The use of LPG in off-grid domestic properties

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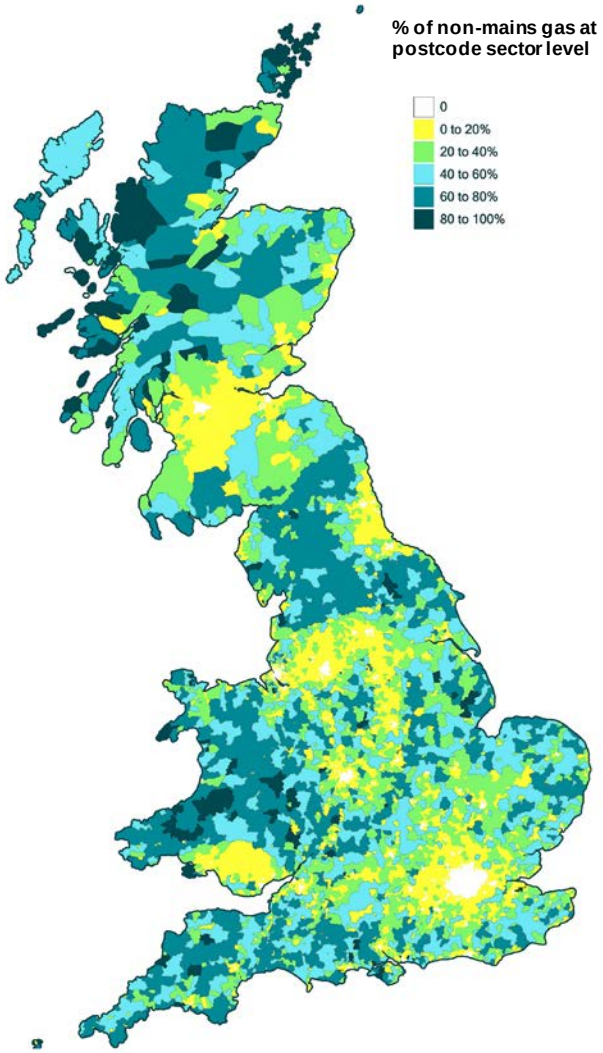
Where is off-grid Britain

- The UK's gas grid network extends to 84% of UK households. Of the remaining 16%, 2 million properties are rural off-grid homes that without LPG would not otherwise have access to gas as a clean, versatile and efficient fuel.
- LPG plays a key role in the rural energy mix, ensuring that these homes and businesses have access to gas and the significant advantages provided by gas powered systems and technologies, that support both cooking and heating requirements.
- LPG is the lowest carbon conventional energy source available to many off-grid homes and businesses which provides immediate, expedient and cost-effective heat and energy.



SOURCE: https://www.uklpg.org/uploads/DOC5B1F84CF86FC4.pdf

Nature of rural off-grid / off-grid heating challenge

Domestic

- Hard to heat, hard to treat
- Difficult to retrofit renewable low temperature heating solutions

Commercial

- Industry sectors; hospitality and leisure, manufacturing plants and factories, British agricultural sector, logistics and transport businesses inc NRMM (non-road mobile machinery)
- High grade heat requirements
- The off-grid location of these commercial enterprises is often intrinsic to their business type and operation. Access to high grade heat is critical in order to meet the heat demand and process temperatures required for these businesses to operate effectually. It is important to recognise that the off-grid fuel supply options available to support such heat demand is currently limited to coal, oil and LPG

Clean Growth Strategy Objectives

DEFRA Clean Air Strategy –

'ambitious, legally binding international targets to reduce emissions of five of the most damaging air pollutants (fine particulate matter, ammonia, nitrogen oxides, sulphur dioxide, non-methane volatile organic compounds) by 2020 and 2030.

October 2017 Clean Growth Strategy

"to phase out the installation of high carbon fossil fuel heating in new and existing business buildings off the gas grid during the 2020s"

" to reduce emissions from heating the 850,000 homes currently not connected to the gas grid in England and that use oil for heating"

