariff for a standard meter, electricity can also be more expensive than other off-grid sources. Even on an Economy 7 tariff, compared to gas central heating, electricity is and will continue to be an expensive means of heating the home. It is also not an environmentally friendly option as its generation produces a significant amount of CO₂ emissions although, as noted, this is expected to reduce in future given Government policy to further decarbonise the electricity supply.

M.29 Given possible usage constraints and the lack of a low carbon advantage that could attract environmentally conscious consumers or encourage policy to incentivise take-up, mains electricity is unlikely to be an

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128 Consumers are able to use a number of comparison websites to search for the best tariff and as discussed in paragraph M.32, switching is relatively straightforward.
attractive long term alternative for off-grid consumers currently using heating oil and LPG. Moreover, if used on a tariff for a standard meter or outside Economy 7 off-peak hours, the cost of using electricity to heat the home is potentially more expensive than using heating oil and LPG and users should therefore monitor the cost of using electricity outside off-peak hours.

**Consumer experience**

M.30 Many off-grid consumers using electricity have no alternative source of heating available to them and many who do are not interested in switching to alternatives. Therefore, choice comes mainly from within the industry.

M.31 Consumers who live in purpose built flats may find that they are unable to access other alternatives. For instance, from the SPA research one respondent noted that 'There's no other option available in this flat. It was built just specifically for electricity'. However, many consumers who use electricity as a main source of heating say they are satisfied. For instance, for England, based on a sample of 219 people who use electricity to heat their homes, research commissioned by Consumer Focus found that 74 per cent are satisfied with their heating system and nearly 70 per cent said their home was not difficult to keep warm with the heating on. In contrast, although based on a small sample, the SPA research suggests that for some users electricity is an inefficient source of heating as it requires planning for cold weather and is difficult to regulate to achieve the desired temperature. Users also felt that electricity does not provide the same level of heat as other central

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129 Satisfaction with electric heating system, taking into account cost and performance: 34 per cent very satisfied; 40 per cent fairly satisfied; 14 per cent not very satisfied; 10 per cent not at all satisfied; three per cent don’t know.

130 This is consistent with indicative results for NI based on a 2010 Energy Savings Trust report, *Into the West: Low carbon heat options off NI’s gas network*, which found that based on a very small sample of users (10), 90 per cent said they are happy with mains electricity as their source of heating. This sample is very small and as such no conclusions can be drawn. The result is at best indicative.
heating options. One user stated that 'they give a good background heat but I wouldn’t say they efficiently heat. You have to really top up in the severe depths of winter with a freestanding electric heater as well which must increase our electricity bills considerably'.

M.32 Domestic consumers in England, Scotland, and Wales have a number of options when choosing their electricity supplier. By comparing and switching suppliers consumers can take advantage of the cheapest electricity tariffs and make significant savings. One of the easiest ways to do this is by using price comparison websites. Switching is fairly straightforward and takes approximately four to six weeks. During this time users are able to have access to uninterrupted services. In NI, domestic consumers have a choice between three suppliers. As there are no minimum or fixed term contracts, customers can switch at any time. However, the process can take up to three weeks to complete. CCNI has developed a price comparison tool to help customers determine whether they would save by switching to a new supplier.

M.33 Suppliers typically offer a range of discounts depending on the method of payment used and also what other services are used. For example, switching to a supplier who provides both gas and electricity could entitle a GB customer to a dual fuel discount. Currently there are no dual fuel discounts available in NI.

131 There are several price comparison websites available, many of which are backed by the Consumer Focus Confidence code: www.consumerfocus.org.uk/get-advice/energy/confidence-code

132 The reason for this is that domestic electricity customers are on a 28-day rolling contract and therefore switching cannot take place until 28 days after the switching request. This timeline is driven by industry processes. With smart metering and associated changes to underlying industry data systems, the timeline for switching may be reduced.

133 The price comparison tool 'Electricity price comparison tool' can be found at: www.consumercouncil.org.uk/publications/
Despite choice and the ease of switching, switching rates for electricity suppliers in GB are low, with the consequence that many households are paying more than they could for their electricity. It was reported by Ofgem that during 2010, only 17 per cent of consumers switched electricity suppliers. This was lower than the rate in 2009, which was 22 per cent. Research commissioned by Consumer Focus found that only about a quarter of users regularly compare prices and that comparison is more common amongst those living in rural than urban areas. Also, according to the SPA research, users tend not to switch between suppliers as they are sceptical about receiving a better deal. In NI, the domestic market has only very recently been opened up to competition. As of June 2011, the share of the market supplied by the incumbent supplier – Power NI – had fallen to 92 per cent.

Scepticism towards switching may result from a lack of awareness about usage, which makes it difficult to compare costs across suppliers. Indeed, the research commissioned by Consumer Focus found that the vast majority of consumers who heat their homes with electricity do not know how much electricity they use each year. In addition to this, the research found that users have difficulty separating costs for heating from other electricity usage in the home. This is especially likely to affect people who spread the cost of electricity by paying monthly direct debits. However, Ofgem requires energy suppliers to provide consumption details on consumer bills and, where customers have been with their suppliers for more than a year, offer a summary of annual consumption once in every 12-month period. There is also a requirement for suppliers to provide an estimate of annual energy costs based on 12-month historic consumption levels (where data is available). With this,

134 Ofgem Retail Market Review – Findings and Initial Proposals. This is slightly higher than the switching rate for gas suppliers, which stood at 15 per cent in 2010.

