
Big Savings on Britain's Doorsteps



Composite Doors and the Green Deal

Compiled by D&G Consulting

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Executive Summary

This report, commissioned by Door-Stop International, outlines the potential for energy efficient door sets in the UK, against the requirements of the Government's Green Deal initiative.

It demonstrates that replacing an old wood, aluminium or PVC door with a high performing composite door will save homeowners money through reduced heat loss (so they keep the thermostat at a lower level and on for shorter periods to achieve a comfortable temperature).

Although the door and window industry has been sceptical of aspects of the Green Deal – its complexity and bureaucracy, a bias towards large companies, and lack of Government marketing to the public of the scheme – it is in no doubt as to the need for improvement in Britain's housing stock. The Green Deal is likely to stimulate demand for energy saving measures such as high performance insulating doors by highlighting the savings homeowners can make and the short payback periods.

- There are an estimated 31 million doors that are over 10 years old installed in UK dwellings.
- In at least 19 million cases replacing these doors with high performing insulating doors would produce annual energy and money savings for the homeowner.
- A high performing insulating door is a composite door – accepted by industry to be the most energy efficient available. New aluminium, wood, and PVC panel doors find it hard to achieve the same energy saving levels and those that do are unlikely to meet the Green Deal Golden Rule because of the cost.
- High performing insulating doors are considered by the Government to be the third most cost effective of the 45 measures that achieve the Green Deal's Golden Rule objectives.
- The potential for energy saving is significant; especially if you consider that many doors have excessive gaps between the door and frame because of warping, shrinking and poor fitting. Heat escapes through these gaps as well as through the lower performance doors themselves. High performance insulating (composite) doors are more durable and longer lasting so they can be expected to retain their energy efficiency for longer thus saving more in the long term, and protecting against energy inflation.
- The payback period is likely to be quicker than the Government's figures for most doors but will depend on the type of door an energy efficient one replaces.

- Actual paybacks range from 5 to 19 years but average around 10 depending on the type of door being replaced and the condition it is in (see Table 6). But these are potentially long lived doors and can be expected to continue saving energy and money for years after payback.
- No matter how homeowners choose to fund their purchase, energy efficient doors can save energy and pay for themselves quickly, in addition to the benefits of a new composite door: improved appearance, better security and peace of mind etc.
- Other markets such as new and social housing can also benefit from energy efficient composite doors.
- The scope for saving energy, carbon emissions and money for UK homeowners and the UK is substantial, and the payback is quick with the potential to keep generating savings after that.
- Compared to most energy saving measures high performance insulating 'composite' doors are a simple, cost effective way to save energy and cut household bills.

1.0 Introduction

The objective of the Green Deal is to provide funding for homeowners to install energy saving measures in their homes with no up-front costs. As savings accrue from the energy saving measures the homeowner will repay the initial funding through their energy bills – the savings balancing out the cost.

Some of the energy saving projects listed by the Government in their *What Measures does the Green Deal Cover* is likely to incur high costs (e.g. boilers and external wall insulation). However, there are less costly projects that have the potential to recover the cost of funding fast (e.g. cavity wall and loft insulation) – the Government has reported, though, that a high percentage of homes have already had loft and cavity walls insulated. This opens up the possibility for both energy efficient doors and windows to benefit from Green Deal funding.

This report, commissioned by Door Stop International, outlines the potential for energy efficient door sets in the UK. Where possible the report provides hard statistics and calculates the results which are designed to stimulate providers and installers of doors to look deeper into the Green Deal and encourage homeowners and landlords to take advantage of the scheme and secure orders to install composite door sets.

The Green Deal has aroused considerable scepticism from the industry as to its impact upon the fenestration sector.

Where possible information including test results have been used in preparing this report together with other authoritative sources including:

- Department of Energy and Climate Change (DECC)
- Office of National Statistics
- Met Office
- Building Regulations Approved Document L
- Glass and Glazing Federation
- BBC
- CEN Solutions
- Association of Composite Door Manufacturers (ACDM)
- BuildCheck Limited
- British Fenestration Rating Council (BFRC)
- Other D&G Consulting Reports
- Composite Door Manufacturers and Installers

2.0 The Green Deal

The Green Deal is the Governments 'flagship' policy aimed at improving the energy efficiency of buildings in Great Britain. Many who read this report will be familiar with the framework of the Green Deal. However, for completeness it is outlined below:

- The key principle is that some energy efficiency related changes to properties pay for themselves through the resulting savings on fuel bills,
- The Green Deal creates a new financing mechanism to allow a range of energy efficient measures to be installed in homes and businesses with no upfront costs. This can, though, include part financing where a homeowner can choose to pay for some of the work themselves.
- There is no standard Green Deal Measure or list of measures that are appropriate for every property. A Measure is defined as an improvement made to a property. What is appropriate for a property depends upon a number of factors including the work already done, the characteristics of the building and in some cases the geographical location.
- To obtain Green Deal finance there are three steps:
 - ✓ Is the measure eligible? Essentially this requires the Measure to be fixed to the property (non-portable). This is because the Green Deal finance is "attached" to a property and not an individual.
 - ✓ Is the Measure suitable for the property? A Green Deal Assessor will determine costs and savings.
 - ✓ Does the Measure meet the Golden Rule? To meet the Golden Rule the expected financial savings resulting from installing a Measure (e.g. a high performance replacement door) must be equal to, or greater than, the cost of repayment over the term of the Green Deal Plan. The repayment period may be the lifetime of the measure or a specified 'pay-back' period.
- For certain Measures an upfront subsidy could be sought via the Energy Company Obligation (ECO). This is mainly directed at lower income and vulnerable households who tend to under-heat their homes and therefore savings from some Measures are less likely to achieve fuel bill savings.
- There are rules and costs contained within the Green Deal pertaining to quality of installation, product assurance, registration and the appointing and training of assessors.
- Running in parallel to the Green Deal is the Home Energy Conservation Act (HECA) that requires all local authorities in England to report on proposed energy conservation measures with the need to improve the energy efficiency of their residential accommodation. This presents more opportunities for the composite door market.

