



RHI: A Smarter Approach

April 2016

Executive Summary

- The November 2015 RHI spending forecast represents a cumulative reduction in expenditure of approximately £1.5 billion in the next five years.
- Biomass has dominated the first few years of the RHI. Given the expressed intention of developing sustainable supply chains and preparing for the mass rollout of low carbon heat, the scheme needs significant reform in order to promote the deployment of non-biomass technologies.
- The RHI presents a significant ongoing cost to the Government. If it is assumed that the majority (82%) of the budget continues to be spent on the non-domestic scheme, then the RHI will commit the Government to ongoing costs in the region of £1 billion per annum for the next two decades.
- Even under the most favourable assumptions of the analysis undertaken for this report, the domestic RHI will merely result in an additional 90,000 renewable heating systems, generating 5 TWh of renewable heat over the next five years. To put these figures into context, it is expected that 8 million gas boilers will be sold in this same period.
- It is unlikely that installing renewable heating systems in just 0.3% of UK homes will result in the UK meeting its 2020 renewable heat target, even accounting for non-domestic generation of renewable heat.
- The key recommendations of this paper are that the RHI should be focussed on three areas:
 - 1) The installation of renewable heating systems in homes where direct electric heating is currently found.
 - 2) The incremental decarbonisation of the LPG sector using biopropane.
 - 3) Increasing investment in the use of biomethane and biogas, in order to reduce the carbon intensity of grid gas.

Background and Rationale for Intervention

According to modelling undertaken by the Department of Energy and Climate Change (DECC)¹, heat related activities account for nearly a third of all greenhouse gas emissions in the UK. Consequently, the decarbonisation of heat is a vital issue that must be addressed if the UK is to meet its 2050 emissions targets. In the shorter term, the UK has a commitment to meeting a European Union mandated renewable energy target, including an indicative target of producing 12% of heat from renewable sources by 2020. Although projections for heat demand in 2020 are not made readily available by DECC, their “Future of Heating” document states that nearly 712 TWh of heat was consumed in the UK in 2009. Assuming that heat demand remains near its 2009 level, the 12% target equates to approximately 85 TWh of renewable heat each year.

The 2020 renewables target forms part of the UK’s longer term commitment of reducing UK greenhouse gas emissions by at least 80% by 2050. Although renewable energy is inherently ‘low carbon’, it is important not to conflate the two terms. The explicit focus of Government schemes should be carbon reduction, in order to be directly aligned with the ultimate goal of an 80% reduction in carbon emissions. At present, the Renewable Heat Incentive (RHI) is the primary policy mechanism that DECC have implemented in order to achieve the 2020 heat target. By supporting the renewable heating industry in its infancy, it is hoped that the RHI will lay the groundwork for the transition to low carbon heating by 2050. Thus, the failure of RHI to deliver on its intentions could have serious long term ramifications as well as shorter term consequences.

Since November 2011, the RHI has provided an incentive for the installation of renewable heating systems in non-domestic buildings. Between August 2011 and March 2014, the primary support mechanism for the domestic sector was the Renewable Heat Premium Payment (RHPP) scheme. The RHPP encouraged the uptake of renewable heating, by providing households with one-off grants to help with the costs of installing such systems. The RHPP proved to be a moderate success, leading to the installation of 15,586 renewable heating systems. In April 2014, incentives to install domestic heating systems were included in the RHI scheme. The RHI scheme operates by providing a tariff payment for each unit of generated renewable heat. It is hoped that these tariff payments will reduce some of the barriers to uptake of renewable heating systems and prepare the supply chain for the mass rollout of low carbon heat.

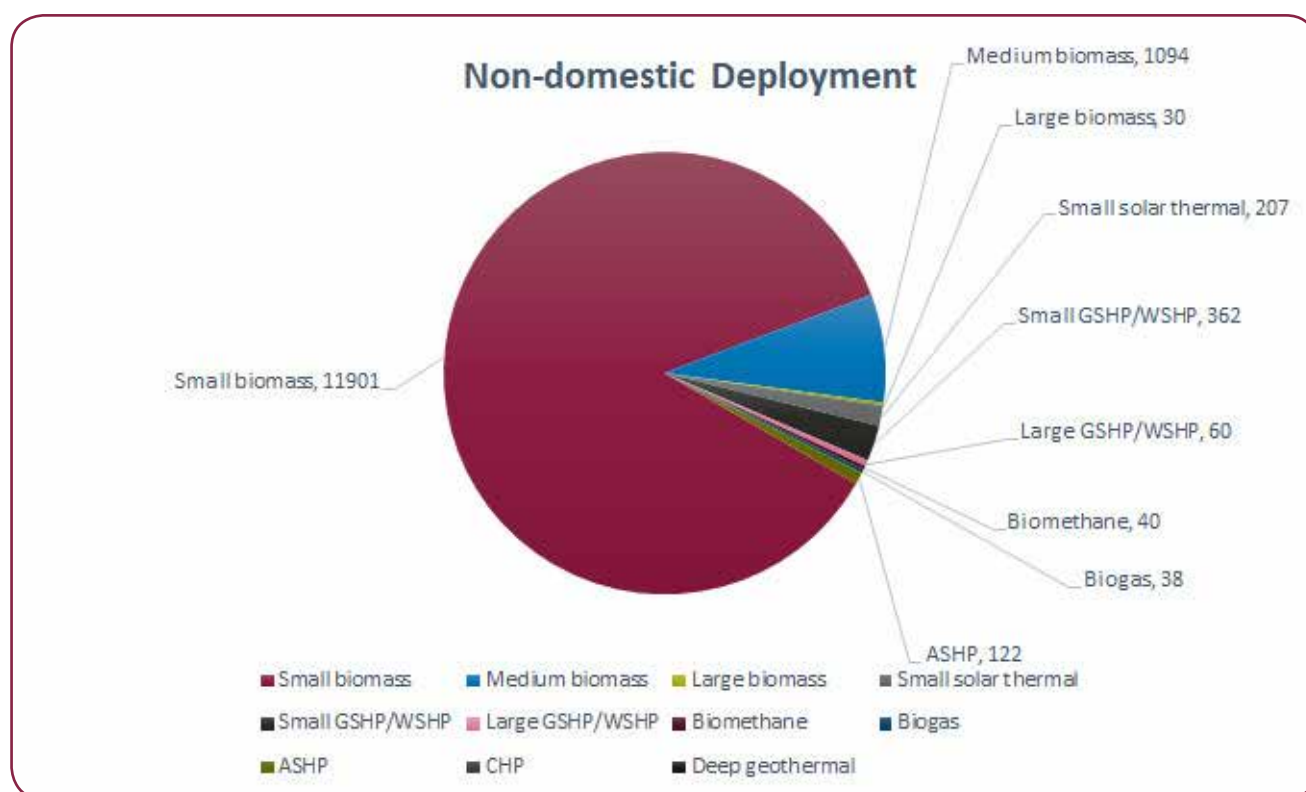
Towards the end of 2015, the future of the RHI was uncertain, with the size of the budget unknown by industry. The Autumn Statement 2015 provided the heating industry with a degree of clarity about the future of the RHI. Despite positive headlines, the announced budget represented a decrease in expenditure when compared with previous forecasts. The “headline” figure of an annual budget of £1.15 billion in 2020/2021 represented a decrease of £690 million from the Office for Budget Responsibility’s estimate of £1.84 billion made in July 2015. To understand the scale of these reductions, the changes to the forecast budget² are presented in the table below:

	£ billion						
	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21	Cumulative
July 2015 forecast	0.43	0.67	0.88	1.15	1.47	1.84	6.44
Autumn Statement 2015 measure	0	-0.03	-0.1	-0.25	-0.46	-0.69	-1.53
November 2015 forecast	0.42	0.64	0.78	0.9	1.01	1.15	4.9

At first glance, a budget of £640 million in 2016/2017, rising to £1.15 billion in 2020/2021 might seem generous, particularly considering the cuts that have been made to other government energy policies. However, as outlined in the table, the November 2015 represents a cumulative reduction in expenditure of approximately £1.5 billion in the next five years.

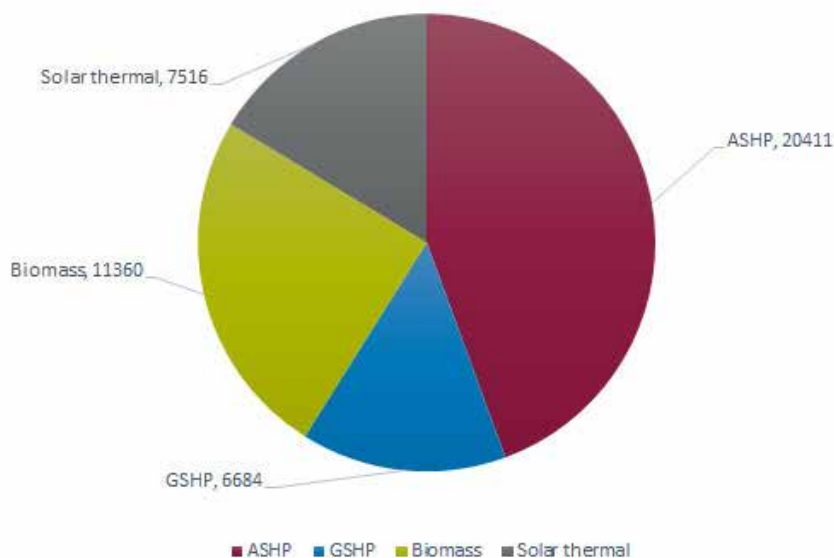
To compound matters, a significant proportion of the budget has already been “spent” on existing installations. Domestic installations receive tariff payments for 7 years after accreditation, while non-domestic installations receive payments for 20 years. At present, domestic installations receive payments on the basis of “deemed” heat demand – an estimate of the property’s expected annual heat usage. On the other hand, non-domestic installations receive payments based on actual, metered heat output. Initially, this may appear to be a fairer system. However, it does create a perverse incentive, whereby recipients are encouraged to generate more heat than is strictly necessary.

Any assessment of future deployment potential needs to take into account installations that are already receiving payments. DECC publish monthly statistics outlining the current deployment through the RHI. As at 31st January 2016, there were 59,825 accredited installations – 45,971 of these are domestic installations, while the remaining 13,854 are non-domestic systems. The graphs below detail deployment, broken down by technology type:



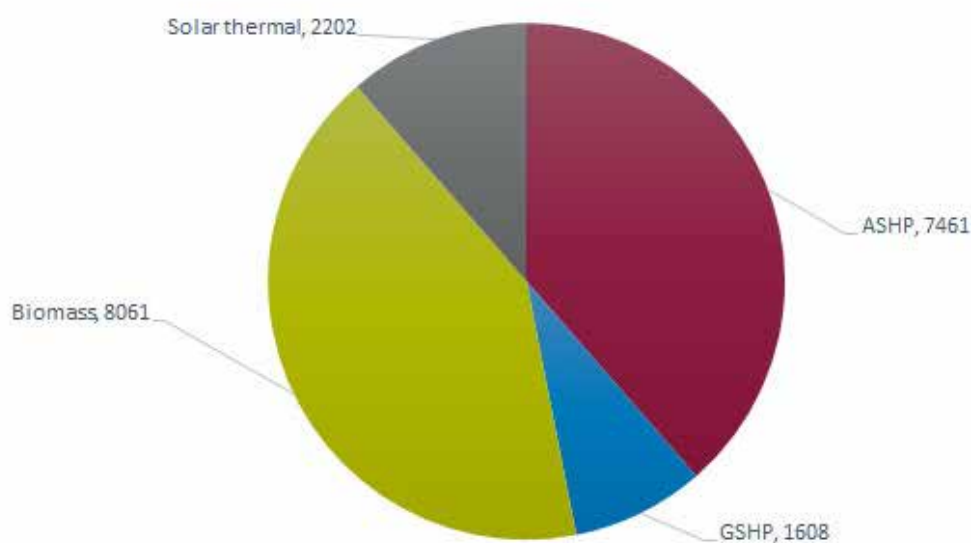
As can be seen, deployment under the non-domestic scheme is dominated by biomass, accounting for 94% of non-domestic accreditations.

Domestic Deployment - New and Legacy Installations



It is worth noting that more 58% of the installations represented in the graph above are actually “legacy” installations – systems that were installed before the launch of the domestic RHI scheme in April 2014. This suggests that the RHI hasn’t been particularly effective in encouraging the installation of new systems. On first glance, it appears that the domestic scheme has been skewed towards air source heat pumps (ASHPs). However, a different picture is painted when one focusses solely on new installations.

