Fuel Poverty in Great Britain, Germany, Denmark and Spain - relation to grid charging and renewable energy

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Highlands and Islands Enterprise

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Executive summary

Highlands and Islands Enterprise (HIE) has commissioned Xero Energy (XE) to examine whether there is any relationship between fuel poverty and locational charging for use of the transmission network. The analysis is in the context of the UK government philosophy that locational charging for grid infrastructure is cost-effective, and thus in the interests of customers – some of the most vulnerable of whom are the fuel poor.

The analysis also examines wider links between fuel poverty, energy prices and renewable energy development. In particular, and of direct relevance to the Highlands and Islands, the report considers fuel poverty and the development of renewable energy in sparsely populated areas distant from centres of demand. Comparisons are drawn with other European countries noted for their high levels of renewable energy penetration, namely Denmark, Germany and Spain.

The key findings (in green) and recommendations (in red) are as follows:

Fuel Poverty

- Fuel poverty levels are high in the UK compared to other northern latitude countries. Southern latitude countries, including Spain, fare even worse, when it is cold.
- The best response to fuel poverty appears to be long-term adaptation to severe weather. This response is exemplified by Northern Scandinavian countries.
- Improving the housing stock is the most effective response to fuel poverty.
- There is a vicious circle whereby rural, off-gas consumers are more vulnerable to fuel poverty and less likely to benefit from schemes aimed at its alleviation.
- There is a need for better targeted support for these "hard-to-treat" homes which are prevalent in the Highlands and Islands.

Fuel Poverty and Transmission charging

- Transmission costs account for 4% of a domestic consumer's utility bill. Differences in cost attributable in the way in which these costs are allocated are likely to be very small.
- The effect of locational Transmission Network Use of System (TNUoS) charges on consumer bills is likely to be insignificant. The effect on generators in the north of Scotland can be very significant.
- Wholesale energy costs account for some 66% of a customer's bill. Despite hosting some of the cheapest generation in the UK, customers in the north of Scotland do not have access to the lowest GB market prices.
- The argument that locational TNUoS benefits customers in the north of Scotland does not seem to be supportable and this point should be made.
- Locational TNUoS is at odds with European policy on the development of rural, peripheral areas. Specifically, it would appear to contravene the non-discrimination clause of the Renewables Directive concerned with grid charges for peripheral areas.

More generally, country comparisons showed no relationship between fuel poverty and renewable energy levels, energy prices or transmission charging regime. On the latter point, it would be very surprising if there were any link, simply because it is concerned with differences between charging regimes which, themselves, only cover a small part of overall system costs.

Transmission charging is of much greater significance to generators, and by implication to the potential for socio-economic development in rural, remote areas of Scotland. There is a trade-off between these socio-economic benefits, coupled with the long-term price stability of fuel-free power, which has not been accommodated within current pricing regimes.

1 Introduction

1.1 The Brief

Highlands and Islands Enterprise (HIE) has commissioned Xero Energy (XE) to examine whether there is any relationship between fuel poverty and locational charging for use of the transmission network. Other related links will also be investigated, especially that of renewable energy development in rural areas.

XE understands the analysis is in the context of the UK government philosophy that locational charging for grid infrastructure is cost-effective, and thus in the interests of customers – some of the most vulnerable of whom are the fuel poor. XE understands HIE is interested in establishing whether there is indeed any relationship between fuel poverty and grid infrastructure pricing or, more widely and perhaps importantly, the promotion of renewables in areas distant from centres of population.

These are key issues for Northern Scotland in particular, because locational charging for use of the transmission network is particularly high for generators. At the same time the region is well endowed with renewable energy resources. It is also sparsely populated and to some extent residents are vulnerable to fuel poverty.

A key means of establishing any relationship is to be through comparison of experiences in countries noted for high levels of renewable energy development – namely Denmark, Germany and Spain.

1.2 Report Structure

The report is structured as follows:

- Section 1 Introduction (this section)
- Section 2 Background
- Section 3 Incidence of fuel poverty
- Section 4 Household energy efficiency
- Section 5 Renewable energy
- Section 6 Energy prices
- Section 7 Grid network charging
- Section 8 Conclusions
- Section 9 Recommendations
- Section 10 References

2 Background

2.1 Fuel Poverty in Scotland

The problem of fuel poverty has, naturally, been high on the political agenda, and even more so with ongoing fuel price rises.

Commenting on official figures which show a rise in fuel poverty levels, the Scottish Communities Minister states:

"*...it is simply not right that in 21st century Scotland nearly a quarter of our population - more than half a million households - are still living in fuel poverty.*" [1]

This is, in essence, the issue – that in a civilised society people are dying in their homes from the cold. It would be difficult to imagine any politician disagreeing with this sentiment.

In 2002, the Scottish Executive committed in a "Fuel Poverty Statement" to take reasonable steps to eradicate fuel poverty by 2016 (similar commitments have been made by the other UK governments). The Statement is required by Section 88 of the Housing (Scotland) Act 2001, which asks ministers to set out, in a "Scottish Fuel Poverty Statement" how people will be protected, as far as is reasonably practical, from living in fuel poverty. The statement should have a target, with progress reported upon at least every four years [2].

The Local Government and Communities Committee of the Scottish Parliament has been holding an enquiry on fuel poverty, taking evidence towards the end of 2007 [3]. Specifically, the committee is looking at the operation of the government's grant programmes for heating systems and energy efficiency measures.

During the course of this enquiry the government stated that it was reviewing fuel poverty and its associated programmes, with reference to the 2016 target on fuel poverty eradication. This review is due to report in early 2008.

2.2 Highlands and Islands Enterprise

HIE is concerned with supporting sustainable economic opportunities for the north of Scotland. Renewable energy combines the potential inherent in the areas' abundant natural resources, with the need for long-term rural development and job creation. It builds substantially on previous experience from the exploitation of oil and gas resources, an industry which has provided valuable income for the area but which is currently in decline.

A natural development is for a shift of this model towards the exploitation of renewable energy resources. The islands are putting themselves forward as part of the solution to pressing needs for sustainable energy, whilst also meeting their own needs for sustainable development.

In exactly the same way as oil and gas resources need to be shipped to centres of demand, large-scale investment in new grid infrastructure is essential to support transport of renewables-based energy to areas of high demand. Currently, the most viable method of transport is via an electrical grid, although future developments could herald new ways of storing and transporting energy.

HIE has been working with stakeholders in progressing island-based projects and the necessary infrastructure. In so doing, HIE has been involved in debate surrounding the charging regime for use of the electricity grid. In particular, the current regime imposes charges that are weighted in favour of generation closer to demand. Island-based generators are distant from major demand centres, and require new infrastructure, at least a portion of which needs to be undersea cabling. This combination leads to some very high costs for connection which, at present, are prohibitory.