- The authorised Green Deal Providers are the organisations that facilitate the Green Deal, providing the finance and arranging for the measure to be installed. They may not actually undertake installation but will be responsible for customer service issues. To operate a Provider will be required to be authorised by the Green Deal Oversight Body and must comply with a number of rules and regulations.
- The Green Deal was originally due to come into effect in October 2012 but the supporting legislation will only come into force on 28th January 2013. This redefined target reflects the delays in getting the necessary processes in place (some are still being finalised) as well as accrediting Assessors, Installers and Providers. Although Green Deal finance won't be available until January 2013 homeowners can apply for an assessment to be carried out now.

This report focuses on the domestic environment as the majority of work undertaken in the development of the Green Deal. The DECC sees the implementation in the non-domestic area as far more complex.

On October 19th 2012 the Government announced a cash back scheme amounting to a total of £125 million aimed at kick starting the Green Deal scheme. The incentive is a first come first served offer and the work has to be arranged through a Green Deal Provider and is only available in England and Wales. The amount quoted as the cash back level for high performance replacement doors is £40.

3.0 Entrance Doors and the Green Deal

The DECC have stated that delivering the Green Deal implies favouring the most cost effective measures first.

The DECC published a Marginal Abatement Cost Curve (MACC) in their *What Measures Does the Green Deal Cover* that shows 'insulated doors' ranking third in the in the range of domestic energy efficient measures. This Marginal Abatement Cost Curve is often reproduced by the DECC in their publications. What it shows in the horizontal axis is tonnes of CO₂ equivalent (i.e. volume) against £ per tonne of CO₂ equivalent (i.e. cost).

Reproduced below is the DECC Marginal Abatement Cost Curve that shows the carbon cost effectiveness of a range of Measures in the domestic sector in 2020 plotted against the total level of abatement possible for each measure by 2020. The Measures below the horizontal line will, claim the DECC, save the householder money in addition to saving carbon. Insulating doors, are shown to be cost effective, however, the total tonnes of CO₂ saved is small as demonstrated by the thin line third from the left on the chart. A marginal abatement cost curve shows a set of options available to an economy to reduce CO₂ emissions, at what cost and where policy should be directed to achieve these reductions.

Chart 1: DECC Marginal Abatement Cost Curve

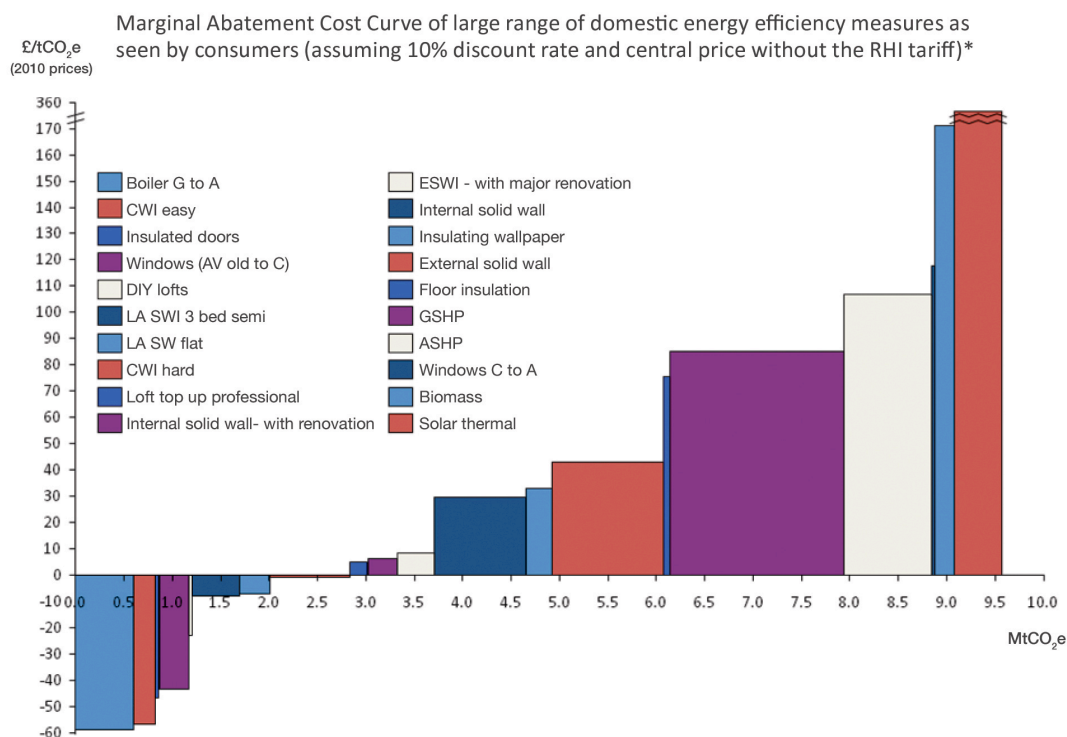
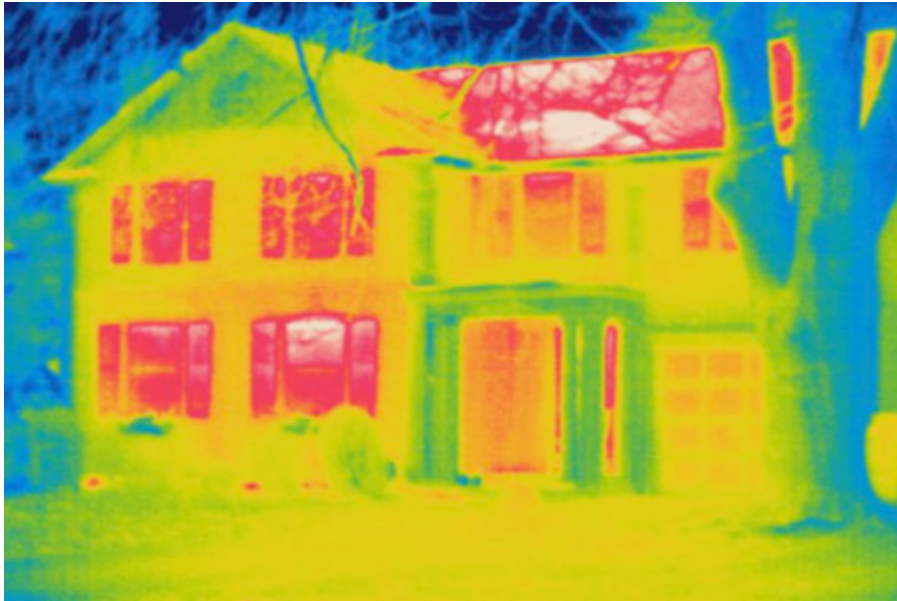