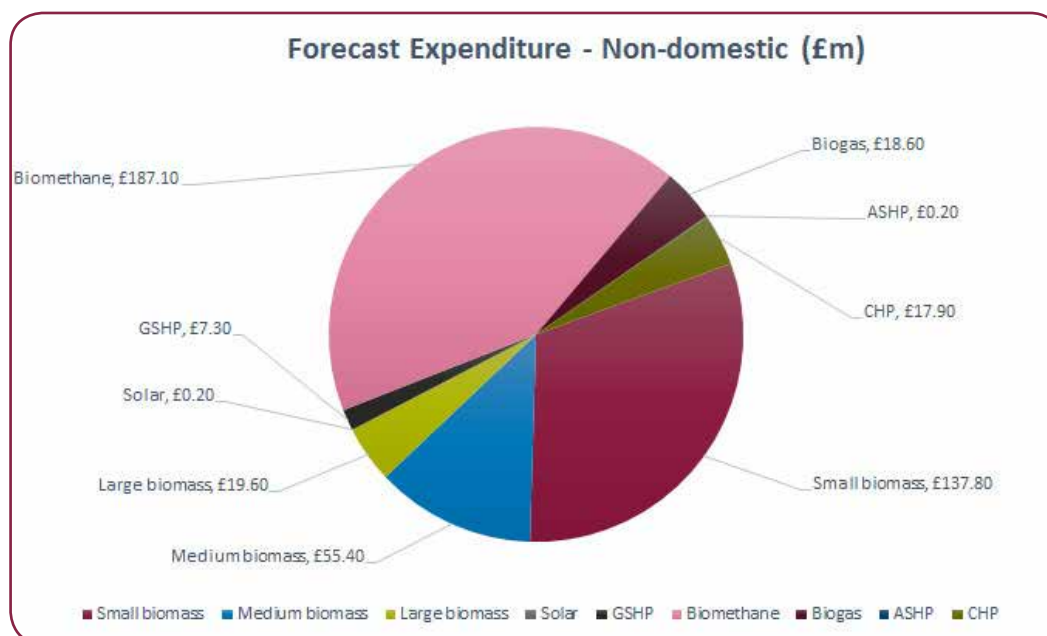
Domestic Deployment - New Installations



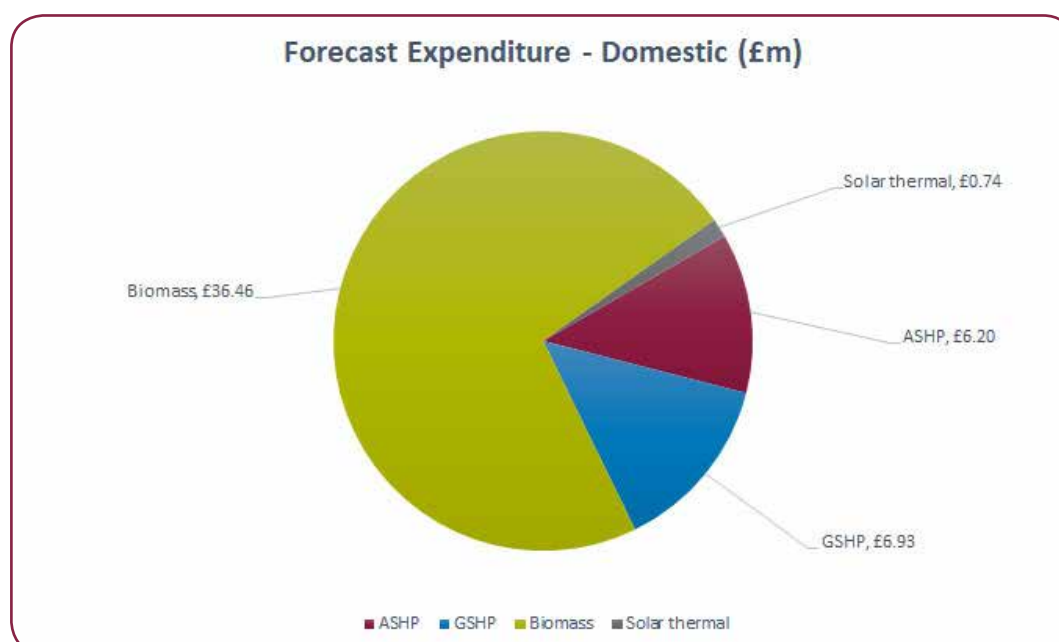
Biomass systems have been the most popular technology since April 2014, representing 42% of new installations. In the same period, there have been 7,461 installations of ASHPs, 1,608 GSHPs and 2,202 solar thermal systems.

DECC also publish quarterly expenditure forecasts for the RHI which estimate the spending on each technology type over the next 12 months. These figures provide some interesting information about the success of the scheme, as well as being useful for estimating long term committed expenditure

The forecast as at 31st January 2016 gave the estimated annual expenditure as £444 million for the non-domestic scheme and £50 million for the domestic scheme. The forecast non-domestic and domestic expenditure is detailed in the graphs below:



The graph above presents DECC's estimates of the amount of money that will be spent through the RHI on each technology type in the next 12 months. Biomass installations (of any size) are expected to receive payments of £213 million between 31st January and 30th January 2017.



Despite representing only a quarter of accreditations, it is expected that biomass systems will account for nearly three quarters of domestic expenditure in the next year. This is in part due to the generous tariffs that early biomass installations received as well as reflecting the larger heat demand of the average biomass installation.

The deployment and expenditure figures suggest that biomass has dominated the first few years of the RHI. Given the expressed intention of developing sustainable supply chains and preparing for the mass rollout of low carbon heat, it is clear that the scheme needs significant reform in order to promote the deployment of non-biomass technologies.

Scheme Reform

Changes to the scheme were explained in March 2016, with the announcement of a consultation concerning the Government's plans for the future of the RHI. In summary, the consultation proposed the following changes to the scheme:

- Capping payments at a pre-determined level of annual heat use.
- Anticipated lower biomass deployment, given its dominance of the RHI to date.
- The promotion of "strategically valuable" technologies, i.e. heat pumps and biogas.
- The removal of solar thermal installations from the scheme,
- The introduction of a budget cap, whereby the scheme can be temporarily closed to new applicants.
- Finance options for fuel poor and low-income households.