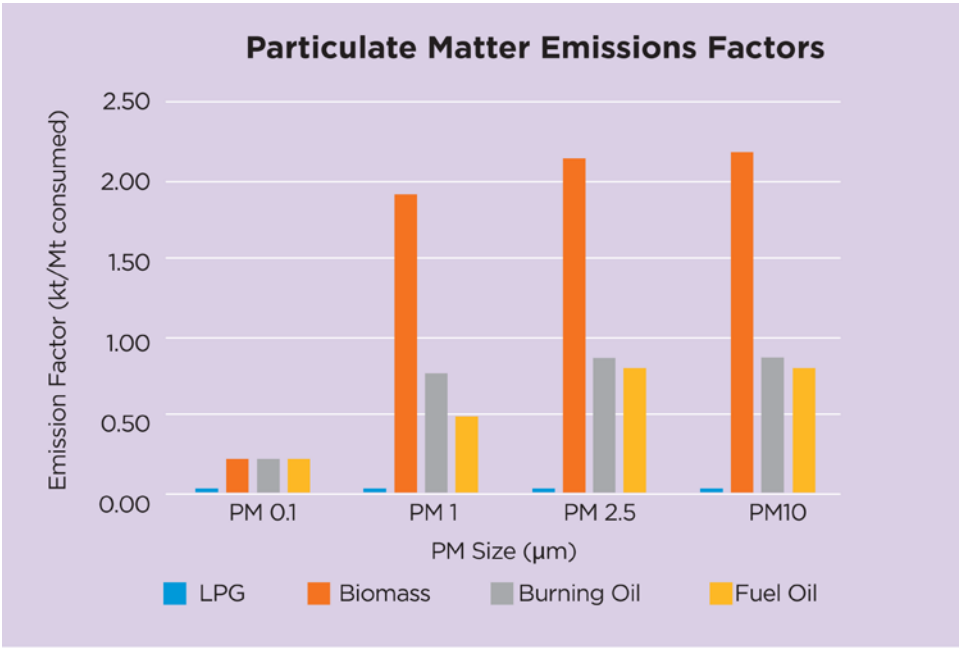
Benefits of LPG

There is no heating process currently fulfilled by coal or oil that cannot be replaced by LPG

LPG cleaner than alternative off-grid fuels

	Increase in CO_2 emissions relative to LPG	Increase in N_2O emissions relative to LPG
LPG	----	----
Kerosene	12%	197%
Fuel oil	23%	197%
Industrial coal	44%	2054%
Electricity	78%	864%

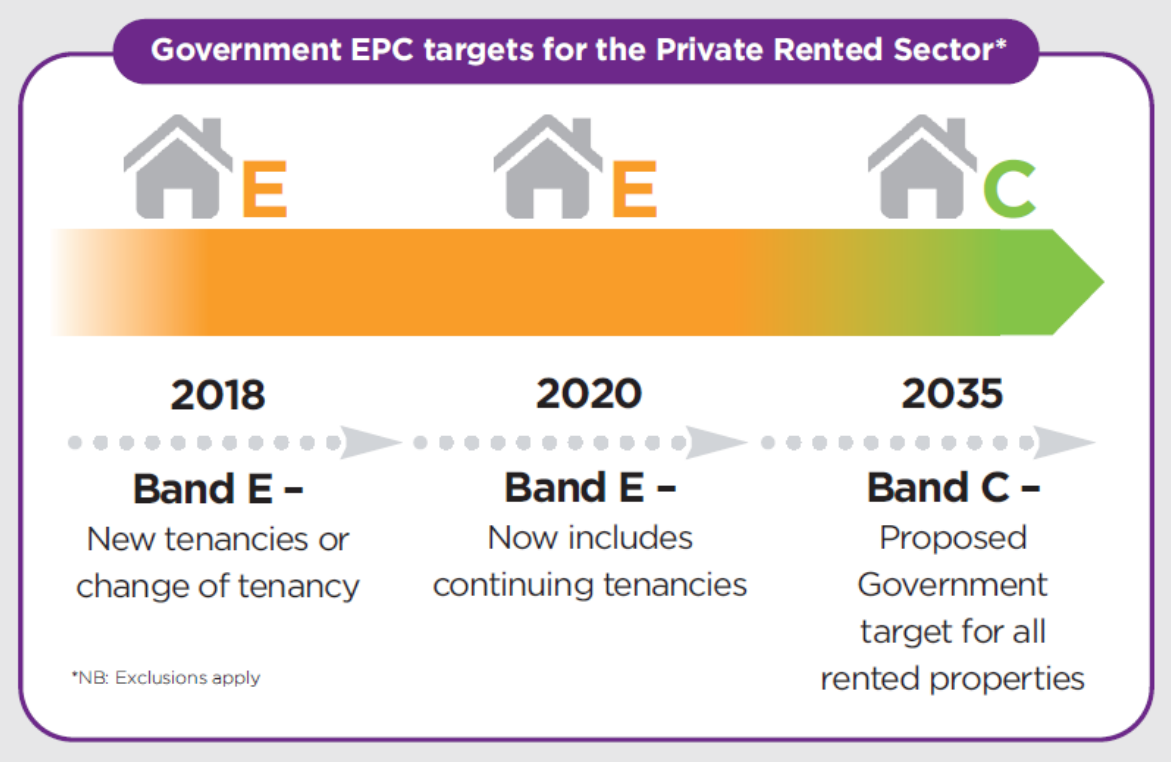
Source: BEIS Greenhouse gas reporting - Conversion factors 2016



Source: National Atmospheric Emissions Inventory (NAEI) 2016

FLO GAS

Issues with MEES for PRS



- Landlords driven to high carbon fuels to comply
- Domestic and Commercial methodologies – varying
- Consumer Confusion – energy efficiency?