Chart 1 above suggests that an energy efficient entrance door set, properly fitted, can contribute significantly to air and energy leakage, draughts and cold spots. This report, therefore, sets out to show the potential savings by fitting a high performance composite entrance door. Unlike high cost projects such as boilers and external wall insulation an energy efficient door properly installed will, in many cases, probably be amongst the Green Deal faster payback projects.

4.0 Heat Loss through an Entrance Door

Where the temperature outside of a building is lower than inside the building heat is lost through the fabric of a building. The thermal image below used as part of the BBC *Reducing Heat Loss* TV programme shows there is a concentration of heat lost through the windows, doors and roof.

Chart 2: Heat Loss through Buildings – Thermal Image



Source: BBC "Reducing heat Loss"

Heat loss through an entrance door (when closed) is normally due to:

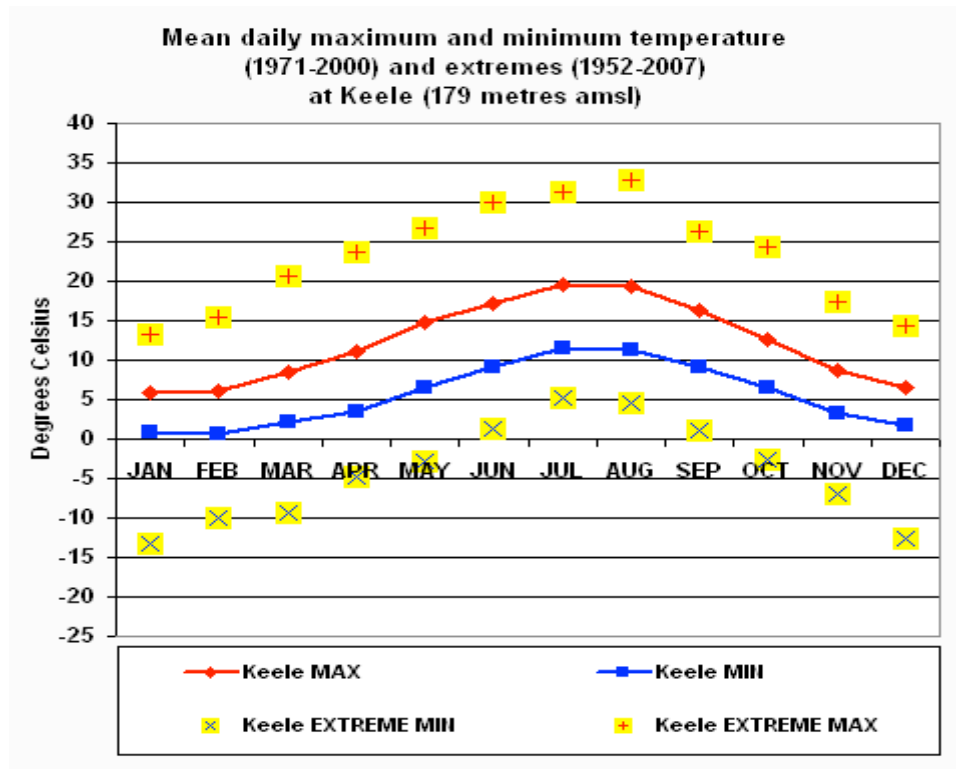
- The construction of the door slab – involving the level and type of insulation.
- Glazing where used – involving the type of glazing (single, double or triple) and materials used (spacers, glass and gas).
- The construction of the door frame.
- Leakage as a result of an ill fitting door within the frame.