It is expected by DECC that the above reforms and budget could lead to an indicative annual deployment³ of 1,000 (domestic) biomass systems, 13,700 ASHPs and 2,500 GSHPs by 2021. **The primary purpose of this report is to assess the viability of this deployment estimate, as well as estimating the size of the domestic RHI market in the intervening period.** One of the primary barriers to uptake of renewable heating systems is the high initial upfront costs. To alleviate this, it has been suggested by some in the industry that a voucher scheme – similar in design to the RHPP - could stimulate higher demand by reducing the effective cost to the homeowner. This report also estimate the potential deployment of renewable heating systems if an indicative voucher scheme were to be adopted.

Estimated Budget

This section considers the deployment potential of renewable technologies, taking into account the November 2015 budget forecast and the March 2016 consultation reforms.

As mentioned above, the design of the RHI means that there is a large amount of committed expenditure, even without new installations. Using the January 2016 forecast, it is possible to build up a more complete picture of the estimated expenditure on existing installations in subsequent years.

We consider two scheme designs. In the first, the RHI continues as before – new installations receive a payment for each unit of delivered renewable heat (deemed or metered) and continue to do so for 7 years after the accreditation of their installation. As a result, any expenditure in one year imposes an additional burden on subsequent years.

It is assumed that there is sufficient demand to use up the entirety of the available budget for new installations in each year. As outlined in DECC's consultation document⁴, 82% of spend took place under the Non-Domestic scheme at the end of 2015, and 18% under the Domestic scheme. For the purpose of this analysis, it is assumed that this expenditure ratio continues. (Full details of the algorithm used to estimate the available budget can be found in the appendix to this document.)

The estimated budget for each year of scheme one (tariff payment) is:

Date	RHI Budget- November 2015 Forecast	Total pre- committed expenditure (existing and new)	Budget for New Installations	Budget for New Domestic
2016/2017	640	499.4	140.6	25.3
2017/2018	780	641.4	138.6	24.9
2018/2019	900	781.4	118.6	21.4
2019/2020	1010	901.2	108.8	19.6
2020/2021	1150	1,011.1	138.9	25.0

This structure provides between £19.6 million and £25.3 million of funding for new installations in each of the next five years. In the second scheme, it is supposed that the RHI is used to provide an upfront contribution towards the capital costs of installing a renewable heating system. Consequently, only existing (index linked) expenditure has to be carried forward into the next year's budget.

The estimated budget for each year of scheme two is:

Date	RHI Budget- November 2015 Forecast	Total pre- committed expenditure (existing and new)	Budget for New Installations	Budget for New Domestic
2016/2017	640	494.5	135.647	24.4
2017/2018	780	494.5	275.647	49.6
2018/2019	900	494.5	395.647	71.2
2019/2020	1010	494.5	505.647	91.0
2020/2021	1150	494.5	645.647	116.2

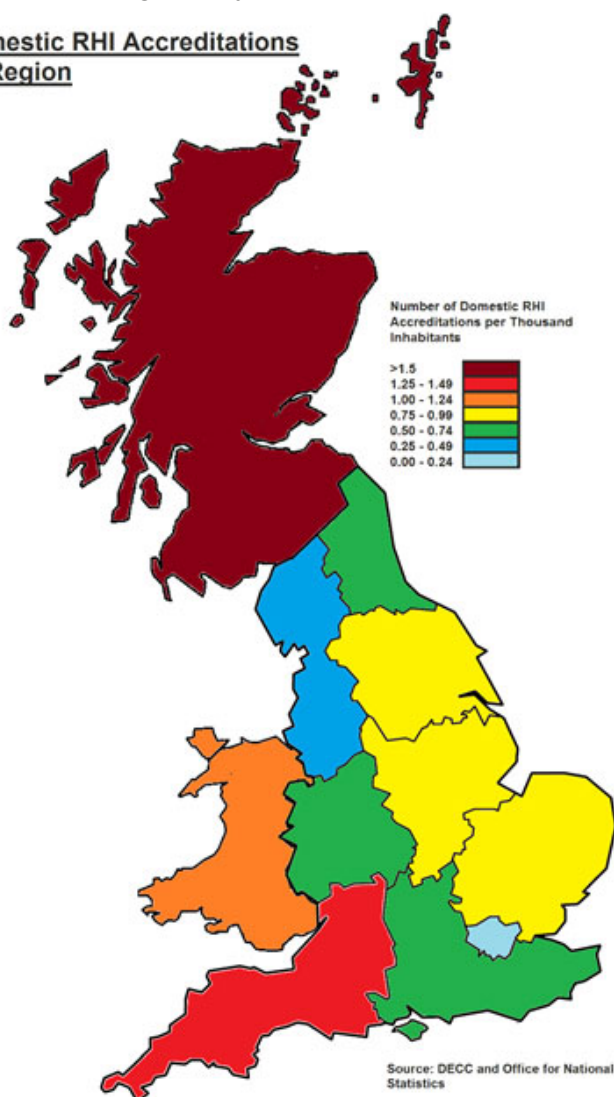
Scheme two, by design results in more “new” money being available to be spent each year - £116 million in 2020/2021, compared with £25 million in the first scheme. However, this extra money does come at a cost. In scheme one, the homeowner's incentive to install a renewable heating system is spread out over seven years. In scheme two, all of the incentive is paid out at the start of the scheme. However, the voucher scheme would not commit the Government to any additional future expenditure. As mentioned previously, non-domestic installations receive tariff payments for 20 years and domestic installations receive payments for 7 years. **As a result, the RHI presents a significant ongoing cost to the Government. If we assume that the majority (82%) of the budget continues to be spent on the non-domestic scheme, then the RHI will commit the Government to ongoing costs in the region of £1 billion per annum for the next two decades.**

However, the upfront contribution would circumvent some of the drawbacks of the existing scheme. Firstly, the high initial costs of renewable heating systems – compared with fossil fuel alternatives – exclude a significant proportion of UK households from the scheme. In the RHI Evaluation Synthesis report, it is noted that “upfront costs remain a barrier and RHI applicants tend to use their own finances”. This should come as no surprise, particularly when one consults the Office for National Statistics' “Financial Wealth: Wealth in Great Britain” dataset⁵.

The modal Briton lives in a home with a net financial wealth of between £500 and £4,999 – much lower than the capital expenditure required to install even the cheapest renewable heating system included in the RHI. To make matters worse, the regional data suggest that financial wealth is lowest in areas of Britain with a high proportion of off-grid households. In the North West and North East of England, median household wealth is £3,500 and £2,600 respectively.