The costs of connecting the islands are what they are – the debate surrounds the means of allocating these costs, and whether it is fair and reasonable to weight the system against generation in the islands.

2.3 This report

The UK government believes that the current network charging system is in the interests of consumers, and, by implication, that it is in line with policies to reduce fuel poverty. Consumers in the north of Scotland might be expected to be particularly vulnerable to fuel poverty, by virtue of the high proportion of rural, and / or off-gas households, and the limited opportunities for improving incomes. This report has therefore been commissioned to examine the question of fuel poverty and consumers in the north of Scotland, and where their interests might lie in the context of grid infrastructure charging and the development of renewables in the north of Scotland.

One might expect that were there any relationship between fuel poverty, network charging and the exploitation of remote renewable energy resources, that this might be evident through comparison with other European countries. For instance, where there has been extensive exploitation of renewables in other countries, how have the network costs been funded and what are fuel poverty levels in these countries?

The extent to which such a comparison can provide clear answers is likely to be limited, given that many other factors are involved, compounding the overall picture. Nonetheless, country comparisons are instructive in examining the important factors at play, and in learning from experiences in other countries.

3 The incidence of fuel poverty

3.1 Introduction

Fuel poverty, and, particularly, policy designed to address fuel poverty, is often perceived as a UK / Irish phenomenon, at least within Europe. Cold-induced mortality is however a world-wide phenomenon and the UK and Ireland are notable for the definition of, and policy focus on, the problem of those unable to afford adequate household warmth.

A fuel-poor household is defined in the UK as one where the estimated required expenditure to maintain adequate warmth and other energy services exceeds 10% of household income [4]. It is a measure of the number of households needing to make impossible decisions on expenditure to meet basic human needs.

There is, however, no pan-European definition of fuel poverty. In other countries it may fall within general poverty-alleviation programmes, or it may simply not be recognised as a major problem. Cross-country comparisons therefore need to employ indicators of fuel poverty, such as the winter variation in mortality levels or utility bill payment arrears.

This Section of the report examines some fuel poverty indicators for the UK, Denmark, Germany and Spain. It then considers in more detail the incidence of fuel poverty in Scotland. Key indicators used are:

- The percentage of households able to adequately heat homes
- Winter mortality rates
- Late payment of utility bills

3.2 Fuel poverty in Europe

3.2.1 Home heating

Research by Healy, in Ireland, examined the incidence of some fuel poverty indicators across Europe [5] for the period 1994 to 1997. Figure 3.1 shows the percentage of households declaring that they are unable to heat their homes adequately for the four countries of interest – the UK, Denmark, Germany and Spain.

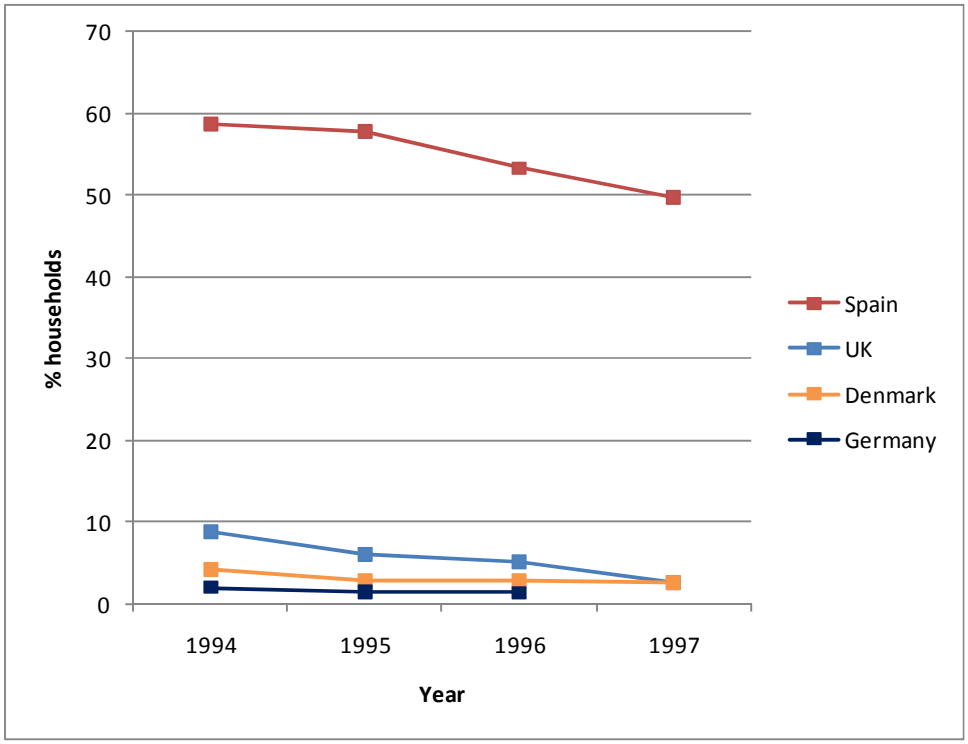

Figure 3.1: Percentage of households unable to heat homes adequately

Spanish people are much more likely to report an inability to heat their homes than any of the other three northern latitude countries. Of the three countries with a comparable climate, the UK has the highest levels of reported inadequate warmth.

The order of magnitude difference between Spain and the other countries is reflective of a general split in the data between northern and southern latitude countries – with the warmer countries reporting consistently higher rates of inadequate heating. It is difficult to therefore meaningfully compare Spain and the UK with this indicator.

3.2.2 Excess winter deaths

Another study, also by Healy [6], examined the rates of excess winter deaths (EWD) across Europe. Figure 3.2 shows the results for the four countries of interest, for the period 1988-1997. Overall the analysis found that EWD rates were higher in countries with milder winters, reflecting again a north-south split in the data. Again, of the northern European countries shown, the UK fares the worst with a higher EWD rate than Germany or Denmark.