135 www.ofgem.gov.uk/Markets/RetMkts/rmr/Documents1/RMR_FINAL.pdf

suppliers may present Economy 7 and 10 users with a breakdown of when they use energy to illustrate how the cost figure was calculated.\(^{137}\) While these requirements may help energy users better track their overall usage, they will not necessarily help consumers distinguish electricity used for heating from electricity used for other purposes.\(^{138}\)

**M.36** The introduction of smart meters from 2012 is also likely to make it cheaper and easier to use electricity as a source of heating.\(^{139}\) In December 2009, DECC announced plans to have smart meters installed in every home in the UK by 2020. Smart meters are electricity meters that send electronic readings of actual usage directly to the supplier. Although by themselves they do not make the cost of electricity cheaper, with an energy monitor they will enable the user to monitor and control usage thereby reducing cost. Smart meters may also allow suppliers to create tariffs that better fit the lifestyle and usage profile of consumers. Moreover, with more accurate readings, suppliers may be better able to forecast and plan energy demand. This is likely to result in significant savings which can be passed on to the consumer.

**M.37** Evidence on concerns about costs is mixed. Participants in the SPA qualitative research considered the cost of electricity used for heating (even on an Economy 7 tariff) to be a significant outlay. One respondent commented that 'I think the price of electricity, I think the price of fuel generally over the past few years is getting out of control'. However, in the research commissioned by Consumer Focus,\(^{140}\) it was found that a

\(^{137}\) Further information can be found at [www.ofgem.gov.uk/Media/FactSheets/Documents1/Supply%20Probe%20QA.pdf](http://www.ofgem.gov.uk/Media/FactSheets/Documents1/Supply%20Probe%20QA.pdf).

\(^{138}\) In a 2011 Consumer Focus report, _Missing the Mark_, it was found that the introduction of annual statements has not led to a marked change in consumer behaviour.

\(^{139}\) Although the official start date for roll-out is 2012, some suppliers (for example, British Gas) have already begun fitting smart meters in some homes.

\(^{140}\) Gill Wales Research: _Heating fuel buying behaviour among consumers who do not use mains gas_, May 2011, commissioned by Consumer Focus.
third of users who had switched from another source of heating to electricity did so because they expected it to be cheaper. Compared to other off-grid heating fuels electricity used on an Economy 7 tariff can be significantly cheaper (assuming effective use of the tariff). For an average three bedroom house, the cost of space and water heating per year is £1,611 for heating oil, £2,272 for LPG, and £1,259 for electricity used on an Economy 7 tariff. If used on a standard tariff however, the average cost is £2,295.\(^{141}\) On a peak Economy 7 tariff the cost of space and water heating per year for an average three bedroom house is likely to be similar to or greater than that on a standard tariff.\(^{142}\)

M.38 To facilitate competition and reduce the cost of electricity to domestic consumers in NI, the NI Utility Regulator currently regulates the prices set by the incumbent supplier – Power NI. In GB, although Ofgem does not regulate retail prices, suppliers are required to inform customers within 65 days of a price change with the option to cancel their contracts if they are not satisfied with the changes. In NI suppliers must give domestic customers at least 21 days notice of proposed variations in price and must give notice of the change having taken effect within 28 days. Domestic customers have the right to terminate the contract where they do not accept the variation.

M.39 Suppliers have responsibilities to support customers through regulated protection mechanisms. For example, in GB suppliers are encouraged to provide customers, upon request, with information on energy efficiency measures including information on any available Government financial support. Under the Carbon Emissions Reduction Target (CERT) and the Energy Company Obligation (ECO) which will replace CERT in 2012, UK

\(^{141}\) Sutherland Tables, July 2011 data.

\(^{142}\) Peak Economy 7 tariffs are generally more expensive than a tariff for a standard meter. Also according to data from DECC, users of Economy 7 on average tend to pay more for their electricity that users on a tariff for a standard meter. For instance, the average annual UK domestic Economy 7 electricity bill was £655 in 2010. This is higher than the average UK domestic standard domestic bill which stood at £417 in 2010

[www.decc.gov.uk/assets/decc/statistics/source/prices/qep221.xls](http://www.decc.gov.uk/assets/decc/statistics/source/prices/qep221.xls)
energy companies are required to promote and subsidise energy efficiency measures such as insulation or other low carbon energy solutions such as energy saving light bulbs. For consumers who are struggling to keep up with payments and who wish to switch to another supplier, the current provider is expected to provide debt management and energy savings advice if they refuse to grant the switch request.\footnote{Further information on various financial schemes and other help for vulnerable consumers can be found on Ofgem’s website at \url{www.ofgem.gov.uk/Consumers/hfvc/Pages/hfvc.aspx}.} Similarly, in NI all domestic suppliers have an obligation to give energy efficiency advice. Electricity suppliers can voluntarily take part in the NI Sustainable Energy Programme (NISEP), which provides funding for energy efficiency measures. The majority of this funding (80 per cent) is ring-fenced for priority vulnerable customers. In NI so-called 'debt blocking' of customers wishing to switch is not permitted.\footnote{Information provided by the NI Utility Regulator.}

\textbf{M.40} Following the completion of its Retail Market Review in March 2011, Ofgem found that further action is needed to make energy retail markets in GB work more effectively in the interest of consumers. In response it has consulted on proposals to make it easier for consumers to engage with the energy market and identify the cheapest supplier. As part of this Ofgem will be consulting on detailed proposals to improve the clarity and transparency of information consumers receive from suppliers. This will include facilitating easy evaluation of tariff options and may extend to simplifying the structure of tariffs available within the market. Ofgem has indicated that depending on the outcome of the consultation, it may refer the market to the CC.