These are all factors that are likely to come into play when a Green Deal Assessor determines if a high performance replacement door is suitable for the property and if it meets the Golden Rule.

Outside temperature is important when determining the heat loss through entrance doors and is an important factor in the heat loss calculations set out in Section 6. When the outside temperature is above the inside temperature of a dwelling there is clearly no heat loss through an entrance door.

To calculate heat loss we needed to establish probable average temperatures. Chart 3 below shows the average daily maximum and minimum temperatures at Keele in the centre of England. The north of England and Scotland is cooler and the south slightly warmer. The chart demonstrates the wide variations in average temperatures – as much as 25°C between extremes.

Chart 3: Average Maximum and Minimum Temperatures



Source: Met office

To determine heat loss through an entrance door the average temperature inside of a dwelling had to be estimated. In the BBC News Magazine of March 2011 an article *How Warm is Your Home* states that the temperature of hallway in a dwelling is between 16.3°C and 17.9°C and overall internal temperature of a home is “roughly 17.5°C”.

For this report we have assumed that the average external temperature for the five spring and summer months, May to September, is above 17.5°C and, therefore, assumed that heating is not turned on in the average home during these months. For the seven autumn and winter months October to April we have assumed the average external temperature is 3°C and therefore, these are the months when heating is turned on to maintain an internal temperature of 17.5°C. These two average temperatures 17.5°C inside the building and 3°C outside during the autumn and winter months are important factors together with the U

value of a door set when determining heat loss when energy efficient doors are fitted. It is stressed the assumed temperatures are estimates taken from Met Office information and will vary by location and by year.

Door slab construction, material used and thickness are important factors in heat loss. For example most metals are good conductors and therefore poor insulators. Therefore, entrance doors (together with patio, French and bifold doors) manufactured in aluminium will tend to incorporate plastic thermal bridging to improve thermal performance. This though was not always the case – there are probably homes today with a single glazed aluminium door without thermal bridging. Wood has a relatively poor thermal efficiency compared to PVC – additionally wood is also liable to warping and shrinkage. PVC has a better thermal efficiency compared to wood or aluminium. Most composite doors today are produced incorporating materials that are good insulators, especially polyurethane foam.

Door frames are also a source of heat loss and, as with door slabs, should be manufactured and reinforced from good insulating materials. The properties of different frame materials are as for door slabs.

Doors installed in homes today that have excessive gaps will allow heat to be lost between the door and the frame. There has been some published analysis of air leakage through door assemblies (e.g. *Estimating Air Leakage through Doors* - Daniel Gross). Gross calculates the outflow of air, and therefore heat, is reduced by as much as 30% if the gap between door and frame is halved. It follows then that doors with an excessive gap between door and frame will be losing considerably more heat than one with a minimal gap.

Heat is also lost through sealed unit door glass panels (IGU's) and, as with windows, IGU's are today manufactured using low-E glass, warm edge spacers and low-conductivity gas (usually argon) to reduce heat loss through the IGU. The fewer and smaller glass panels in most composite door sets the less heat is lost. Doors produced with IGU's manufactured prior to the introduction of low E glass, warm edge spacers and low conductivity gases are less energy efficient as those with. The energy efficiency of single glazed doors and those with broken down IGU's is poor.

5.0 U Value - Measure of Heat Loss through an Entrance Door

The U value (also known as the coefficient of heat transmission) is the measure of how well a material allows heat to pass through it. The lower the U value the greater a door's resistance to heat flow and the better its insulating value.

The British Fenestration Ratings Council (BFRC) launched the Door Energy Rating Scheme in 2011. This allows the door set slab and frame to be assessed for U value and air leakage in accordance with Approved Part L1 of the Building Regulations. A minimum U value of 1.8W/m²K in England and Wales (1.6W/m²K in Scotland) has been applied from 2010 for all newly manufactured door sets. This will be reduced to 1.4 W/m²K from 2013.

U value declarations shown in this report are from tests and simulations carried usually out on door sets. The term door sets relates to a door slab assembled into a frame. Comparisons can be made between door slabs produced using differing materials and different structures provided the frame and assembly of the door slab are a constant. Additionally comparisons can be made and conclusions drawn as to the thermal efficiency, between different frame materials – e.g. softwood, PVC and composites.

The following sub sections 5.1 to 5.3 set out U values for door sets manufactured from different slab, frame and IGU's. The results in the tables are of necessity a sample of test and simulation results.

The DECC *Government Impact Assessment* quotes "Double Glazing" A and C WER's when referring to energy saving measures and not U values. However, the U value is an important factor as it is one of the functions for calculating heat loss through an entrance door together with the external and internal temperature variations and the door area.

5.1 U Values – Composite Door Sets

The following tables set out the U values for a range of composite door sets. The U Values are from the declarations from tests and/or simulations for newly manufactured door sets fitted correctly with specified minimum door gaps. For consistency and to allow comparisons to be made, in all cases the door set size is assumed to be constant at 1000mm x 2000 mm and the threshold is thermally broken aluminium.

Table 1 below shows declared U value results for 44mm composite door sets with a door slab constructed with polyurethane foam and GRP skins – this is the most popular door slab by volume in the UK (see *The 2012 Annual Composite, PVC-U Patio, Bifold and Panels Door Market and Forecasts to 2014* from D&G Consulting). The test result declarations range from a solid slab without glazing through to glazed doors. The table also shows the results for different combinations of IGU and frame materials.