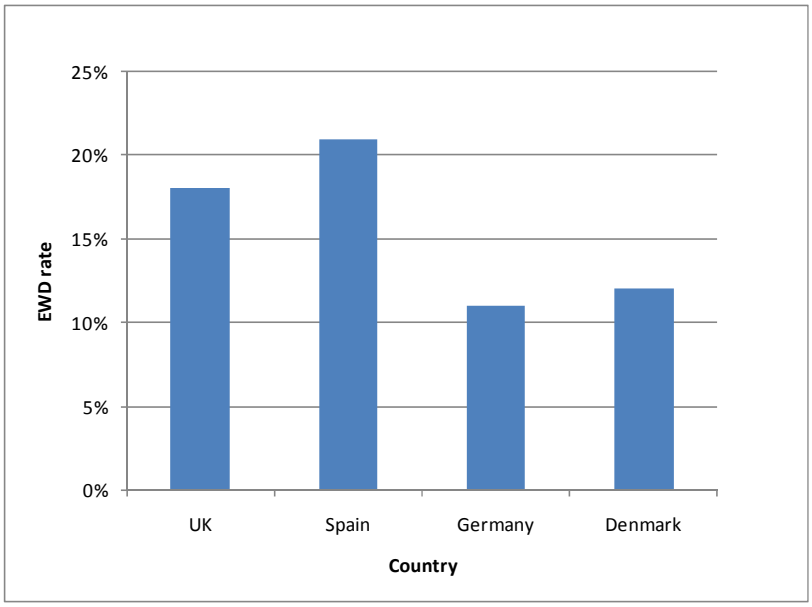

Figure 3.2: Excess winter death rates

A third study by the Eurowinter group [7] (published in 1997) also found the same trend of higher EWD rates in southern latitude countries. The authors of both studies concluded this was because of the preventative measures taken in northern countries against cold temperatures (notably better housing standards), and the more appropriate behavioural responses to the cold i.e. Northern European countries cope better with the cold, because they experience more cold.

Figure 3.3 illustrates this phenomenon – where people in milder climates seem to be more susceptible to the cold. The figure is taken from a presentation by the UK Meteorological Office's health forecasting unit, which seeks to forecast cold-related ill-health, and in so doing better prepare the relevant health services [8]. The figures are dramatic and show the UK (London) death rates at double the other countries shown which include Germany, and Finland, where winter temperatures are very substantially lower than those in the UK.

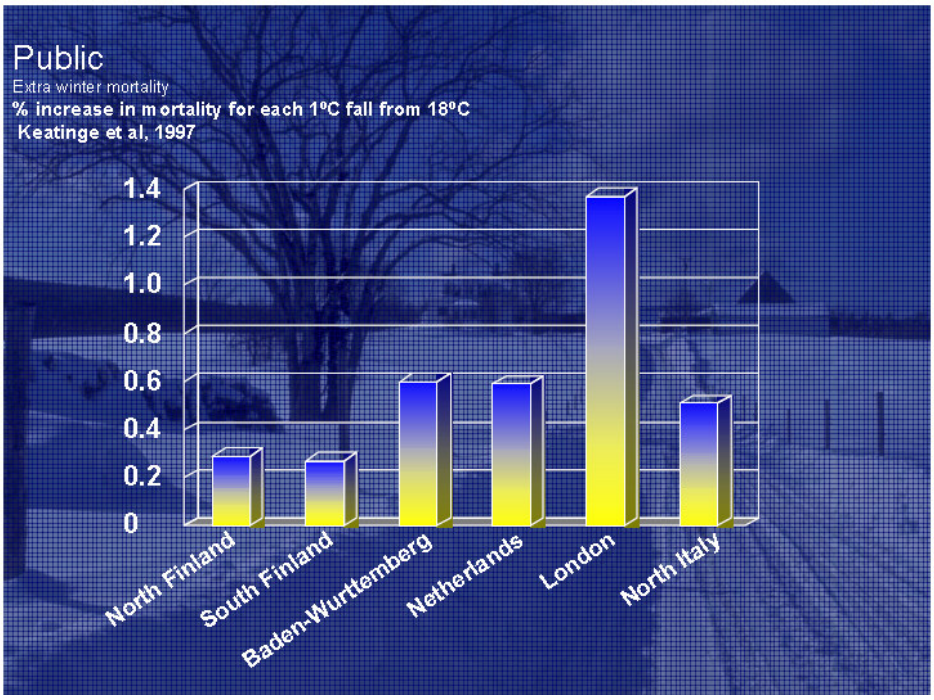

Figure 3.3: Mortality and cold weather

There is no definitive analysis which explains these observations. However, it would seem that the UK is not so mild as to show very high, southern-latitude levels of ill-preparedness for low winter temperatures. However, it does seem that it is rather ill-prepared compared to its Northern latitude neighbours, perhaps because its climate is not quite as severe, especially when compared to the northern Scandinavian countries.

3.2.3 Utility bill payment

Figure 3.4, taken from [5], shows a different kind of fuel poverty indicator which relates more to income and expenditure, namely the percentage of households subject to late-payment of utility bills. The UK has by far the highest rate of the four countries shown, including Spain. Analysis of the data in the study suggested that low-income households, younger people, and lower levels of education, were all associated with late payment of utility bills.

There could be a number of explanations for these differences in bill payments, and caution should be applied in reading too much into the data. For instance, late payments could fall through installation of pre-payment meters which would simply substitute being cold for being in debt. It is sufficient to note that for this indicator, there is no evidence that countries with a higher renewable energy penetration than the UK have any more difficulty in meeting utility bills. In fact, the trend would appear to be quite the opposite.

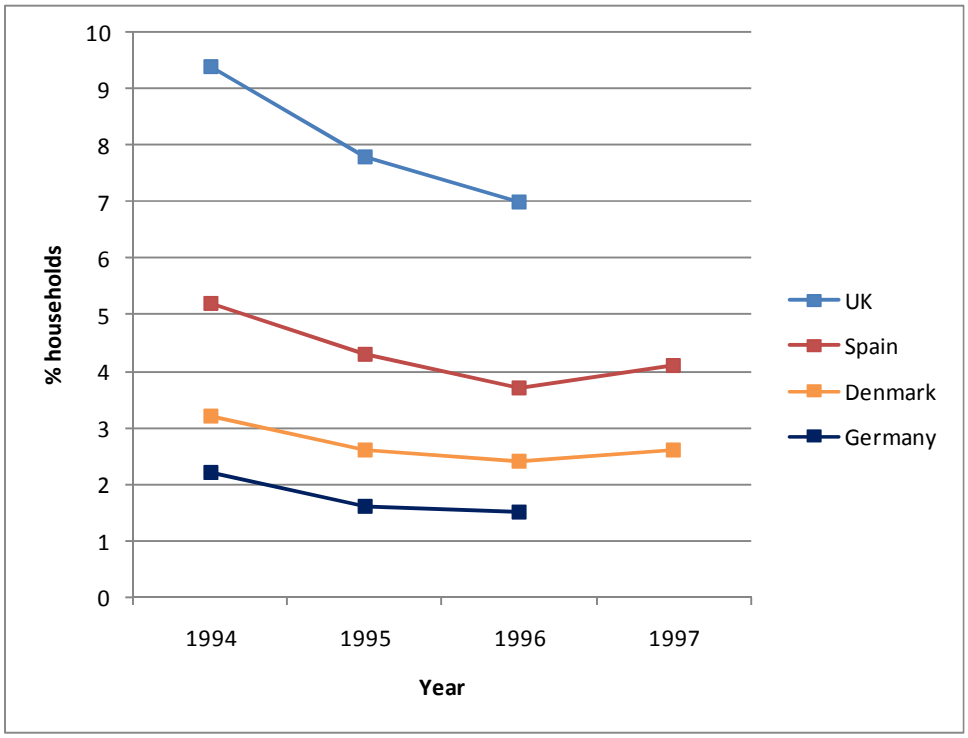

Figure 3.4: Percentage of households unable to pay scheduled utility bills

3.3 Fuel Poverty in Scotland

Official statistics on fuel poverty and housing standards can be found in the Scottish House Condition Survey (SHCS). The latest survey was undertaken over 2005-06 [9].