\textbf{M.41} Consumer advice and further information on consumer protection can be found on the websites of the sectoral regulators.\footnote{Ofgem: \url{www.ofgem.gov.uk/Pages/OfgemHome.aspx}, NI Utility Regulator: \url{www.uregni.gov.uk/}.}
Consumer advice

M.42 The generation and supply of electricity in the UK is dependent on the domestic production of fuel, which is not robust. The long term decline of fossil fuels coupled with the exhaustible nature of its supply means that electricity prices are likely to continue to increase in the future. As a source of heating, it is more expensive than gas and, if use is not concentrated during off-peak hours on Economy 7, could also be just as or more expensive than heating oil and LPG. In addition, electricity generated through non-renewable sources contributes more to carbon emissions than other off-grid fuels. This is at odds with the UK’s agenda to decarbonise energy usage. As such, mains electricity is not an attractive long-term alternative source of heating, particularly compared to gas, for heating oil and LPG consumers. We advise that:

- Off-grid consumers who use mains electricity as the primary source of heating should:
  - Where switching to alternative sources is possible, periodically consider whether mains electricity is the most cost effective and suitable means of heating the home.
  - Where electricity is the only option, consider whether, in light of government schemes such as FIT\textsuperscript{146} generating their own electricity through microgeneration is a more cost effective option.

\textsuperscript{146} See Chapter 6 of the main report for further details on microgeneration and the FIT scheme.
This annexe is concerned with the supply of solid fuel for use in domestic heating in the UK. For the purposes of this annexe, we define solid fuel as including mineral fuels such as coal and coke, and biomass fuels (of which the most common is wood). Further details on these different types of solid fuel are set out in the section 'Main types of solid fuel' in this annexe.

Introduction

For many households in the UK, solid fuel is an efficient, easy to use, and economical method of space and water heating. For room heating, solid fuel can be used on open fires or in standalone appliances such as stoves (the latter being much more efficient). Solid fuel can also be used in cookers, and in more complex systems such as gravity fed boilers that can provide heating and hot water for an entire house and channel heat through a central heating system.

As with gas and oil, the majority of domestic consumption of solid fuel goes towards heating as opposed to other purposes such as cooking or lighting. According to data obtained from DECC:

- In 2009, 92 per cent of domestic consumption of mineral solid fuel was accounted for by space heating and eight per cent went towards water heating.

- Domestic wood combustion is mainly used for heating. In 2009, 223 thousand tonnes of oil equivalent of domestic wood combustion was used for heating.

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147 Solid fuel has a high heat (calorific) content and, according to Sutherland Tables (July 2011 data), is generally cheaper than other off-grid fuels. Further details on the costs of solid fuel compared to other off-grid sources are provided in paragraph N.26.

148 Data obtained from the domestic data tables in DECC's *Energy consumption in the UK*. 
Solid fuel is an important component of the off-grid energy market. There are 343,000 users in the UK, with 240,000 in England, 33,000 in Scotland, 37,000 in Wales, and 33,000 in NI. As a main heating source used by off-grid energy consumers, solid fuel is the third most popular (after electricity and heating oil), with particularly high usage in Wales as shown in Table N.1.

**Table N.1: Use of solid fuel as main heating source**

<table>
<thead>
<tr>
<th>Country</th>
<th>Percentage of off-grid population using solid fuel as main source of heating</th>
<th>Main Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>England</td>
<td>8%</td>
<td>Rural areas</td>
</tr>
<tr>
<td>Scotland</td>
<td>6%</td>
<td>Rural areas</td>
</tr>
<tr>
<td>Wales</td>
<td>14%</td>
<td>Rural areas</td>
</tr>
<tr>
<td>NI</td>
<td>5%(^{150})</td>
<td>Urban areas</td>
</tr>
</tbody>
</table>

Source: Consumer Focus Report and NI House Conditions Survey (2009).

- However, findings from the SPA research indicate that for the off-grid consumers surveyed, solid fuel is mainly (and frequently) used as a secondary source of fuel. This is supported by research commissioned by Consumer Focus,\(^{151}\) which found that in England solid fuels such as wood, coal and coke tend to be used as secondary rather than main heating fuels.

- In England, Scotland and Wales, those using solid fuel as a main source of heating tend to live in rural areas whilst in NI the majority live in urban dwellings. As shown in Table N.2, off-grid properties

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\(^{149}\) Data obtained from DECC’s Digest of UK Energy Statistics (DUKES) Table 7.6.

\(^{150}\) This figure is based on users of solid fuel central heating systems only and does not include use of standalone solid fuel systems. In the 2009 NI House Condition Survey fuel use is recorded according to central heating (CH) type and there may be additional solid fuel use within the categories CH Dual/Other and Non CH. However, a breakdown of the individual figures is not available.

\(^{151}\) Gill Wales Research: *Heating fuel buying behaviour among consumers who do not use mains gas*, May 2011, commissioned by Consumer Focus.
using solid fuel tend to be older and more than a quarter are poorly insulated.