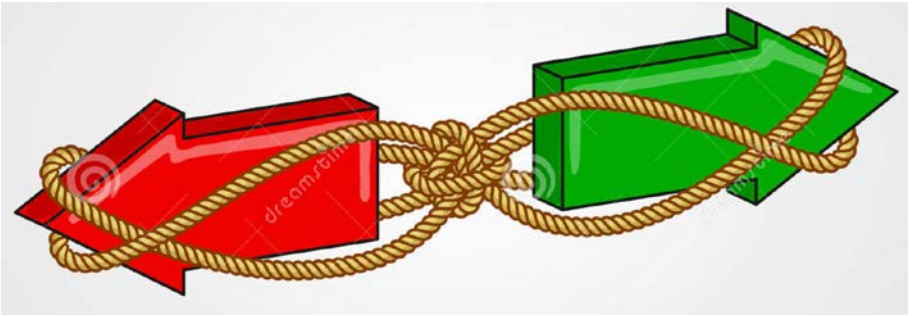
MEES promotes higher carbon fuels in off grid properties

FEATURE	DETAILS
LOCATION	Norfolk
BUILDING TYPE	Semi-detached Rural cottage
AGE	Pre-1900
SIZE	~110m^2, 3 bedrooms
WALLS	Mix of stone and solid brick, no insulation
ROOF	Pitched tiled roof, 250mm insulation at joists
FLOORS	Solid floor, no insulation
WINDOWS	Secondary glazing
HEATING	84% efficient combi boiler*

*electric heating is always treated as 100% efficient in SAP

FUEL	HEATING	ASSET RATING	EI RATING
BULK LPG	Condensing combi	F23	E44
BOTTLED LPG	Condensing combi	G10	E44
MAINS GAS	Condensing combi	D57	E48*
HEATING OIL	Condensing combi	E40	F35
ELECTRICITY	Dry Core	G4	G19
	Storage Heaters**	E42	F24

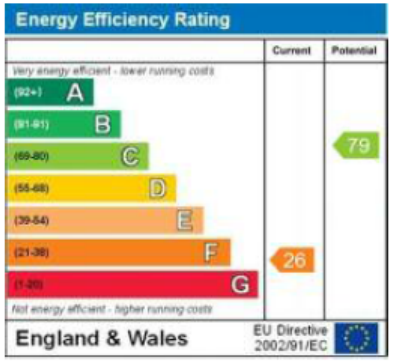
*note that the RdSAP software used for producing Domestic EPCs treats LPG as having a higher emissions factor than mains gas (SAP2012 Table 12) **High heat retention storage heaters



The above shows that while the dwelling configured to use LPG does not meet the PRS(MEES) criteria, the same property, when heated with mains gas, will meet the criteria.

The property will also achieve the PRS(MEES) criteria if configured to use an oil boiler or high retention electric storage heaters, despite the worse Environmental Impact Rating, indicating higher carbon emissions.

Domestic vs Commercial Methodology

	NON-DWELLING	DWELLING
METHODOLOGY	SBEM 5.4b	RdSAP 9.93
ASSET RATING		
CO2	9.70 tonnes	7.60 tonnes
ENERGY COST	N/A	£2139
EI RATING	N/A	E46

The results show that should this property be assessed as a commercial building, which is assessed on emissions, it would achieve a D rating, and would comply with the PRS(MEES) regulations.

Should the same building be assessed as a dwelling, which is assessed on energy cost, it would achieve an F rating, and would require improvements before it could comply with the PRS(MEES) regulations.