Table 1: U Values for 44 mm Composite Door Sets

Door type	IGU - all 24mm			Frame	Door set U value W/m2K
	Area m2	Spacer	Gas type		
Solid - no glass				PVC 3 chamber	0.9
Solid - no glass				softwood	1.1
Single IGU in top of door	0.47	warm edge	90% argon	PVC 3 chamber	1.2
Two IGU's at top of door	0.32	aluminium	90% argon	PVC 3 chamber	1.3
Single IGU in top of door	0.47	warm edge	90% argon	hardwood	1.4
Two IGU's at top of door- FD30	0.32	stainless steel	air	Winkhaus Ecoframe	1.6

Source: Buildcheck

Table 1 above shows that a U value at or below 1.0W/m2K was achieved with a solid 44mm composite door set. Also a 44mm half glazed composite door set with an IGU manufactured with a warm edge spacer and argon gas fitted in a PVC 3 chamber profile frame with steel reinforcement achieved a U value test result of 1.2W/m2K.

The table also shows that under test conditions a solid composite door set achieved a better U value with a PVC frame than with a softwood frame.

Table 2 below shows the U values for 68mm double rebate composite doors constructed with polyurethane foam and GRP skins similar to the 44mm examples in Table 1 above. The figures are for two door sets, one with no glazing and the other with part glazing.

Table 2: U Values for 68 mm Double Rebate Composite Door Sets

Door type	IGU - all 24mm			Frame	Door set U value W/m2K
	Area m2	Spacer	Gas type		
No glass				PVC 3 chamber	0.8
Two IGU's at top of door	0.32	warm edge	90% argon	PVC 3 chamber	1.0

Table 2 above shows that under test conditions a U value of 0.8W/m2K was achieved with a solid 68mm double rebate composite door set. Also a 68mm double rebate composite door

set with an IGU manufactured with a warm edge spacer and argon gas and fitted in a PVC frame with steel reinforcement achieved a reported U value test result of 1.0W/m²K.

5.2 U Values – Wood and Metal Door Sets

Table 3 below shows U values for a range of door sets manufactured from timber and metal. Because we do not have official test reports the U values are based upon those published in the Building Regulations Approved Document L1 together with information from CEN Solutions and other sources within the public domain.

It also shows the results for different combinations of IGU materials and the frame material is assumed to be constant with softwood. Referring to Table 1 it suggests the U values could be marginally improved with the use of PVC frames rather than softwood.

Table 3: Estimated U Values for Door Sets Manufactured from Wood and Aluminium

Door type	IGU - all 24mm			Frame	Door set U value W/m ² K
	Area m ²	Spacer	Gas type		
Solid wood 100mm no glass				softwood	1.8
Aluminium 100mm thermal break fully glazed	0.94	warm edge	90% argon	softwood	1.9
Wood 50mm single IGU at top	0.47	warm edge	90% argon	softwood	2.4
Solid wood 50mm no glass				softwood	3.0
Wood 50mm single IGU at top	0.47	aluminium	air	softwood	3.0
Aluminium single glazed	0.94			softwood	5.7

Source: Building Regulations Approved Document L: CEN Solutions

Wood has relatively poor thermal efficiency and it takes a solid 100mm timber door set to achieve a U value of 1.8W/m²K to comply with the current Approved Part L1 of the current English Building Regulations.

A fully glazed aluminium door with a 4mm thermal break in a softwood frame could theoretically achieve a U value of 1.9 with warm edge spacer and argon filled IGU's. However, the thermal efficiency of a single glazed aluminium door set without a thermal break as sold in DIY stores some years ago has a U value of 5.7W/m²K.

5.3 U Values – PVC Door Sets

Until the advent of the reliable composite door PVC doors replaced doors manufactured from wood, aluminium and steel. Whilst early PVC doors were an improvement on the many existing wood, steel or aluminium doors they replaced the thermal efficiency was typically poor by today's standards.

As IGU's improved the thermal efficiency of PVC doors in turn improved. Where full height or half panels were used in early PVC doors there was little or no insulation between the inner and outer skins. Over the years MDF or ply has been used to improve panel structural, thermal and acoustic performance. There are many thousands of PVC doors produced and installed in the UK. PVC panels today often have an insulating material as part of the structure. However, the test results shown below suggest that a fully glazed PVC door is at its limit achieving at best a U value of 1.6W/m²K. To get close to composite door levels of performance we estimate that the structure would need to be manufactured from multi chamber PVC profile filled with an insulating material – as seen in Europe.

Table 4 below shows U value results for a range of PVC door sets. We have shown results from simulated test reports provided by systems companies for current generation PVC doors. We have, though, constructed the U values for different door and IGU configurations by using the test results and tables of U values shown in *Approved Document L1*. The table also shows results for doors fitted with a combination of IGU materials. The frame material is assumed to be a constant 3 chamber PVC profile.

Table 4: Estimated U Values for Door Sets Manufactured from PVC

Door type	IGU - all 24mm			Frame	Door set U value W/m ² K
	Area m ²	Spacer	Gas type		
PVC fully glazed	0.94	warm edge	90% argon	PVC 3 chmbr	1.6
PVC fully glazed	0.94	aluminium	90% argon	PVC 3 chmbr	1.8
PVC IGU at top	0.47	warm edge	90% argon	PVC 3 chmbr	2.4
PVC fully glazed	0.94	aluminium	air	PVC 3 chmbr	3.0
PVC full height panel	0.25	aluminium	air	PVC 3 chmbr	3.5

Table 4 shows that under test conditions a U value of 1.6 W/m²K is achieved with a fully glazed door with IGU's manufactured with a warm edge spacer, argon gas and low E glass.