Table N.2: Profile of off-grid properties

<table>
<thead>
<tr>
<th>Country</th>
<th>Age of property using solid fuel</th>
<th>% of homes using solid fuel that are un-insulated</th>
</tr>
</thead>
<tbody>
<tr>
<td>England</td>
<td>2% built post 1980</td>
<td>31%</td>
</tr>
<tr>
<td>Scotland</td>
<td>4% built post 1982</td>
<td>34%</td>
</tr>
<tr>
<td>Wales</td>
<td>1% built post 1980</td>
<td>28%</td>
</tr>
<tr>
<td>NI</td>
<td>21% built post 1980</td>
<td>153</td>
</tr>
</tbody>
</table>

Source: Consumer Focus Report and NI House Condition Survey (2009)

Although solid fuel has the advantage of being a relatively cheap source of energy compared to other off-grid fuels, with the exception of biomass, it is less environmentally friendly than mains gas, heating oil, and LPG. Given the Government’s renewable and carbon emissions targets associated with the UK Renewable Energy Strategy, the UK Low Carbon Industrial Strategy, and the UK Low Carbon Transition Plan,

152 This figure is based on users of solid fuel central heating systems only and does not include use of standalone solid fuel systems. Note that in the NI House Condition Survey 2009 fuel use is recorded according to central heating (CH) type and there may be additional solid fuel use within the categories CH Dual/Other and Non CH. However, a breakdown of the individual figures is not available.

153 Comparable data for NI is not available.

154 See paragraph N.26 for comparative costs.

155 Information on the relative carbon emissions is based on data from DECC and was obtained from [www.nef.org.uk/greencompany/co2calculator.htm](http://www.nef.org.uk/greencompany/co2calculator.htm).

156 These strategies are discussed in more detail in paragraph 6.25 to 6.27 of Chapter 6 of the main report.
this drawback could significantly reduce the attractiveness of solid fuel as an alternative source of energy for off-grid consumers in the long term.

N.6 This annexe focuses on the potential for solid fuel to be an alternative source of energy for other off-grid consumers (particularly those using heating oil and LPG). In so doing, this chapter considers:

- The main types of solid fuels used for domestic purposes.
- The solid fuel market in the UK.
- The role of solid fuel as an off-grid alternative.
- Consumers’ experiences of using solid fuel.

N.7 We believe that users are generally satisfied with solid fuel and it is an important part of the current energy mix for many off-grid consumers. However, with the exception of wood fuel, its potential to be a long term alternative as a main source of heating for users of heating oil and LPG is limited by its impact on the environment. As a supplementary source, solid fuel can have a role in the fuel mix of off-grid consumers.

Main types of solid fuel

N.8 There are two main types of solid fuel – mineral solid fuel and biomass solid fuel. Mineral fuels used for domestic purposes include coal in its natural form such as bituminous coal and natural smokeless fuel (anthracite and dry steam coal) and manufactured solid fuels (manufactured smokeless fuel and manufactured non-smokeless fuel). Wood, which is available in many forms including logs, chips, and pellets is the most common biomass fuel used by domestic consumers.

N.9 There are other mineral and biomass fuels, but these are not ordinarily used by domestic consumers as they are not suitable for most appliances or most residential areas.
Other mineral fuels include petroleum coke, which can, according to industry advice, damage appliances if used in an unblended form.\textsuperscript{157}

Other biomass fuels include charcoal (which is used as a metallurgical fuel), agricultural products (including waste products and plant matter), food waste, and animal waste (such as manure and poultry litter), which are mainly used in farming and the industrial sector. As these types of biomass fuel are not typically used by domestic consumers, wood, being the most popular domestic biomass fuel, will form the focus of the rest of this section.

Apart from their physical appearances, the suitability of these fuels will depend on cost, calorific content, and type of appliance in use.

In the domestic sector, mineral solid fuel is generally cheaper and will normally have higher heat (that is, calorific) content than wood, which typically has less than half the calorific value of other solid fuels. This means that mineral solid fuel is able to produce more heat for a longer period of time.

However, wood is widely available throughout the UK, has lower carbon emissions and as such is, compared to mineral solid fuels, preferred as a more environmentally friendly option in terms of carbon emissions.\textsuperscript{158}

Both types of solid fuel can be used in fireplaces, stoves or in a central heating system, although different variants may be more suited to specific uses or appliances. Appliances may be multi-fuel, offering the possibility to burn a mix of different types of solid fuels.

\textsuperscript{157} See for example, \url{guide.hetas.co.uk/guide_appliances.html} and \url{www.specflue.com/regulations/solid_fuel_guide.pdf}

\textsuperscript{158} See for example, \url{www.energysavingtrust.org.uk/Generate-your-own-energy/Wood-fuelled-heating www.stovesonline.co.uk/fuel-CO2-emissions.html}. The EST estimates that by replacing coal with pellet central heating in a typical three-bedroom semi-detached house 7.5 tonnes of CO\textsubscript{2} per year would be saved.
N.11 Table N.3 summarises the main mineral and wood fuels used by domestic consumers.
Table N.3: Main solid fuels used by domestic consumers