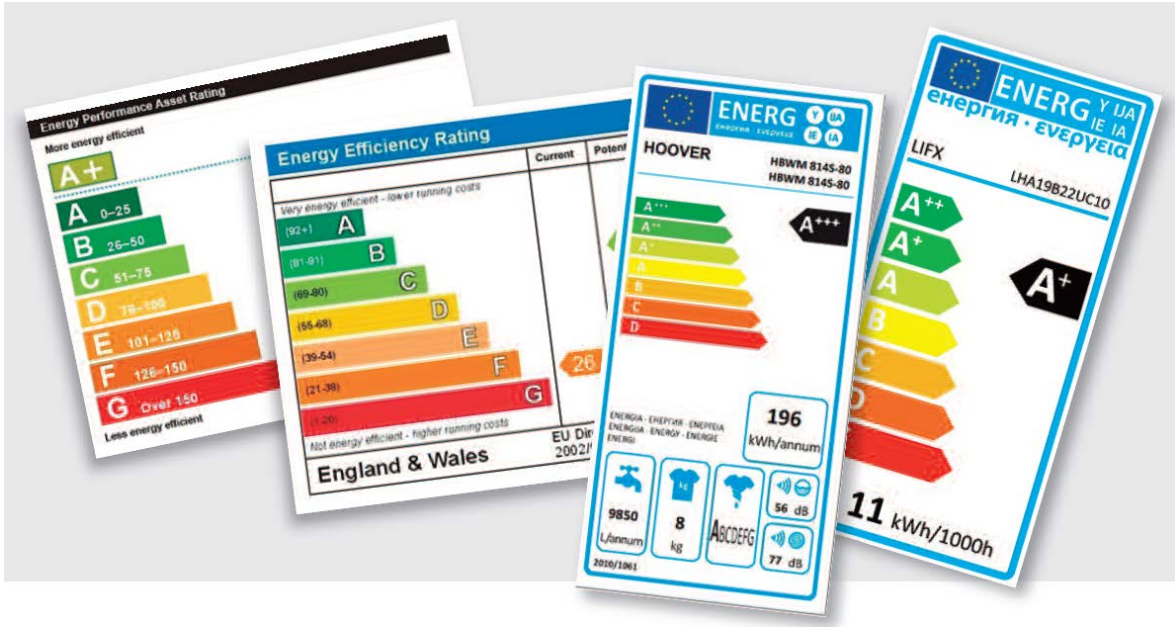
The SAP EPC also lists an "Environmental impact" (EI) rating which is given an E rating, however this is not used for the PRS(MEES) compliance. Interestingly, the predicted emissions from SBEM are significantly higher than SAP.

FEATURE	DETAILS
LOCATION	North Wales
BUILDING TYPE	Rural detached farmhouse
AGE	Pre-1900
SIZE	~150m^2, 4 bedrooms
WALLS	Solid brick walls, no insulation
ROOF	Pitched slate roof, 250mm insulation at joists
FLOORS	Suspended timber floor, no insulation
WINDOWS	20mm UPVC double glazing
HEATING	Alpha Intec^2 35CE Boiler fed by Bulk LPG

Consumer Confusion

EPC Label used in:

- EPC Domestic – costs
- EPC Commercial – building emissions
- DEC – emissions
- Vehicles – emissions
- Light bulbs – power consumption
- Boilers and AC – energy efficiency
- Household Appliances – power consumption



Measures & Recommendations

1.8 Replacement of primary heating appliances

When replacing an existing appliance, the efficiency of the new appliance should not be significantly less than the efficiency of the appliance being replaced. If the replacement involves a fuel switch, then the relative carbon emissions associated with the new and existing fuels should be considered when assessing the reasonableness of the proposed new appliance. The aim is to discourage replacement of an existing appliance by a significantly less carbon efficient one.

Replacement not involving fuel or energy switch

Where the primary heating appliance is replaced by one using the same fuel or energy supply, the seasonal efficiency of the new equipment should be:

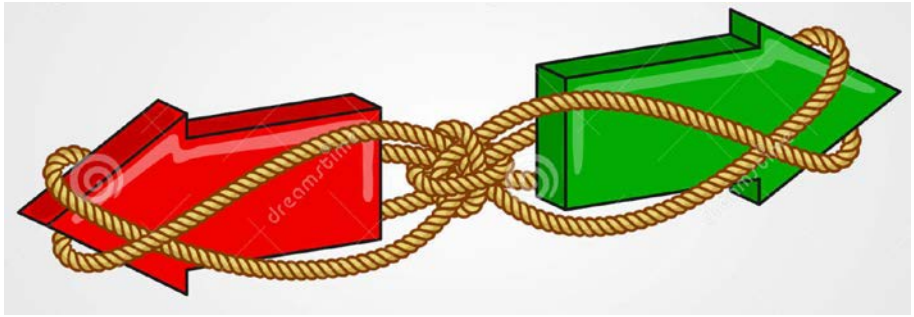
a. as stated in the relevant fuel-based section of this guide, and

b. not worse than 2 percentage points lower than the seasonal efficiency of the controlled service being replaced. If the efficiency of the appliance to be replaced is not known, efficiency values may be taken from Table 4a or 4b of SAP 2012.

Replacement involving fuel or energy switch

If the new heating appliance uses a different fuel, the efficiency of the new service should be multiplied by the ratio of the carbon dioxide emission factor of the fuel used in the service being replaced to that of the fuel used in the new service, to obtain the 'carbon equivalent efficiency'. The checks described in sub-paragraphs a. and b. above should then be made. The carbon dioxide emission factors should be taken from Table 12 of SAP 2012.

- Building regulations prevents switching to higher carbon solutions
- Exemptions register



Recommendations

1. Remove fuel cost element of EPC

2. Include carbon emissions as part of methodology