The SHCS calculates fuel poverty as defined by more than 10% of income spent on all household fuel use. This provides an official estimate of fuel poverty based on assumptions for expenditure on heating, compared to income.

Data for 1996 shows fuel poverty at 36% of households. This dropped substantially to 13% in 2002, when the next survey was undertaken. Annual surveys between 2003 and 2006 show steadily increasing levels to 24% in 2006. The rate of fuel poverty tends to be higher in rural areas, for those without gas, and for those in low energy efficiency-rated houses. The first two of these at least are highly applicable to Highland Scotland and the Islands suggesting fuel poverty rates are likely to be relatively high.

Excess winter mortality levels are also available for Scotland. Figure 3.5 shows "increased winter mortality" levels in Scotland from the General Register Office of Scotland (GROoS) [10]. Data for fuel poverty levels has been shown on the same graph for an approximate comparison of trends.

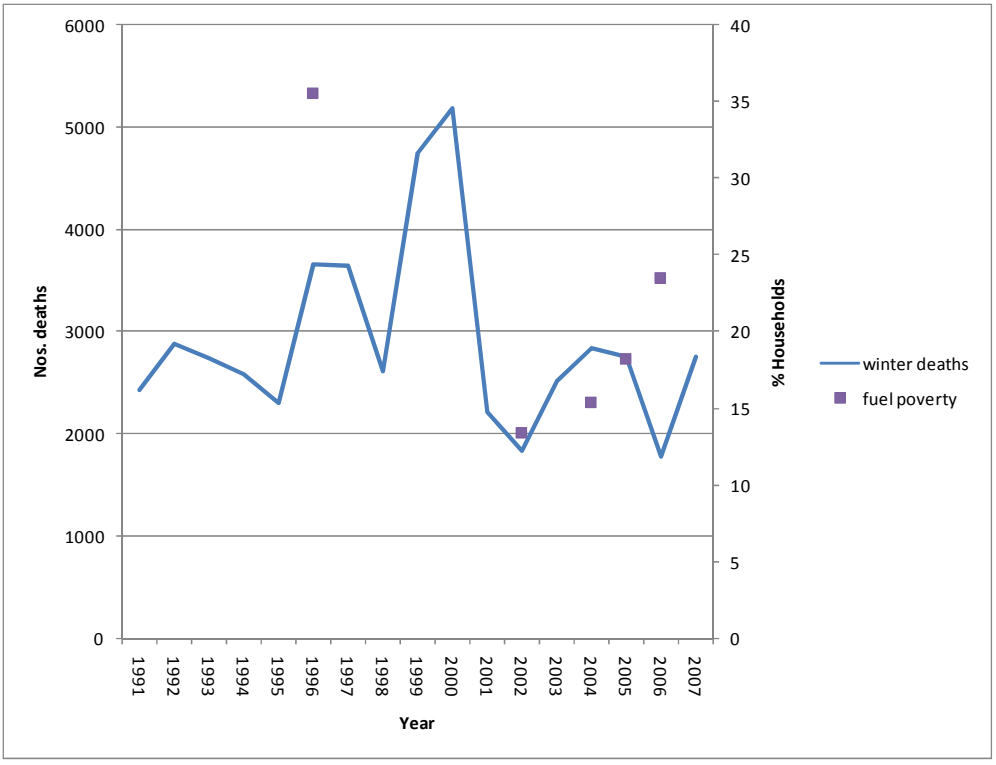

Figure 3.5: Winter deaths in Scotland and fuel poverty levels

Commenting on the winter mortality data, the GROoS states that:

"*many studies have shown that mortality levels in Scotland are markedly higher in winter months than summer months. Moreover, there are indications that this increased winter mortality has been relatively high in Scotland (and the rest of the UK) when compared with many countries with more extreme winter climates, though UK levels are comparable to several southern European countries (e.g. Greece, Italy, Spain) and lower than those recorded in Portugal and the Republic of Ireland. Whilst a number of theories have been advanced to explain these observations, there is as yet no consensus on the underlying mechanisms involved*."

Data for fuel poverty levels is patchy, but Figure 3.5 shows that there is no clear relationship between EWD rates and fuel poverty. There are a number of interacting factors contributing to fuel poverty, and, more importantly, to excess winter mortality. A reduction in fuel poverty levels does not necessarily mean a reduction in excess winter mortality levels – the latter is only achieved if people are able and willing to take appropriate responses to cold weather.

3.4 Summary

There is no pan-European definition of fuel poverty and so there is no easy means of comparing fuel poverty, as specifically defined in the UK, with other countries. There are however indicators of fuel poverty such as excess winter deaths and self-reported parameters on the availability of adequate warmth.

The main finding for Scotland and the rest of the UK is that many people are simply not adequately protected against the cold. Addressing fuel poverty is one response, but it shouldn't be the only response. It may be that we do not fully understand how to redress winter mortality levels. However, discussion later in this report suggests that other measures such as a sense of community and improvements in health care may be important parts of an overall response. Improvements in housing standards are considered to be of paramount importance.

For HIE's area, the data suggests that rates of fuel poverty are likely to be higher than the national average. This is because of the higher incidence of fuel poverty amongst rural and / or off-gas housing stock.

The key findings from cross-country comparisons are:

- The UK generally fares poorly on fuel poverty indicators, compared to its northern latitude counterparts.
- Scotland, and particularly its rural areas, such as the Highlands and Islands, compare poorly to other parts of the UK.
- Southern latitude countries have very high levels of winter-related deaths and direct north-south comparisons are difficult.

4 Household energy efficiency

4.1 Introduction

Improvements in household energy efficiency are an obvious, often cheap, way of reducing expenditure on heating and hence reducing fuel poverty. Even more preferable is for buildings to conform to high standards of energy efficiency from the outset and building standards in Northern Scandinavia are often hailed as exemplary in this respect. Many commentators have suggested that better housing standards are at least, in part, responsible for the lower levels of cold-related deaths in these countries.

This section of the report looks at some measures of household energy efficiency across Europe, and considers performance in Scotland.

4.2 European household energy efficiency

Figure 4.1 and Figure 4.2 show selected data from a European initiative [11] which collates energy efficiency data across Europe.