Many thousands of PVC doors have been installed over the past 20 years and many of these will still be in place (see Attachment 1). 75% of these doors are likely to have a U value of 3.0W/m²K or worse because:

- a. The IGU's will not have warm edge spacers, nor be argon filled or have low E glass.
- b. The in-fill panels will most probably not be insulated to today's standards.
- c. They may have been badly fitted or damaged.
- d. Old gaskets and seals will have shrunk and warped.

Additionally, wood, aluminium and PVC doors are likely to struggle to meet the U values required in the revised *Approved Document L1* that is due to be implemented in 2013 without additional insulating measures taken.

6.0 Heat Loss Calculations

This section shows the typical energy (heat) loss for each of the door set types and configurations shown in Section 6 to 8 above.

Table 5 below shows the heat loss in KW/year after calculating the U value to Watts/hour and after taking into account the difference between average internal and external temperatures (see Section 4). The £ loss per year for each door type reflects the seven months where average external temperatures are expected to be below those inside the dwelling. For the calculation the assumed cost of energy is 11.3p per KW – this is an average of gas and electricity for this report. The costs for individual households will vary depending upon the type of energy meters fitted and tariffs.

The door type described is as Tables 1-4 above but has been abbreviated in Table 5 and Chart 4 below.

Table 5: Estimated Heat Loss and Value for Door Sets

Door type	area m2	U value W/m2K	Ht loss W/hr	Heat loss KW/yr	Loss/year £
68mm double rebate composite, no glass, PVC frame	2	0.8	23	117	13
44mm composite, no glass, PVC frame	2	0.9	26	132	15
68mm double rebate composite, single IGU, warm edge spacer, argon, PVC frame	2	1.0	29	146	17
44mm composite, no glass, softwood frame	2	1.1	32	161	18
44mm composite, single IGU, warm edge spacer, argon, PVC frame	2	1.2	35	175	20
44mm composite, two IGU, alum spacer, argon, PVC frame	2	1.3	38	190	21
44mm composite, single IGU, warm edge spacer, argon, hardwood frame	2	1.4	41	205	23
44mm composite, two IGU, steel spacer, air, Winkhaus frame	2	1.6	46	234	26
PVC fully glazed, warm edge spacer, argon, PVC frame	2	1.6	46	234	26
100mm solid wood, softwood frame	2	1.8	52	263	30
PVC fully glazed, aluminium spacer, argon, PVC frame	2	1.8	52	263	30
50mm wood, single IGU, warm edge spacer, argon, softwood frame	2	2.4	70	351	40
PVC half glazed, warm edge spacer, argon, PVC frame	2	2.4	70	351	40
50mm solid wood, softwood frame	2	3.0	87	438	50
50mm solid wood, single IGU, alum spacer, air, softwood frame	2	3.0	87	438	50
PVC fully glazed, aluminium spacer, air, PVC frame	2	3.0	87	438	50
PVC half glazed, aluminium spacer, air, PVC frame	2	3.2	93	468	53
PVC full height panel, small IGU, aluminium spacer, air, PVC frame	2	3.5	102	512	58
Aluminium, full height single glazed	2	5.7	165	833	94

The energy savings in Table 5 have been independently researched and calculated by D&G Consulting using declared U values for the different door types together with estimated temperature variations. However, the energy savings are similar to that published in the *DECC Impact Assessment*, namely 317KW/year.

Chart 4 below shows heat loss value for the range of doors in Table 5 above. Composite doors are shown in green, wood in black, PVC in red and the aluminium single glazed door in blue