Although the RHI isn't limited to off-grid households, the economic case for installing a renewable heating system isn't particularly compelling when mains gas is the existing fuel. As a consequence, it is likely that the ability to pay for a renewable heating system is lowest in areas where renewable heating would most be helpful. This fear is partially borne out by the evidence - the figure below details the number of domestic RHI accreditations, weighted by the size of the population in each region.

**Domestic RHI Accreditations
by Region**



Scotland has the highest number of accreditations per capita, with 1.72 accreditations for every 1,000 inhabitants. This is no doubt the result of the preponderance of off-gas heating in Scotland, compared with other areas of Great Britain. Of concern is the poor uptake of renewable heating technologies in the North West (0.40) and North East (0.53), where a higher proportion of homes are off the gas grid.

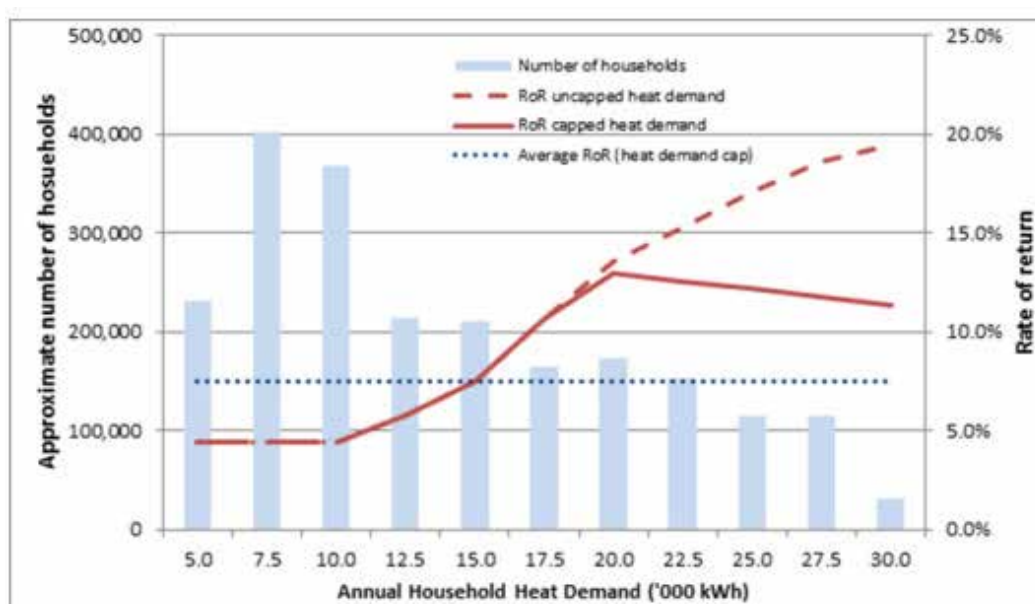
Current Scheme

Next, we consider the deployment potential from the two scenarios. The current tariffs for each technology are:

- Air source heat pump: 7.42 p/kWh of generated renewable heat
- Ground source heat pump: 19.10 p/kWh
- Biomass: 5.14 p/kWh

Degression triggers for post-2017 are yet to be published, so these have been estimated by fitting a linear regression model to historical triggers and extending this model to 2021. It is assumed that exceeding the trigger leads to a tariff reduction of 10% and exceeding the super trigger leads to a reduction of 20%.

As mentioned earlier, one of the most significant – and welcome – changes to the Domestic scheme is the introduction of a cap on payments. ASHP installations will receive tariff payments for the first 20,000 kWh of renewable heat in any year. Payments to GSHP and biomass installations will be capped at 25,000 kWh. Any subsequent generation will not receive any tariff payments. The RHI Impact Assessment (March 2016) outlines the effect that this will have on the rate of return for householders, compared with a flat tariff structure. This is demonstrated in the graph below:



Under a flat tariff structure, the expected rate of return continues to rise as household heat demand increases. Consequently, this scheme provides a disproportionate incentive to people with large or energy inefficient houses. Considering the high installation costs of renewable heating technologies (£8,000 and upwards), it seems injudicious for the Government to be providing capital-rich homeowners with an investment opportunity with a rate of return in excess of 10%. A capped tariff structure would go some way towards correcting this inequity. Households above the heat demand cap (20,000 kWh) will still receive a rate of return in excess of 10%, but excessive returns should no longer be possible.

Heat Demand Scenarios

This analysis considers two heat demand scenarios. In the first, the heat demand for each technology is assumed to match the reference heat demand (i.e. the heat demand of the “typical” installation) as estimated by DECC⁶. This will be referred to as the “Reference Scenario”. In the Reference Scenario, the following average heat demand values are assumed:

- ASHP: 14,000 kWh
- GSHP: 17,000 kWh
- Biomass: 24,500 kWh

In the second, the heat demand for each technology is assumed to meet the cap – the “Cap Scenario”. In this scenario, the following average heat demand values are assumed:

- ASHP: 20,000 kWh
- GSHP: 25,000 kWh
- Biomass: 25,00 kWh

The final assumption relates to how much of the available budget for new installations is spent on each technology. This is impossible to predict in the absence of ring-fenced budgets for each technology, so these have been chosen to be illustrative. In the first instance (Scenario One), it is assumed that each technology receives a third of the overall Domestic budget. The second has been chosen to approximately meet DECC’s indicative market sizes in 2021 of 1,000 domestic biomass systems, 13,700 ASHPs and 2,500 GSHPs. Assuming that the same proportion of the budget is spent on each technology in each year, this suggests that 50% of the budget is spent on ASHPs, 45% on GSHPs and 5% on biomass boilers.

Deployment – Reference Scenario

Given the initial tariffs listed in the previous section, the Reference Scenario heat demands lead to the following average annual payments for each technology:

- ASHP: £1,039
- GSHP: £3,247
- Biomass: £1,259

Based on the estimated expenditure, available budget for new installations and the two expenditure scenarios the following deployment is estimated:

Year	Scenario One			Scenario Two		
	ASHP	GSHP	Biomass	ASHP	GSHP	Biomass
2016/17	8,043	2,573	7,445	12,064	3,474	1,117
2017/18	7,847	2,511	8,152	11,771	3,389	1,223
2018/19	6,650	2,127	7,752	9,974	2,872	1,036
2019/20	6,040	1,932	7,902	9,060	2,609	941
2020/21	7,634	2,442	9,988	11,451	3,297	1,190
Total	36,213	11,586	41,240	54,320	15,640	5,507
			89,038			75,467

Even using the most favourable assumptions, merely an additional 90,000 renewable heating systems would be installed through the RHI, generating 5,075 GWh of renewable heat in the next five years. However, this would include a large number of biomass systems. Scenario Two better reflects DECC’s intentions for deployment 2021 and would result in the installation of 75,000 renewable heating systems, with just 3,562 GWh of renewable heat. **To put these figures into context, it is expected that 8 million gas boilers will be sold in this same period.** Using an illustrative value of 12,500 kWh of heat per household, these boilers would produce 100,000 GWh of heat in a single year.