4.2.1 Energy efficiency improvements

Figure 4.1 shows improvements in household energy efficiency over a four year period. Germany and Denmark exceed the UK's performance, with Spain underperforming compared to the UK. The EU average is shown by the red line and the UK is below it.

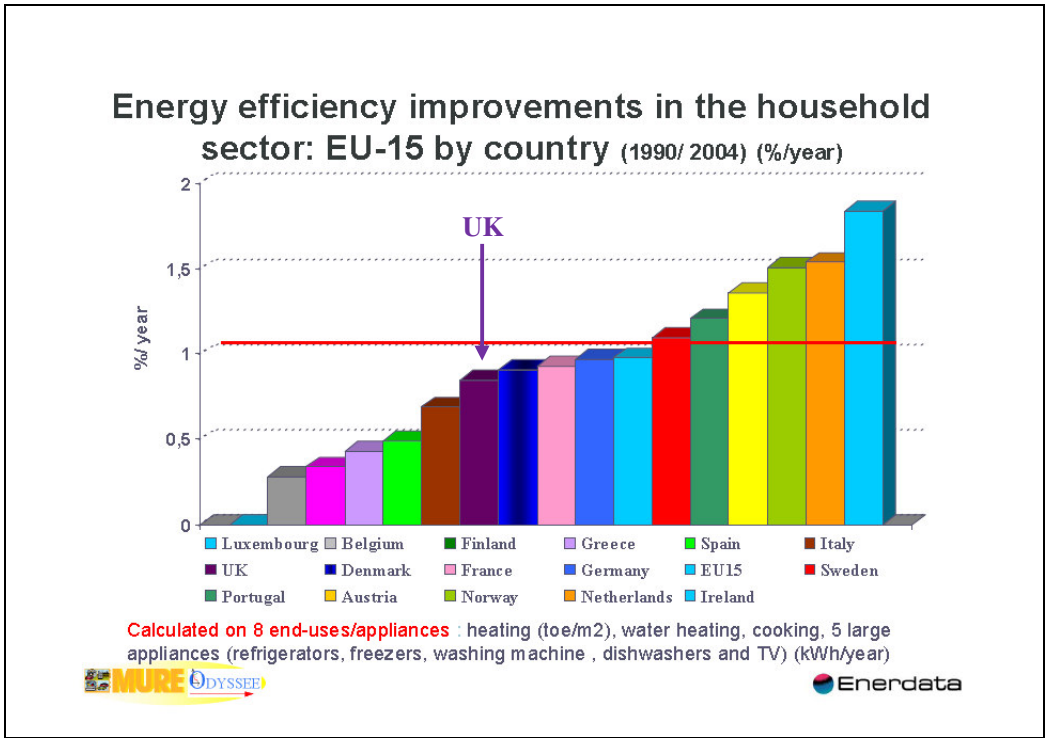

Figure 4.1: Household energy efficiency improvements
(the legend should be read row by row to correspond with the graph i.e. the UK comes after Italy)

4.2.2 Household energy consumption

Figure 4.2 shows temperature-corrected household energy consumption, which is higher in the UK than in Germany, Denmark and Spain and second only to Ireland. It shows UK household energy consumption is increasing and in the European context is very high, indicating that the UK suffers with relatively more energy inefficient housing.

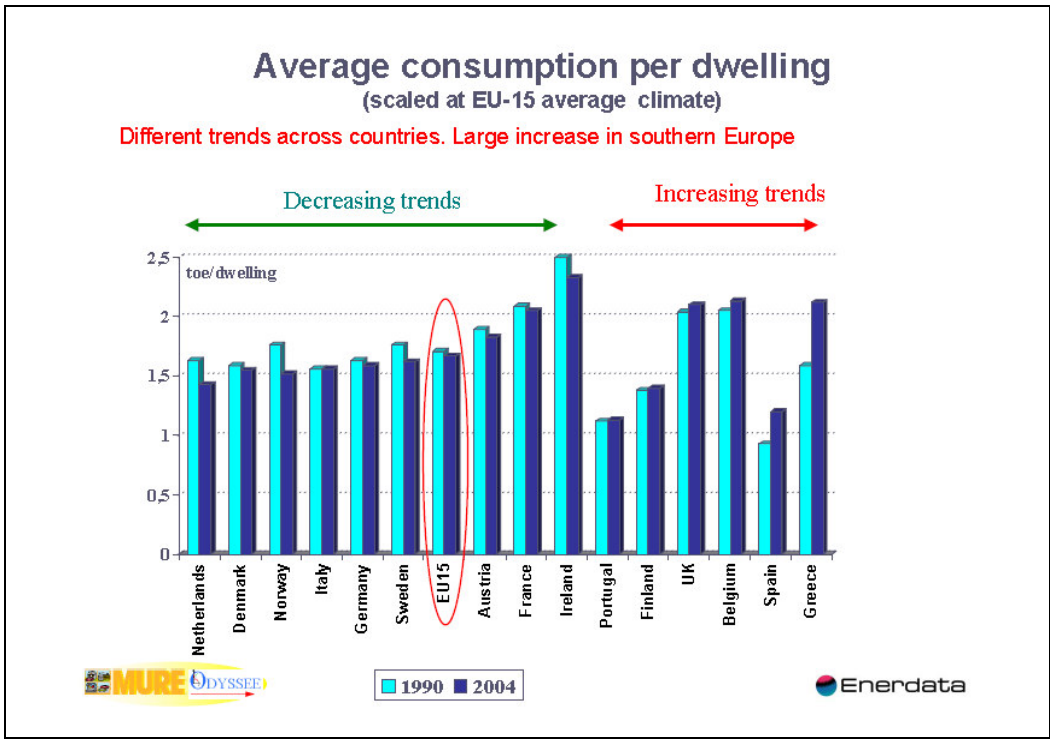

Figure 4.2: Temperature-corrected energy consumption by dwelling

4.2.3 Summary

There are a raft of measures which serve to illustrate the general point that the UK tends to underperform on energy efficiency in the European context. The relatively better energy efficiency performance of Germany and Denmark coincides with lower levels of fuel poverty in these two countries.

Ireland presents somewhat of an anomaly in so far as it shows exceptional improvements in energy efficiency in the latter half of the last decade, although it experiences relatively high levels of fuel poverty. This may in part reflect the fact that Ireland, and particularly Dublin, has experienced rapid economic expansion with which the electricity sector has not kept pace. Demand for electricity has outstripped supply, simply making improvements in energy efficiency a necessity, or a defacto outcome from there being less electricity to consume.

Measures such as installation of roof insulation score relatively highly in the UK, perhaps reflecting a general tendency in the UK to target the so-called “low hanging fruit” – the cheapest, most accessible energy efficiency measures. It also reflects the need to improve the existing housing stock through retrofitting of energy efficiency measures. Other more expensive measures such as fitting double glazing are less prevalent in the UK than in some other countries.