<table>
<thead>
<tr>
<th>Mineral</th>
<th>Biomass – Wood Fuel</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Bituminous coal:</strong> This is raw, natural coal. It is the most traditional fuel for open fires with a high calorific content. It can also be used in many multifuel stoves. It is relatively cheap compared to other mineral solid fuels and is available in various sizes (for example, lumps are more suitable for domestic use and the smaller ‘slacks’ are used for industrial purposes. The size of the coal used will depend on the type of appliance. Victorian bar-fronted fireplaces typically use the larger sizes whilst smaller sizes tend to be used in modern appliances.</td>
<td><strong>Fuel Logs:</strong> This is the most common form of wood fuel and can be used in a stand alone log stove or in wood and log fuelled boilers. Fuel logs have a high calorific content compared to other biomass fuels and around 90 per cent of the heat released is captured to heat the property, making them very efficient.</td>
</tr>
<tr>
<td><strong>Natural smokeless fuels:</strong> These fuels are generally approved as closed appliance fuels and are used in room heaters and boilers. The most popular natural smokeless fuel is anthracite. Anthracite (which is comparable to dry steam coal) is similar in appearance to coal though less dusty. It is more expensive than coal but has a high calorific value. Anthracites are available in two sizes for closed appliances: large nuts and small nuts. The larger size is preferred for room heaters and freestanding boilers.</td>
<td><strong>Heat logs:</strong> These products (sometimes referred to as wood briquettes) are manufactured from sawdust and bound or pressed together into a log shape. They incorporate a flammable substance that makes the product easy to light. Some are authorised for use in smoke control areas. Heat logs are suitable for use on open fires but they have a low calorific value and will only give a fire lasting for two or three hours.</td>
</tr>
<tr>
<td><strong>Manufactured smokeless fuels:</strong> These fuels have a similar calorific value to bituminous coal and can come in different sizes and shapes (for example, nuggets or oval). They are mainly coke (cokes and coke blends),</td>
<td><strong>Wood chips:</strong> Wood chips are generally a by-product of the arboriculture industry. They are also often produced from waste timber. Wood chips are used in screw-fed stoves and boilers and are most suitable for larger</td>
</tr>
</tbody>
</table>

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159 Calorific values can be found at [www.decc.gov.uk/assets/decc/statistics/source/cv/dukesa_1-a_3.xls](http://www.decc.gov.uk/assets/decc/statistics/source/cv/dukesa_1-a_3.xls)

160 This is made by reducing the volatile content of coal, grinding it, and mixing it with a range of fuels.
Mineral | Biomass – Wood Fuel
--- | ---
which are usually sold by brand name. Coke is derived from coal that is processed to eliminate most of the smoke-producing components. While both coal and coke may be used in coal stoves, coke is preferred in smoke controlled areas. Like coal, coke is suited to many multifuel stoves and may be used in room heaters. | domestic dwellings, such as a farmhouse or for commercial premises such as leisure centres. | Wood pellets: These are typically manufactured from timber waste from sawmills. They are used in specially designed stoves and fireplaces and have a low calorific content. The high density of wood pellets means they require less storage space than logs or wood chips.

Source: Solid Fuel Association (SFA) website, HETAS website, Environmental Protection UK

### The solid fuel market

**Market Size and Demand**

The total market for mineral solid fuels has been declining since the middle of the twentieth century. Cheaper oil based energy sources along with factors such as the 1956 Clean Air Act, the transition to diesel engines in the railway sector, increasing mining difficulties and increasing levels of consumer environmental awareness, have led to a

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161 Arboriculture is the cultivation and care of trees and is primarily focused on individual woody plants and trees.

162 [www.solidfuel.co.uk/frame/main.html](http://www.solidfuel.co.uk/frame/main.html)

163 [www.hetas.co.uk](http://www.hetas.co.uk)

dramatic decline in the use of mineral solid fuel. This decline also included a marked decrease in the early 1980s associated with a fall in oil prices and a change in UK energy policy, which led to the privatisation of the British Coal Corporation. This was followed by the mass pit closures of 1984/5 which also had an adverse impact.

- With regards to domestic consumption, in 1970, mineral solid fuel accounted for 49 per cent of total fuel used, but by 2006 this figure stood at just over one per cent.\textsuperscript{165} From this point the domestic consumption recovered slightly to almost two per cent in 2007 and has been relatively stable up to 2009, as illustrated in Figure N.4 below.

N.13 In contrast, the demand for wood is on an upwards trend. Between 1993 and 2009, there was a 36 per cent increase in the use of wood to generate heat.\textsuperscript{166} While wood fuel has been used with varying popularity for many centuries, efforts to reduce the use of fossil fuels and to help mitigate the effects of climate change in recent times have seen a steady increase in the use of wood fuel as an alternative source of heating. Further growth is expected in both the industrial and domestic sector.\textsuperscript{167}

- With regards to domestic consumption, wood combustion for heating purposes rose by 26 per cent between 2006 and 2009.

\textsuperscript{165} Derived from volume data in DECC’s \textit{Energy consumption in the UK}.

\textsuperscript{166} Derived using volume data from DECC’s \textit{Digest of UK Energy Statistics} (DUKES), Table 7.1.1.

\textsuperscript{167} DECC’s Digest of UK Energy Statistics (DUKES), Chapter 7.
Figure N.4: Domestic mineral solid fuel and wood fuel consumption 2000 – 2009

Based on the domestic consumption data (shown in Figure N.4 above), growth in domestic use of wood fuel has been greater than in the domestic use of mineral solid fuel. However, in terms of volume used for heating purposes, mineral solid fuel is more than twice that of wood fuel.

- Data obtained from the Digest of UK Energy Statistics published by DECC show that mineral solid fuel accounts for two per cent of UK energy consumption by the domestic sector whilst biomass (including wood) accounts for one per cent.