Deployment - Cap Scenario

Given the initial tariffs, these heat demands lead to the following average annual payments for each technology:

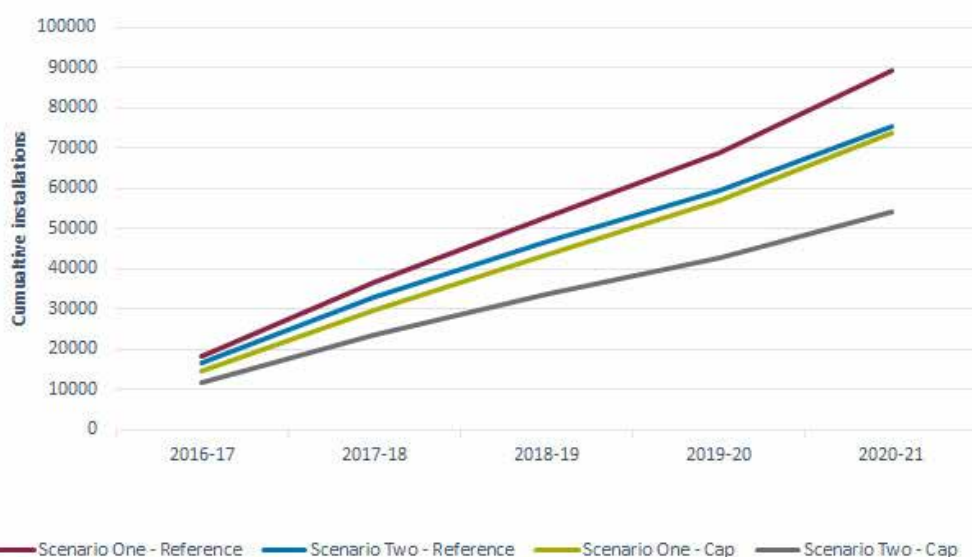
- ASHP: £1,484
- GSHP: £4,775
- Biomass: £1,285

Based on the estimated expenditure, available budget for new installations and the two expenditure scenarios the following deployment is estimated:

Year	Scenario One			Scenario Two		
	ASHP	GSHP	Biomass	ASHP	GSHP	Biomass
2016/17	5,630	1,750	7,296	8,445	2,362	1,094
2017/18	5,493	1,707	7,989	8,240	2,305	1,198
2018/19	4,655	1,447	7,597	6,982	1,953	1,015
2019/20	4,228	1,314	7,744	6,342	1,774	922
2020/21	5,344	1,661	9,788	8,016	2,242	1,166
Total			73,364			54,056

In the Cap scenario, maximum estimated deployment is only 73,462 renewable heating systems and 5,075 GWh of generated renewable heat. Scenario Two would only result in the installation of 54,056 systems and 3,562 GWh of heat.

Cumulative Deployment in Each Scenario



Voucher Scheme

As outlined above, an alternative scheme would involve the domestic budget being used to provide an upfront voucher to homeowners, in a similar fashion to the RHPP. To determine the value of this voucher, it is necessary to first estimate the cost of an average installation of each of the technologies. To do this, we use information provided in the “Sectoral scenarios for the Fifth Carbon Budget – Technical Report” concerning capital costs. The mid-point of the capital cost range is used. Since these figures are presented in terms of price per kW of installed capacity, it is also necessary to take into account the average capacity of installations.

DECC’s monthly RHI statistics provide some information about the average capacity of installations. For each of the technologies the median installation capacity is greater than the mean. This is indicative of a number of very large installations having a disproportionate effect on the mean. In the case of biomass installations, the mean capacity is more than twice as large as the median capacity, suggesting that there are some exceptionally large installations. Given the skewness of the distribution, the median capacity will provide a better description of the “typical” household and is therefore used for calculating the average installation cost.

Using these two figures, it is possible to estimate the average installation cost of each technology type. The results are presented in the table below:

	Domestic capital costs (£/kW)	Average capacity of installation (kW)		Average installation cost (£)
		Mean	Median	
Air source heat pump	750-1250	9.9	8.5	8,500
Ground source heat pump	1500-2500	13.9	10	20,000
Biomass	710-1190	26.6	11.5	10,925

Although it could be argued that a more sophisticated model would incorporate a reduction in costs as time goes on, it is assumed that the installation cost of each of the technologies remains constant until 2021. A reduction in costs could be easily included, but it is felt that the introduction of such an inherently uncertain variable would add little to the accuracy of our findings. Furthermore, DECC’s supplementary assessment of the ASHP and GSHP markets⁷ suggest that the scope for significant reductions in the installation cost of these technologies is limited.

50% Voucher

It is assumed that the Government provides a voucher for half of the cost of each installation. This would bring the installation price of ASHPs, GSHPs and biomass systems to £4,250, £10,000 and £5,463 respectively.

Using the same expenditure proportions as above, the estimated deployment from this scheme is presented in the table below:

Year	Scenario One			Scenario Two		
	ASHP	GSHP	Biomass	ASHP	GSHP	Biomass
2016/17	1,915	814	1,189	2,873	1,099	178
2017/18	3,891	1,654	2,417	5,837	2,233	363
2018/19	5,586	2,374	3,469	8,378	3,205	520
2019/20	7,139	3,034	4,434	10,708	4,096	665
2020/21	9,115	3,874	5,662	13,673	5,230	849
Total	27,646	11,749	17,171	41,469	15,862	2,576
			56,566			59,907

25% Voucher

Next, the effect on deployment of providing a voucher for a quarter of the cost of each installation. This would bring the installation price of ASHPs, GSHPs and biomass systems to £6,375, £15,000 and £8,194 respectively.