Chart 4: Estimated Annual Heat Loss Value for Door Sets

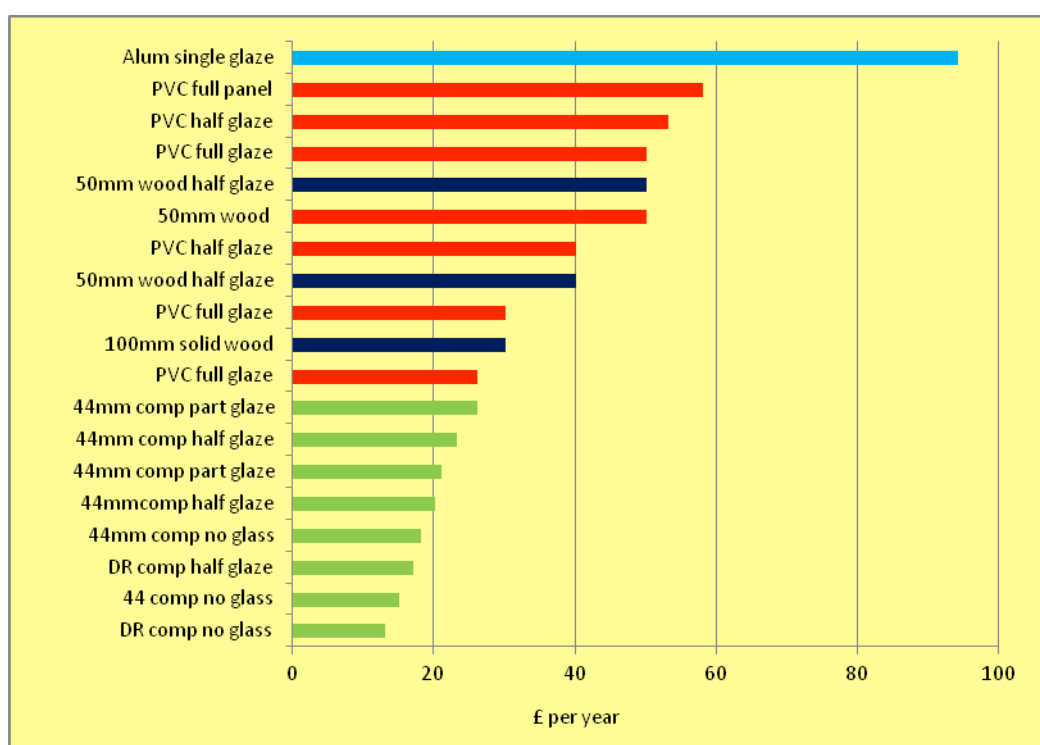


Table 5 and Chart 4 shows that at the extremes a solid composite door set is potentially losing £13 per year (this is over the seven months the external temperature is lower than the internal dwelling temperature) whereas a single glazed aluminium door is estimated at potentially losing over £94 per year.

PVC and 50mm wood doors fitted with old style IGU's pre warm edge spacer, argon gas and low E glass – incur potential heat losses between £50 and £58 per door per year.

However, as mentioned in Section 4, a door with door gaps between door slab and frame in excess of that specified could be 30% less energy efficient than the figures shown in Table 5. It is expected that this will be a factor that will be taken into account by the Green Deal Assessor

7.0 Costs and Payback

To provide indicative payback periods we have assumed the average installed cost for a solid 44mm composite door is £549 excluding VAT, finance charges, assessment and administration costs. A 68mm double rebate door will almost certainly incur a premium. We have assumed for the report that to comply with the Golden Rule composite doors with small IGU's or solid doors will be favoured. However, under the rules of the Green Deal consumers are able to part fund the total cost of a high performance composite door.

There are also additional costs which are likely to vary according to the product, homeowner and Provider. These costs are:

- Interest on the loan – in the DECC *Impact Assessment* published June 2012 the estimate is that an interest rate of 7.5% could apply – but has yet to be firmed up and could vary with different Providers.
- Assessment cost – this relates to the visit by the Assessor to determine if the homeowner is eligible. This cost could be shared if there is more than a single measure being assessed - for example two doors and/or some windows. Payment for Green Deal assessments is expected to be left to market forces and not regulated at this stage. Although in the DECC *Impact Assessment* a probable cost of £112.50 per assessment could apply.
- Green Deal provider costs and administration cost. As with assessment costs this could be shared if there is more than a single measure from one Provider.

As the Green Deal stands at the moment VAT is payable on all measures where VAT is currently levied. However, in the case of the customer being VAT registered (e.g. a non domestic customer or a VAT registered landlord) VAT may be recovered. See *Treatment of VAT in the Green Deal* from DECC.

Table 6 below shows the key payback periods for the six entrance door configurations in our tables that are the least energy efficient – these six configurations almost certainly constitute a significant percentage of doors currently installed in dwellings in the UK.

Table 6 below shows four levels of payback:

1. The minimum payback period assumes average energy prices of 11.3p per KW. This is an assumption taking into account consumers on a pre payment meter who will not usually have access to the best tariffs and are most likely to be paying more than 11.3p

- per KW for energy and other consumers who take account of Direct Debit and other discounts and are likely to be paying less than 11.3p per KW.
- The column headed 'excessive gaps to frame' shows the improved payback in this circumstance when there could be an estimated additional 30% heat loss as described in Section 4.
 - The column headed '30% increase' assumes there is a 30% increase in energy costs at the time of the assessment compared with current prices. There has been a 38% increase in energy costs over the period 2010 to 2012 and in November 2012 a further 8% increase has been announced by some of the energy companies and has been included in this payback calculation. So by the time the Green Deal is in full swing an increase in energy costs of 30% is conservative.
 - The fourth column is the extreme case. This shows the effect of a 30% increase in energy costs together (3 above) together with an ill-fitting door (2 above).

Table 6: Estimated Payback Period – Years
Excluding VAT, Interest Payments, Assessment and Administration Costs

Door type	minimum payback period years	excessive gaps to frame payback period years	30% increase in energy costs payback period years	Excessive Gaps & 30% increase in energy costs payback period years
Aluminium, full height single glazed	7.4	5.7	5.7	4.4
PVC full height panel, small IGU, aluminium spacer, air, PVC frame	14.4	11.2	11.2	8.4
PVC half glazed, aluminium spacer, air, PVC frame	16.6	12.8	12.8	9.8
50mm solid wood, softwood frame	18.3	14.4	14.4	10.8
50mm solid wood, single IGU, alum spacer, air, softwood frame	18.3	14.4	14.4	10.8
PVC fully glazed, aluminium spacer, air, PVC frame	18.3	14.4	14.4	10.8

Table 6 above demonstrates a payback period of between 5 and 19 years is possible by taking into account the age and condition of the entrance doors fitted in dwellings and also the cost of energy in the dwelling at the time of Green Deal assessment. Assessors are not permitted to take into account future energy cost increases.