- Figure N.4 illustrates that in 2009:
  - Domestic consumption of coal stood at 0.7 million tonnes of oil equivalent and domestic consumption of coke, coke breeze and other manufactured solid fuels amounted to 0.1 million tonnes of oil equivalent.
  - Almost 0.4 million tonnes of oil equivalent of wood was used by the domestic sector for heating.
The supply structure

N.15 The main industry bodies for suppliers of mineral solid fuel are:

- Solid Fuel Association (SFA): The SFA promotes awareness of the benefits of biomass and solid fuel heating, safety in use, and best installation practices among domestic consumers. It is funded by solid fuel and biomass producers, fuel distributors, and appliance manufacturers and retailers.

- Coal Merchants Federation (GB) Ltd (CMF): CMF is a member body of the SFA. It represents a merging of the retail and wholesale distributive coal trade associations, with the retail division including the Coal Merchants Association of Scotland (CMAS) as an affiliated member. The CMF runs an Approved Merchants Scheme with a code of practice to which all of its members must sign up.\(^{168}\)

N.16 The main industry bodies for suppliers of wood fuel are:

- HETAS: HETAS plays an important role in quality assurance for the industry. It is the organisation recognised by the Department of the Environment as the official testing and approval body for biomass and other solid fuels, relevant domestic heating appliances, and services (including the registration of competent installers and servicing businesses).

- There are no approved merchant schemes for wood fuels, but standards are currently being developed by the European Committee for Standardisation. Once finalised, these will help consumers to choose the right type and quality of fuel for their appliance.

N.17 The supply available for each type of solid fuel is described in more detail in the following sections.

\(^{168}\) A similar merchant scheme does not exist in NI.
Mineral solid fuel

N.18 There are a large number of coal merchants across the UK serving domestic consumers, who typically supply all three main mineral fuels – coal, anthracite and coke.

• In England, Scotland and Wales there were over 750 coal merchants who were members of the CMF in 2009. However, an unknown number of merchants trade outside these schemes and may amount to a further 75 to 100 suppliers.

• In NI, there are about 100 coal merchants.

N.19 The market for the supply of mineral solid fuel to domestic consumers is characterised by a large number of small suppliers and only two national suppliers – CPL Distribution Ltd and Corralls with both selling over 19,000 tonnes a year to domestic consumers.\(^{169}\) According to data from the CMF, 76 per cent of its members sell less than 1,000 tonnes a year (typically delivered by two men and a single lorry) whilst only about three per cent of all merchants are larger suppliers selling more than 3,000 tonnes per annum. Mineral solid fuels are also sold at outlets such as garage forecourts, DIY shops, corner shops, and garden centres. According to the SFA, the total number of such retailers is estimated by the SFA to be as high as 10,000.\(^{170}\)

N.20 Solid fuel users tend to buy in a series of purchases throughout the heating season, paying in cash or by cheque. We were told by the CMF that customers who have their fuel delivered typically purchase 10 or 20 bags at a time. When purchasing mineral solid fuel, the SFA recommends that consumers buy from a coal merchant who is a member of the Approved Coal Merchants Scheme and have signed up to the Coal Trade Code.

\(^{169}\) CPL Distribution is the larger of the two national suppliers.

\(^{170}\) Information provided by SFA in an unpublished SFA document.
Suppliers will typically deliver fuel directly to customers either in open sacks of 50kgs or in plastic pre-packed bags of 25kgs. The delivery of open sacks is regulated by the Weights and Measures Act 1985. Subject to Section 26 of the Act, a statement in writing of the quantity must be delivered to the consignee at or before delivery of the goods. Quantities not exceeding 110 kilograms in a single delivery are exempt from this. Therefore, deliveries of less than three 50kg bags will be exempt. However, since consumers typically purchase more than three bags at a time, most deliveries would not be exempted.

Pre-packed fuels, estimated by the SFA to account for 30-40 per cent of the domestic market, are usually more expensive than open sack ones. Many merchants operate cash and carry depots where customers purchase pre-packed fuels. Pre-packed fuels are also available at various outlets but the range on offer is sometimes limited and may only cater for open fires.

Wood

According to data obtained on wood fuel suppliers from the Biomass Energy Centre, there are around 280 regional wood fuel suppliers in the UK (with 100 in England, 72 in Scotland, 97 in Wales, and 7 in NI). Of these, 66 have national coverage.

Unlike coal and smokeless fuels which have to be sold in defined weights, no weights and measures regulations exist in relation to wood. Logs and wood are usually sold in 'nets' or by lorry load. Wood fuel can be purchased by volume or weight. However, according to the SFA, it is better to purchase wood by volume, rather than by weight as between 35-60 per cent of the weight of freshly felled wood is water.

Fuel logs usually come from local sources and can be bought from a variety of outlets (for example coal merchants, farmers, and tree

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Information on wood fuel suppliers can be found at: [www.biomassenergycentre.org.uk/portal/page?_pageid=73,1&_dad=portal&_schema=PORTAL](http://www.biomassenergycentre.org.uk/portal/page?_pageid=73,1&_dad=portal&_schema=PORTAL)
surgeons) for approximately £150 for a 1 cubic metre bag. Heat logs are relatively expensive at approximately £12 per 20kg and can be purchased from coal merchants as well as from outlets such as supermarkets, garages, and DIY centres. Wood chips are sold for roughly £20 per 60 litres.\(^{172}\) As they are bulky, they can be expensive to transport, however they can also be purchased from garden centres. Pellets are typically priced at £11 per 10kg and can be bought in bags, typically in weights of 10 – 20kg or in bulk. If bought in bulk, they can be delivered by a special lorry with a blower and a hose which can supply up to four tonnes into a storage hopper or a container. Similar to the wood chips, pellets can also be purchased in garden centres or directly through suppliers.