4.3 Energy efficiency in Scotland

4.3.1 General

Building energy efficiency is measured in the UK by a National Home Energy Rating (NHER) score, where a score of 7 or above is considered "good." For Scotland as a whole, the 2005-06 SHCS estimates the percentage of houses achieving a rating of 7 or above as 46%, an increase on 31% in 2002. To put this another way, over half of Scottish houses do not perform well. Key points are:

- Rural areas have a proportionately lower level of energy efficient housing stock.
- Gas centrally heated houses tend to score higher than those using electricity for heating, and substantially more so than those using oil or solid fuels for heating.
- Urban dwellings score higher than rural dwellings.

Given the three key points above it is clear that households in the Scottish Highlands and Islands in general will demonstrate poorer thermal efficiency than many other regions of Scotland, and will perform badly compared to the UK as a whole. More than 50% of households are likely to exhibit poor thermal efficiency.

4.3.2 Energy efficiency initiatives

There are a number of initiatives aimed at improving household energy efficiency:

Energy supply company energy efficiency / carbon commitments

For many years, energy supply companies have been obliged to promote energy efficiency, the costs of which are recouped via a levy on customer bills. Typical activities include the distribution of energy saving light bulbs or fridges, the provision of energy audits, and grant assistance for measures such as insulation. The energy regulator Ofgem is responsible for overseeing companies' energy efficiency schemes [12].

As of April 2008, the emphasis will change from targeted energy efficiency measures to targeted carbon reductions. The new scheme is called the Carbon Emissions Reduction Target (CERT).

For both schemes, a specified percentage of measures must be promoted to low-income customers. For the new CERT, this is proposed to be 40%. In so doing, the scheme is part of the government's response to fuel poverty.

Under these schemes, energy or carbon savings are based on estimated savings. That is, there is no audited obligation to ensure savings are achieved. A more stringent obligation was mooted in the 2007 Energy White Paper, and has been consulted upon for post-2011 [13]. At the end of 2007 the government said it was too early to decide whether to go ahead with such an obligation for "absolute" reductions in household energy or carbon reductions [14].

Grant schemes for household improvements in energy efficiency

The UK government and the devolved administrations each run grant schemes for improvements in housing and heating facilities, specifically targeted at low-income households. They are run by application and capped by the available funds each year.

In Scotland, the Scottish Government is responsible for the Central Heating Programme (CHP) and Warm Deal. The CHP provides new central heating systems for vulnerable groups. Off-gas customers have experienced some difficulties in accessing more expensive oil-fired systems, or are steered towards electricity-based systems which are cheaper to install,

but can be more expensive to run. Customers in rural areas tend to experience longer delays in the application and assessment process – more than 80% of applicants in KW, ZE and HS postcodes waited longer than 3 months for a survey, compared to a national average of 54% [15].

The sister Warm Deal programme provides grants for a package of energy efficiency measures, again, for certain qualifying groups.

4.4 European building standards

As previously noted, it is widely appreciated that building standards in Nordic countries result in better thermally insulated housing than the equivalent UK standards.

The Scottish Government recently commissioned a report on low carbon buildings, from an international expert panel of building and energy professionals, including heads of building regulatory systems from Denmark, Austria and Norway. On the initiative, the 5th annual UK report on fuel poverty states that:

"*One aim..... is to move construction of new buildings, including housing, towards the rigorous energy performance levels imposed in Scandinavia. This will allow householders to reduce their energy use and carbon dioxide emissions, as well as lower their fuel bills.*" [16]

The panel report has been published [17], and ministers are currently considering its recommendations. Research inputs for the report included a comparison of building standards between Scotland and Denmark, Finland, Norway and Sweden. Using the latest 2007 building standards for Scotland, the study found that a "model" house in Scotland "*does not meet the requirements in any of the other countries considered.*" It attributes this mainly to "*differences in climate between Scotland and the other countries, all of which are appreciably colder in winter.*"

The comparison of building standards between countries is not straightforward because of differences in calculation methods and assumptions. However, the report says that:

"*despite these differences, it is clear that all the Nordic countries have energy standards which would usually necessitate U-values*[1] *that are substantially lower (more demanding) than those used in the benchmark dwelling and provide for appreciably higher internal temperatures to be maintained whilst the external temperatures are much lower.*"

"*If the Swedish levels of U-values were to be adopted in the Scottish benchmark dwelling the space heating needs could be reduced by 23% and the total CO_2 emissions from the benchmark dwelling could be reduced by 13%. Adopting the air-tightness standards used in Norway and Denmark, together with an efficient mechanical ventilation system with heat recovery to avoid condensation damage, could increase the reduction in CO_2 emissions to 19%.*"

The clear message is that building standards in the UK are poor compared to other European countries, especially the Nordic region.

[1] A U value is a well known indicator of a building's energy efficiency used in the UK.

4.5 Summary

The UK tends to underperform on energy efficiency on a European (EU-15) basis. On a comparative basis the UK shows:

- Lower than EU average efforts to improve energy efficiency.
- Very high energy use per household, second only to Ireland.

In addition to the above, in a UK context the following are particularly important:

- Rural areas have a proportionately lower level of energy efficient housing stock.
- Gas centrally heated houses tend to be more thermally efficient that than those using electricity for heating, and substantially more so than those using oil or solid fuels for heating.
- Urban tend to be more thermally efficient than rural dwellings.

Given the key points above it is clear that households in the Scottish Highlands and Islands in general will demonstrate less energy efficiency than many other regions of Scotland and will perform badly compared to the UK, and indeed Europe, as a whole.

- More than 50% of households in the Highlands and Islands are likely to exhibit poor thermal efficiency, according to the latest official data.

UK programmes for energy efficiency improvements tend to target the easiest, cheapest measures. There would appear to be a vicious circle whereby rural and off-gas houses are particularly vulnerable to fuel poverty and at the same time, tend to be classed as "hard to treat" and therefore less likely to benefit from energy efficiency schemes. This is very relevant to the HIE area, which would benefit from a response to fuel poverty that was more appropriate to the particular problems faced by rural, remote communities.

Building standards in the UK have recently been raised, but they still fall short of the benchmark standards implemented in Scandinavian countries. It makes sense that where temperatures are severe, such as in Northern Scandinavia, there is an institutional response through long-term measures such as thermally efficient housing and appropriate behavioural responses. These kind of measures do appear to be much more effective than short-term fixes during cold spells.