This supports the case that a composite door set exchanged with a door that was produced prior to energy efficient IGU's is most likely to comply with the Green Deal Golden Rule and therefore save the householder money against their energy bills. The Golden Rule principle is that total costs must not exceed the estimated savings over the estimated lifetime of the measure – but it is down to the Assessor to determine if the Golden Rule applies in each case.

The table above shows the estimated payback period excluding VAT, interest payments, assessment and administration costs. It also excludes any incentive payments similar to that announced in October 2012. The calculations also do not take into account the Energy Cost Obligation (ECO) where Green Deal Providers will be able to make uneconomic measures meet the Golden Rule by including support from the ECO (in effect a subsidy).

This section demonstrates that the potential Green Deal take up and payback is subject to a number of variables ranging from the cost of the installed door, assessment and administration costs, interest charged, incentives, ECO subsidy and VAT. Therefore to be definitive on both payback periods and Golden Rule compliance will largely rest with the Assessor and Provider. Composite door suppliers and installers - assuming they are not on the approved list of Providers (see Section 2) would be well advised to be aware of the impact of these variables in different scenarios.

8.0 Potential Volume for Energy Efficient Door Sets under the Green Deal

There is an estimated 47million external entrance doors fitted to dwellings in the UK (see the Appendix to this report). It is estimated that 82% of these have been replaced over the years with double glazed products. (See D&G Consulting *2012 Annual Window Door and Conservatory Industry Report and Forecast to 2015*). The 82% of doors (some 38 million) already replaced is after taking into account new build dwellings and those demolished. Importantly many of these replaced doors are over ten years old and most likely to be less energy efficient than many doors produced today.

However, the potential for energy efficient doors under the Green Deal is considerable. We have made the following assumptions relating to the potential volumes:

- Over the past ten years a total of 13 million PVC and composite doors have been produced. It is assumed that most (but not all) of these are energy efficient and are most likely to have a U value of 2.0W/m²K or less. It was after 2002 that IGU's with coated glass and argon gas giving a U value of 1.7W/m²K came onto the market in volume.
- We estimate that the volume of wood and aluminium domestic entrance doors produced over the past ten years is 2.6 million. However, we estimate that only 30% will be energy efficient having a U value of 2.0 W/m²K or less. Table 5 shows that a 50mm half glazed wood door with an IGU manufactured with a warm edge spacer, argon gas and low E glass has an estimated U value of 2.4 W/m²K or less.
- There are an estimated 800,000 entrance doors fitted in listed buildings where like-for-like materials are usually specified for replacements.

Therefore, our estimate is there are 31 million entrance doors fitted in the UK today that are over ten years old for which, if replaced with a high performing energy efficient door, it would be likely to result in energy saving payback over a period. However, not all of these entrance doors are in situations in a dwelling where the energy savings would be sufficient to comply with the terms of the Golden Rule as it is set out today and at current energy prices. Some examples are doors within an enclosed porch or conservatory, doors in some flats especially where entrances are shared and entrance doors to some town houses and split level dwellings. Additionally some older dwellings have heavy duty doors fitted. It is estimated, therefore, taking into account the examples above (and others) that in at least 19 million cases replacing these older doors with high performing insulating composite doors would produce annual energy and money savings for the homeowner.

9.0 Summary

This report demonstrates that replacing an old wood, aluminium or PVC door with a high performing composite door will save the homeowner money through reduced heat loss as shown in Table 5.

The advantages of the homeowners taking the Green Deal route are:

1. There are no upfront costs for the homeowner – whether a private consumer, a private landlord or a social registered landlord.
2. There are incentives for early adopters.
3. Some homeowners will be eligible for the ECO subsidy.

On the other hand there are potential disadvantages to homeowners:

1. There are likely to be additional costs on top of the installed door cost.
2. The homeowner is required to go through an official Provider who may not offer the most competitive price.

There are some downsides working against manufacturers and installers realising the potential volumes under the Green Deal. These include:

1. Some Providers quoting high prices for composite doors pushing the payback period outside of the Golden Rule without a contribution by the homeowner.
2. Assessors not able to accurately assess heat loss. This is a very real issue – it is advised that the industry provides tables of U values for a wide range of doors and conditions. Also the effect of excessive gaps between door and frame needs to be understood – see Section 4.

However, there are positive factors working for making headway into realising the potential volumes under the Green Deal:

1. Energy costs that could be greater than we have assumed in the report.
2. The possible increase in homeowners falling into fuel poverty bringing into play the Energy Company Obligation.
3. Social Landlords, especially Housing Associations and Local Authorities being required by Government to ensure their properties meet stringent energy efficiency targets.
4. Private rented property - from 2018 it will become an offence to let properties with energy ratings F and G. Over 15% of the total English housing stock is privately rented. Properties with the worst energy efficiency rating (Energy Performance Certificate Band G) are more than four times as common as in the social sector

(Ref D. Timms LSE). It is this housing stock that needs radical improvement. The Green Deal provides a route to improvement for this stock that does not come directly out of the landlord's pocket.

5. When private houses change hands they now have to have an Energy Performance Certificate to give potential buyers an upfront look on how energy efficient a property is and how it can be improved.

Finally this report has shown the energy saving potential of high performing composite doors over many of the doors currently installed in dwellings in the UK. Rather than go down the Green Deal route homeowners will need to decide if they will be better off by funding the installation of a high performing composite door by some other means avoiding the add-on costs associated with the Green Deal.