Using the same expenditure proportions as above, the estimated deployment from this scheme is presented in the table below:

Year	Scenario One			Scenario Two		
	ASHP	GSHP	Biomass	ASHP	GSHP	Biomass
2016/17	3,830	1,628	2,379	5,745	2,197	357
2017/18	7,783	3,308	4,834	11,674	4,465	725
2018/19	11,171	4,748	6,939	16,757	6,409	1,041
2019/20	14,277	6,068	8,868	21,416	8,191	1,330
2020/21	18,230	7,748	11,323	27,345	10,459	1,698
Total	55,291	23,499	34,342	82,937	31,723	5,151
			113,133			119,812

A 25% voucher would actually permit higher deployment than the current tariff structure, with deployment in the region of 120,000 under the most favourable assumptions. It is not the purpose of this paper to determine if a 25% voucher would prove to be a sufficient incentive, but it should be reiterated that this scheme would not commit future governments to any additional expenditure.

Deployment - Conclusions

This analysis demonstrates that the current RHI budget is unlikely to cause any meaningful change to the UK heating market. The best case scenario under the current tariff structure results in the installation of 90,000 renewable heating systems over the next five years. Given that the vast majority of the 27 million households in the UK currently heat their homes using fossil fuels, it is clear that installing renewable heating systems in just 0.3% of these homes will barely begin to help the country meet its 2020 renewable heat target.

In light of the insufficient funding available to the RHI, we change our focus to identifying how the limited RHI budget can be put to best use.

Existing Heating Systems

To understand how to maximise the impact of the RHI, it is useful to explore the prevalence of different heating systems throughout the UK. From the latest English Housing Survey, it is known that primary heating fuels are found in the following proportions throughout England (figures for Scotland and Wales are not published as frequently or to the same level of detail):

- Gas: 86.9%
- Oil: 3.7%
- Solid fuel: 0.7%
- Electricity: 8.7%

For simplicity, it is assumed that these proportions continue to be true throughout Scotland and Wales. In reality, this probably overestimates the number of gas fired central heating systems, since the gas grid is less prevalent in these countries. Consequently, the number of oil fired, solid fuel and electric central heating systems is likely underestimated.

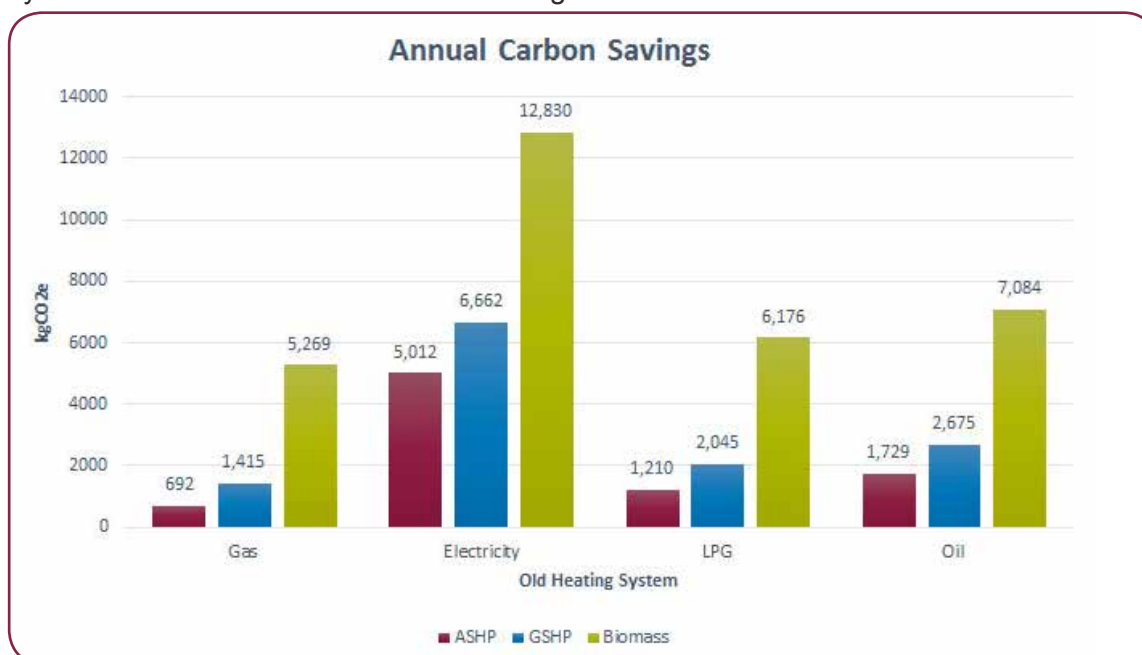
Given the (approximate) 27 million homes in the UK, this suggests the following population levels for each of these heating fuels.

- Gas: 23.46 million homes
- Oil: 1 million homes
- Solid fuel: 0.19 million homes
- Electricity: 2.35 million homes.

Household carbon savings

One of the primary benefits to the UK of incentivising the installation of renewable heat is the resulting reduction in carbon emissions. Air and ground source heat pumps use electricity as their fuel – currently, grid electricity has a carbon footprint of 0.494 kgCO₂e per kWh (plus an additional 0.043 kgCO₂e from transmission and distribution losses). This compares unfavourably with natural gas (0.185 kgCO₂e/kWh), LPG (0.215 kgCO₂e/kWh) and oil (0.245 kgCO₂e/kWh). However, the high efficiency of heat pumps offsets the greater carbon intensity of the fuel, therefore leading to carbon savings. Although the combustion of biomass does release carbon dioxide into the atmosphere, a sustainable approach to planting replacement trees does create a “closed carbon cycle”. Consequently, the net effect is near-zero carbon emissions. Analysis conducted by DEFRA has resulted in biomass being assigned a carbon footprint of 0.012 kgCO₂e/kWh.⁸

The graph below illustrates the carbon savings that would be made by switching from each existing heating system to each of the renewable technologies.



The greatest savings would be made in situations where direct electric heating is replaced by a renewable heating system. In light of the current carbon intensity of grid electricity, the figures above suggest that the replacement of a mains gas boiler with a heat pump would have a nugatory effect on carbon emissions.

The graph above suggests that a wholesale switch to biomass would be the easiest way of decarbonising UK heat demand. However, given that the UK is now burning 33% of the world's wood pellet imports, there is growing concern about the sustainable credentials of this fuel source⁹. Although technically “renewable”, it should be clear to most that heating UK homes using wood is not a sustainable solution to our long term goals. That this behaviour has been incentivised using public funds is symptomatic of the dysfunctional decision making that underlies the RHI.