The West Midlands Public Health Observatory, in a report on "Fuel poverty and the elderly" states that: "*Increasing thermal efficiency is enormously important in combating fuel poverty. Expensive and inefficient heating systems coupled with poor insulation ensure that those already experiencing fuel poverty have to pay more to heat their houses than those who are more affluent. The best way to protect against fuel poverty is investment in insulation and energy efficient heating systems, as this way the occupants can pay minimum amount to keep warm. This will not entirely proof households against fuel poverty if fuel prices continue to rise or if income does not match inflation, but will at least cushion the effects of these changes.*" [7]

These conclusions are also mirrored by recent work by the World Health Organisation [18].

- The UK as a whole and Scottish regions in particular are in need of better energy efficient housing and improvement schemes.

5 Renewable Energy

5.1 Introduction

A key question for this study is whether fuel poverty is linked to high penetrations of renewable energy, and, particularly, to the promotion of renewable energy in areas distant from demand centres, i.e. rural areas such as the Highlands and Islands or peripheral areas as defined by the EU. The following sections examine these two issues and to what extent there is a link.

5.2 Renewable energy and fuel poverty in Europe

5.2.1 General comparisons

Figure 5.1 shows the percentage of renewable energy generation in total generation for the four countries of interest. It shows why Spain, Germany and Denmark have been selected as comparators to the UK – namely that renewable energy penetration levels are higher than in the UK. This is primarily due to the uptake of new wind energy developments of relevance also to the UK and especially Scotland.

There is no obvious correlation with fuel poverty levels – for instance Spain has some high levels of fuel poverty, and high renewable energy penetration, whereas Denmark has low levels of fuel poverty, and high renewable energy penetration.

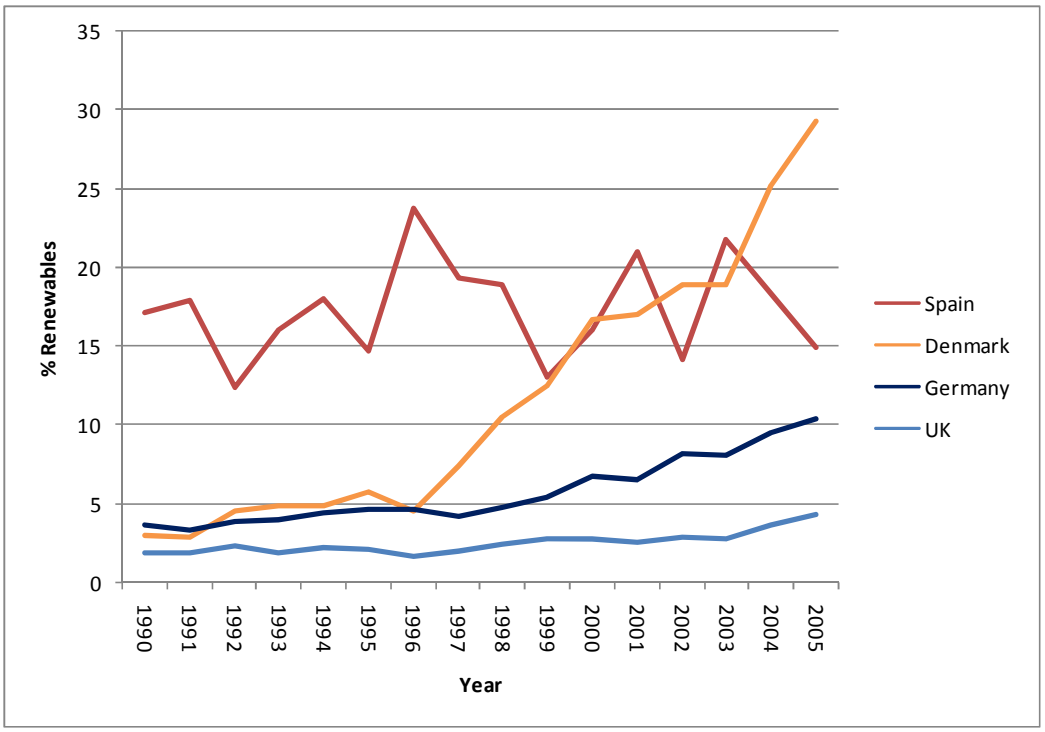

Figure 5.1: Percentage of renewable energy in total generation

However, established hydro generation is included in these figures, and thus it is not a true test of whether the promotion of <u>new</u> forms of renewable energy could be linked to fuel

poverty. The vast majority of new renewables in all four countries comprises wind energy. Figure 5.2 shows the percentage of wind energy in total generation. Again, there would appear to be no positive correlation. For instance, Denmark has the highest levels of wind energy penetration, and exhibits low levels of fuel poverty.

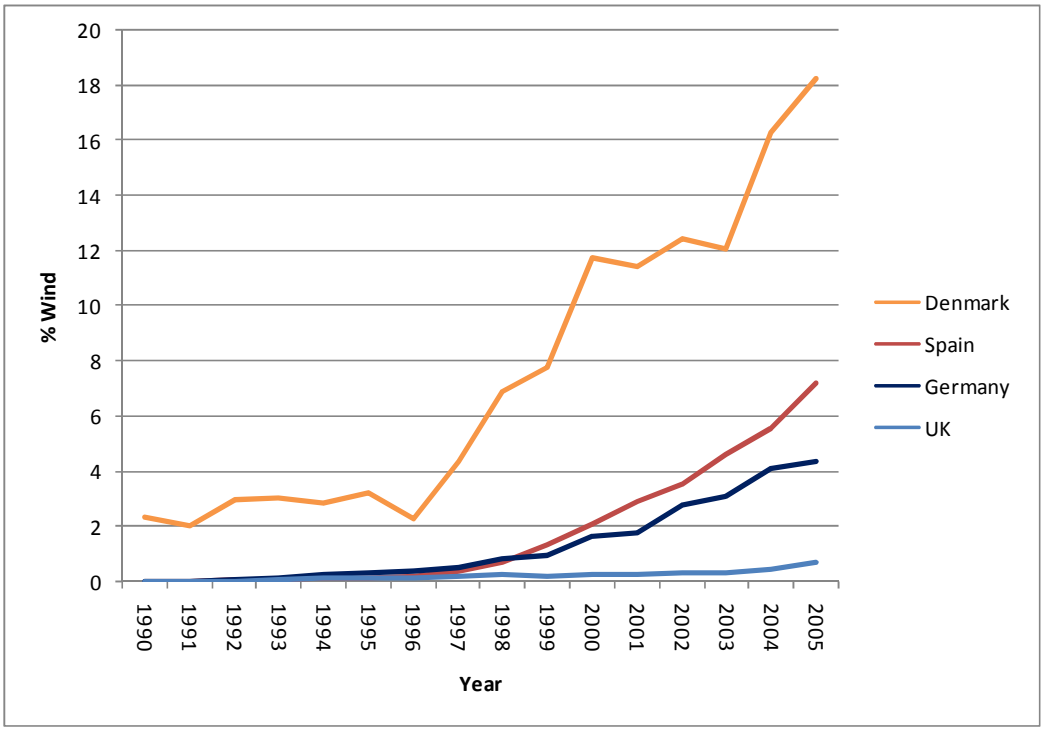

Figure 5.2: Percentage of wind energy in total generation

5.2.2 Peripheral regions

An important consideration is whether like-for-like comparisons are possible. In the UK fuel poverty rates can be higher-than-average in remote and rural areas such as the Scottish Highlands and Islands. Part of the reason for this is likely to be the general under-developed nature of these regions, which is in part tied to their wild nature.