**The role of solid fuel as an off-grid alternative**

**N.26** There are several benefits to using solid fuel for heating. Solid fuel is an efficient and easy to use source of energy. It is available in abundance and unlike heating oil and LPG is not subject to the pressures of scarcity and security of supply. As a result, solid fuel typically has a lower running cost than other off-gas grid heating fuels. For example, for an average size three bedroom house, the average cost of space and water heating is £1,255 using wood pellets, £1,248 using coals, and £1,089 using anthracite nuts. This compares favourably to £1,259 using electricity (economy 7), £1,611 using heating oil, and £2,272 using LPG.\(^{173}\)

**N.27** There is also a wide variety of solid fuels and a large number of suppliers. This provides the consumer with a range of choices to meet their diverse needs. Solid fuel is also relatively easy to source and transport. It can be delivered by solid fuel merchants or purchased at a number of local retail outlets and does not face the same health and safety barriers or restrictions on deliveries as do heating oil and LPG.

\(^{172}\) Wood chips, although solid, are most commonly measured in the industry by litres.

\(^{173}\) Sutherland Tables, July 2011 data.
However, there are drawbacks to using solid fuel, in particular the impact on the environment. Coal and other mineral solid fuel systems will usually have a greater impact on the environment than an equivalent gas system as they will generally release more air pollutant and carbon dioxide. Although wood is usually regarded as being 'carbon lean' and will typically emit far less carbon dioxide over its lifetime than natural gas, it may still have environmental impact through emissions associated with the harvesting and transporting of the wood and the manufacture of the wood fuels. This drawback is likely to be a major deciding factor in the future growth of the solid fuel market. Unless technology is available to reduce carbon emissions, given Government measures to cut carbon emissions, use of (mainly mineral) solid fuel as a source of heating is likely to decline in the future.

A related barrier to using solid fuel is the potential health effects that can result from handling and using solid fuel. For instance, air pollutants such as particles and sulphur dioxide can lead to breathing difficulties and carrying heavy sacks can be a challenge for the elderly or people with physical disabilities.

As with heating oil and LPG, delivery of solid fuel during harsh weather conditions can be problematic. Some users may not have adequate storage facilities to store sufficient fuel to meet their heating needs during the winter period. As such, they may need to make several orders increasing the risk of delivery problems.

For consumers looking to use solid fuel and who require a new chimney or appliances, switching could be costly. Cost can range from about £500 to £2,000 for a new chimney, about £250 to £2,000 for a

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174 The relative carbon emissions of solid fuel compared to gas can be found at [www.nef.org.uk/greencompany/co2calculator.htm](http://www.nef.org.uk/greencompany/co2calculator.htm)

175 See [www.forestry.gov.uk/forestry/infd-7m8g28](http://www.forestry.gov.uk/forestry/infd-7m8g28) for further details.

176 Estimation of the costs of installing a new chimney was provided by SFA.
stove and about £1,000 to over £7,000 for a boiler.\textsuperscript{177} These costs are similar to the installation costs of microgeneration technologies such as solar thermal and micro wind.\textsuperscript{178}

N.32 As an economical and efficient source of heating fuel with a wide variety of variants to choose from, solid fuel is an attractive off-grid source of energy. However, immediate primary switching costs are still substantial for those without the necessary infrastructure or equipment. Moreover, the environmental impact of mineral solid fuels is at odds with government policy and therefore its potential to be a long term alternative source of fuel for consumers on heating oil and LPG is limited. It is more likely to remain as a supplementary source of fuel for domestic users.

**Consumer experience**

N.33 Indicative results from the SPA qualitative research and from a survey commissioned by Consumer Focus\textsuperscript{179} suggest that consumers' experience in using solid fuel is mixed. Respondents to the SPA research generally expressed dissatisfaction with quality and effectiveness. For instance, on quality one respondent stated 'There are four people in the area who sell wood and they’re all about the same price but the wood quality is quite variable' and on effectiveness, one respondent stated 'I've got an open fire. I think it is expensive and my heating isn’t efficient. If you’re out working all day your heating’s not working until you get in. I don’t think it is cost effective'.

\begin{enumerate}
\item \textsuperscript{177} Estimates of the costs for a solid fuel stove and boiler were obtained from an internet price comparisons for stoves and boilers.
\item \textsuperscript{178} Average microgeneration installation costs are provided in Table 6.6 in Chapter 6 of the main report.
\item \textsuperscript{179} Obtained from the Gill Wales Research report, *Heating fuel buying behaviour among consumers who do not use mains gas*, May 2011, which was commissioned by Consumer Focus.
\end{enumerate}
However, based on a sample of 30 respondents, the survey commissioned by Consumer Focus found that in England three in four people who use solid fuel as their main source of heat are satisfied with their heating system. In addition, the results indicated that most users think their homes are warm enough and that it is easy to keep warm. In addition, nine out of 10 say they had as much heat as they wanted last year. The survey also found that delivery and storage were not areas of concern.