Recommendations

For the 23 million British households with a gas boiler, the grid injection of biomethane (and other biogases) would be the most appropriate option for decarbonising their heat. The Impact Assessment document indicates that biomethane and biogas are a more cost effective option than heat pumps¹⁰. In 2020/2021, it is expected that 4.04 TWh of renewable heat will be generated by biomethane/biogas through the RHI, at a cost of £48.8m/TWh. This compares favourably with the 1.075 TWh of renewable heat from heat pumps, at a cost of £119m/TWh.

Crucially, the widespread use of biogas would not require the typical British household to change their behaviour in any way and would not just benefit households who are able to afford expensive new heating systems. Given the apathy for recent Government energy schemes, the most practicable decarbonisation strategy – where possible - would appear to be the one in which the decision to reduce their carbon emissions is taken out of the consumer's hands.

As explained in the previous section, the greatest savings would be made in situations where direct electric heating is replaced by a renewable heating system. However, the technologies included in the domestic RHI are not suitable for all property types. Heat pumps often comprise a sizeable outdoor unit as well as an indoor component, while biomass systems require more significant storage space.

As a result it is unlikely that these technologies are suitable for flats. Excluding flats, the English Housing Survey estimates that there are over 750,000 properties in England where electricity is the primary heating fuel. Work conducted by Consumer Focus suggests that a further 400,000 homes throughout Scotland and Wales use electric heating, although it is not known how many of these would be suitable for these renewable heating systems. These figures suggest that there are enough electrically heated households in the UK so that this sector should be considered a priority for the installation of new renewable heating systems.

Further to this, as detailed in EUA's report "Biopropane for the off-grid sector", it is recommended that biopropane should be included in the RHI. Biopropane is a renewable alternative to LPG that could provide an effective solution to the carbon reduction requirements of the 170,000 UK homes that currently use LPG. Using the heat demand values from the Reference scenario, switching from LPG to biopropane would reduce household carbon emissions by 2,506 to 4,386 kcCO₂e respectively. As with biomethane for mains gas customers, biopropane would require no behavioural change from consumers and would allow them to continue using their existing appliances, thereby greatly increasing the chances of meaningful decarbonisation.

DECC should view the last 24 months of the RHI as a learning experience. Many of the posited "pathways" to meeting the UK's long term targets incorporate vast numbers of heat pumps in retrofit scenarios. However, the estimated deployment in this analysis and DECC's finding that heat pumps are unlikely to see significant price decreases, make these scenarios seem increasingly unlikely. In light of this, EUA/HHIC would advocate a more targeted strategy, where the RHI is used to fund the most appropriate solution for each sector of the heating market.

With limited resources, it is logical to spend money where the marginal effect is highest. As a result, the key recommendations of this paper are that the RHI should be focussed on three areas:

- 1) The installation of renewable heating systems in homes where direct electric heating is currently found.**
- 2) The incremental decarbonisation of the LPG sector using biopropane.**
- 3) Increasing investment in the use of biomethane and biogas, in order to reduce the carbon intensity of grid gas.**

It is important to emphasise the role that heat pumps (both electric and gas-driven) will have in the new build heating market. New build homes typically have thermal properties that better suit the operational characteristics of heat pumps. In addition, the higher installation costs can be more easily subsumed within the build costs and subsequent sale price, rather than necessitating significant outlay from an existing homeowner. As such, it is recommended that the installation of heat pumps should be strongly encouraged for new build homes.

Rather than adopting a blanket, one-size-fits-all approach to the decarbonisation of heat, it is prudent in the short term to focus limited Government resources on the sectors of the heating market where the most progress can be made.

Appendix

Bibliography

1. Emissions from Heat; Department of Energy and Climate Change; page 3; available at https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/140095/4093-emissions-heat-statistical-summary.pdf
2. Supplementary forecast information release; Renewable Heat Incentive; Office for Budget Responsibility; available at http://budgetresponsibility.org.uk/docs/dlm_uploads/Renewable-heat-incentive_November2015.pdf
3. The Renewable Heat Incentive: A reformed and refocused scheme; p17-18; available at https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/505972/The_Renewable_Heat_Incentive_-_A_reformed_and_refocussed_scheme.pdf
4. The Renewable Heat Incentive: A reformed and refocused scheme; p15; available at https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/505972/The_Renewable_Heat_Incentive_-_A_reformed_and_refocussed_scheme.pdf
5. Wealth in Great Britain; Office for National Statistics; available at <https://www.ons.gov.uk/peoplepopulationandcommunity/personalandhouseholdfinances/incomeandwealth/compendium/wealthingreatbritainwave4/2012to2014>
6. Impact Assessment - The Renewable Heat Incentive: A reformed and refocused scheme; DECC; available at: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/505132/Consultation_Stage_Impact_Assessment_-_The_RHI_-_a_reformed_and_refocussed_scheme.pdf
7. The scope for cost reductions in a mass market for low carbon heating technologies; DECC; available at <https://www.gov.uk/government/publications/the-scope-for-cost-reductions-in-a-mass-market-for-low-carbon-heating-technologies>
8. Carbon conversion factors; DEFRA; available at <http://www.ukconversionfactorscarbonsmart.co.uk/>
9. Does the UK's biomass burning help solve climate change; The Carbon Brief; <http://www.carbonbrief.org/investigation-does-the-uks-biomass-burning-help-solve-climate-change>
10. The Renewable Heat Incentive: A reformed and refocused scheme; p62-63; available at https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/505972/The_Renewable_Heat_Incentive_-_A_reformed_and_refocussed_scheme.pdf

Procedure for estimating available budget

The following algorithm is used to calculate the available budget for each year:

- 1) The available budget for a year is calculated by taking the forecast budget and subtracting the amount that has been committed to be spent on existing installations.
- 2) New expenditure (equal to the available budget for a given year) is carried forward into the next year and added to pre-committed (pre-2016) expenditure.
- 3) Any new expenditure is assumed to increase by 1%, as an estimate of indexation by the Consumer Price Index (CPI). Pre-2016 accreditations receive tariff payments that increase in line with the Retail Price Index (RPI). RPI is traditionally higher than CPI, so has been assigned an estimated value of 2% in this analysis.
- 4) Repeat Steps 1-3 for each subsequent year.