Based on the number of mineral solid fuel and wood fuel suppliers and the range of products available, users appear to have a variety of choices to meet their needs. However, responses to our Off-grid Market Study call for evidence reveal that in some areas there is limited choice of suppliers. For instance, we were told that in Inverness and the West Highlands, there is only one main supplier.

With regard to price, our roundtable participants and the SPA research indicated that the price of solid fuel has risen alongside heating oil but unlike heating oil, retail prices do not fluctuate but increase year on year.

Given the small sample base for both these research studies, any results are at best indicative. Since only a few households surveyed use solid fuel as a main source of heating, an extensive survey would be required to get a robust idea of consumers’ experience in using solid fuel.

Conclusions and recommendations

Our examination of the solid fuel market has necessarily been high level within the context of this study, where we have primarily been concerned with understanding its role as an alternative and hence a potential competitive constraint to heating oil and LPG.

We have not found solid fuel to be a strong alternative as a primary heating source (and its future prospects in this regard are considerably weakened by policy and environmental direction). However, solid fuel is an important and widely used supplement to heating oil and LPG with which many off-grid consumers are happy.
Within our study, we received few representations from consumers regarding issues in the solid fuel market. Insofar as the functioning of this market itself goes, our findings detailed above do not appear to give any immediate cause for concern regarding endemic problems in the industry that would necessitate follow up or further study at this time. However, this should not be interpreted as confirmation of a clean bill of health given the limited review undertaken to date.
O THE REFERENCE TEST

O.1 In order to make a market investigation reference (MIR) to the CC, the OFT must have reasonable grounds for suspecting that any feature, or combination of features, of a market in the UK for goods or services prevents, restricts or distorts competition in connection with the supply or acquisition of any goods or services in the UK or part of the UK (the 'reference test').

O.2 The reference test sets out the three types of market feature that could have an adverse effect on competition for the purposes of a MIR – structural features, conduct of firms, and the conduct of customers. Our guidance says that there will often not be clear separation between structural features and those relating to conduct.

O.3 Where the reference test is met, the decision on whether to make a reference rests on the exercise of the OFT’s discretion. The OFT’s guidance on market investigation references sets out four criteria that must, in our view, be met before we decide to make a reference:

- Alternative powers – it would not be more appropriate to deal with the competition issues identified by applying the Competition Act 1998 (CA98) or using other powers available to the OFT or, where appropriate, to sectoral regulators.

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180 The reference test is set out under section 131 of the Enterprise Act 2002.

181 Paragraph 1.9 of the Guidance.


183 Paragraph 2.1 of the Guidance.
• Proportionality – the scale of the suspected problem, in terms of its adverse affect on competition, is such that a reference would be an appropriate response to it.

• Availability of remedies – there is a reasonable chance that appropriate remedies will be available.

• Undertakings in lieu – it would not be more appropriate to address the problem identified by means of undertakings in lieu of a reference.

O.4 The OFT is not required to draw firm conclusions on the definition of the relevant market for the purpose of a market investigation reference provided it has sufficient understanding of the relevant competitive constraints to enable it to reach a view whether the effects on the competitive process are sufficient (or otherwise) to justify a reference.\textsuperscript{184}

\textsuperscript{184} Paragraphs 4.8 to 4.12 of the Guidance.
ACKNOWLEDGEMENTS

P.1 In the course of our market study, the OFT received submissions from and/or held discussions with: individual consumers; consumer organisations; industry; central, devolved and local government; regulators; other private sector organisations and other interested parties.

P.2 We spoke and corresponded extensively in our study with representatives from companies involved with heating oil, LPG, microgeneration technologies, solid fuels and electricity. We do not name individual companies for possible confidentiality reasons. However, we would like to thank all companies who have been in contact with us for the information provided and cooperation.

P.3 Other than individual companies in the sectors covered by this study, and in addition to contributions from individual consumers, we received information from the following key interested parties. This list is not exhaustive. We are grateful for the time and interest of all contributors and their willingness to assist the OFT in its work.

Trade associations

- Coal Advisory Service
- Coal Merchants Federation
- Federation of Petroleum Suppliers
- National Caravan Council
- National Farmers Union
- Northern Ireland Oil Federation
- Oil Firing Technical Association
- Renewable Energy Association/REAL
• Solid Fuel Association
• Solar Trade Association
• UKLPG
• UK Petroleum Industry Association

Gas distribution networks and other third parties
• AEA Technology Group plc
• National Grid Networks
• Northern Gas Networks
• Scotia Gas Networks
• Wales & West Utilities
• Wood MacKenzie
• Xoserve Ltd

Consumer, community interest, charitable and not-for profit bodies
• Action With Communities in Rural England
• Citizens Advice
• The Consumer Council for Northern Ireland
• Consumer Focus
• Consumer Focus Scotland
• Consumer Focus Wales
• Energy Saving Trust
• National Energy Action
• National Energy Action (Northern Ireland)
• National Grid Affordable Warmth Solutions
• St Vincent de Paul Northern Ireland
• Which?

Government and Regulatory Bodies

• Competition Commission
• Department for Environment, Food and Rural Affairs
• Department of Energy and Climate Change
• Department for Social Development (Northern Ireland)
• Department of Enterprise, Trade and Investment (Northern Ireland)
• Health and Safety Executive
• Local Authority Trading Standards Services
• Local Government Association
• Northern Ireland Authority for Utility Regulation
• Northern Ireland Housing Executive
• Office of Gas and Electricity Markets
• Scottish Government
• UK Forestry Commission (via the Biomass Energy Centre)
• Welsh Government