European development funds are often targeted at rural areas as part of a remit which promotes social and economic cohesion across regions and member states. The means of doing so is through "*investing in regions' indigenous potential to promote the competitiveness of regional economies*" [19]. The 2008 management plan for the Directorate General for Regional Policy scopes the use of future development funds [20]. On rural areas, it says the funds will "*support areas affected by geographical or natural handicaps which aggravate the problems of development, particularly in the outermost regions as well as the northern areas with very low population density, certain islands and island Member States, and mountainous areas. Furthermore, the renewal of rural areas and of areas dependent on fisheries through regional economic diversification will also be supported.*"

Reform of development fund priorities for 2007-2013 has brought a "*greater emphasis on building endogenous assets and potential by combining investments in infrastructure, education and training, innovation and entrepreneurship, environment and risk prevention. This approach seeks to ensure that each sector is developed not in isolation but in the context*

of a coherent vision for the socio-economic development of the Member State or region concerned."

Thus European policy is unambiguous in its desire to see greater socio-economic opportunities for rural, peripheral areas such as the Scottish Highlands and Islands, a key means of which is the development of infrastructure in support of utilising endogenous assets in a sustainable way. This long-standing focus is reflected in the 2001 Renewables Directive [21] which states that "*Member States shall ensure that the charging of transmission and distribution fees does not discriminate against electricity from renewable energy sources, including in particular electricity from renewable energy sources produced in peripheral regions, such as island regions and regions of low population density*."

It is no coincidence that rural (or peripheral) areas are often those with excellent renewable energy resources, due in part to their often wild, windy, maritime and mountainous nature. In consideration of the comparison countries only Spain and the UK (e.g. the Scottish Highlands and Islands) has such peripheral areas. Spain and the UK both have high levels of fuel poverty, for their climate.

There are potential socio-economic benefits arising from renewable energy projects and these should help to alleviate fuel poverty, although the effects may be more localised than can be shown from Figure 5.1 and Figure 5.2. Examination of this would need a significantly more detailed study. Spain however has made such local socio-economic development an integral part of renewable energy projects.

5.2.3 Micro-renewable energy and fuel poverty in Scotland

A key overlap between fuel poverty and renewable energy has been in the potential role of micro-renewables for supplying energy in remote locations. This is distinct from the more general and wider-scale renewable energy developments considered in previous sections.

The new electricity suppliers' energy efficiency scheme (CERT) strengthens the role of renewable energy in its focus on carbon savings. Accredited schemes can include micro-renewables for the production of electricity and / or heat.

A pilot study is underway with Scottish Government funding, testing the viability of including renewable energy technologies in the central heating programme [22]. One of a ground-source heat pump, an air-source heat pump, or a biomass system, have been installed in 88 properties. The emphasis is on so-called "hard to treat" properties off the main gas network. Results from the pilot should be available later this year.

A number of NGOs have stated their support for micro-renewables in tackling fuel poverty, especially in rural areas. In a Scottish Parliament enquiry on fuel poverty Energy Action Scotland asks that "*provision ..... be made now in the Spending Review to allow the full potential of micro-renewables to be brought into the fuel poverty programmes, particularly for hard to treat and rural/off gas homes*." [23] In the same enquiry, Citizen's Advice Scotland recommends "*examining and supporting the role of micro generation in tackling fuel poverty.*" [24]

In the context of ongoing fuel price rises, Ofgem has noted the cost to consumers of environmental measures such as the Renewables Obligation. The implication is that a number of factors are exerting an upward pressure on consumer prices. This is discussed further in Section 6.

5.3 Summary

A general conclusion is that there appears to be no association between a country's renewable energy penetration level, and the incidence of fuel poverty.

- Denmark and Germany exhibit low levels of fuel poverty but high levels of renewable energy generation.
- Spain exhibits high levels of fuel poverty and high levels of renewable energy generation.
- The UK exhibits high levels of fuel poverty and low levels of renewable energy generation.

This conclusion holds for the promotion of new forms of renewable energy, principally wind energy.

However, despite the above general relationship it is possible to conclude that renewable energy developments and fuel poverty are tied in that they typically occur in remote and rural areas (peripheral areas). This is probably no accidental coincidence since these areas are often wild, windy, maritime and mountainous. Such regions exist in parts of Spain and the UK, notably the Scottish Highlands and Islands, and the connection may well be strongest at a local level. There is also an important issue in whether the local renewable energy developments are sufficient to stimulate local socio-economic growth and fuel poverty reductions. Local socio-economic stimulation has been an important part of Spanish renewable energy policy. To investigate this relationship further would require more detailed work than is within the remit of this current study.

- Remote and rural areas are often fuel poor and often have good renewable resources.
- There may be a further connection between renewable energy development, local socio-economic development and the relief of fuel poverty.
- Spain has made local socio-economic development an important part of renewable energy development and this may provide some local relief from fuel poverty.
- The EU also sees development of remote and rural areas as important and views renewable energy as part of this.

The above conclusions are largely drawn through consideration of the facts at a national or regional level. Renewable energy developments also permeate to a household level, particularly through micro-renewable generation schemes and this can have heat (and hence fuel poverty) benefits. Some support has been given in Scotland and this may be extended.

6 Energy prices

6.1 Introduction

If energy prices rise faster than incomes, there is an inevitable knock-on effect on households vulnerable to fuel poverty. Customers are vulnerable to energy price fluctuations if, for instance, they need to use a lot of energy to keep warm (in poorly insulated homes), or if energy bills make up a disproportionate amount of total income.

Governments and regulators make decisions on where costs will fall, both on market participants and outwith the market. Market liberalisation has generally lead to identification of costs and a better understanding of where costs are being passed through directly to consumers. Practices are not consistent, and there are costs which remain outside the market. As such energy price comparisons are not on a strictly like-for-like basis. Where consumers are not paying for energy-related costs via their energy bill, they will probably be recouped elsewhere in general taxation.

6.2 Energy prices and fuel poverty in Europe

Figure 6.1 shows household electricity prices, inclusive of all taxes, for the four countries of interest [25]. The key observation is that the UK has some of the lowest electricity prices in Europe, but one of the highest levels of fuel poverty.

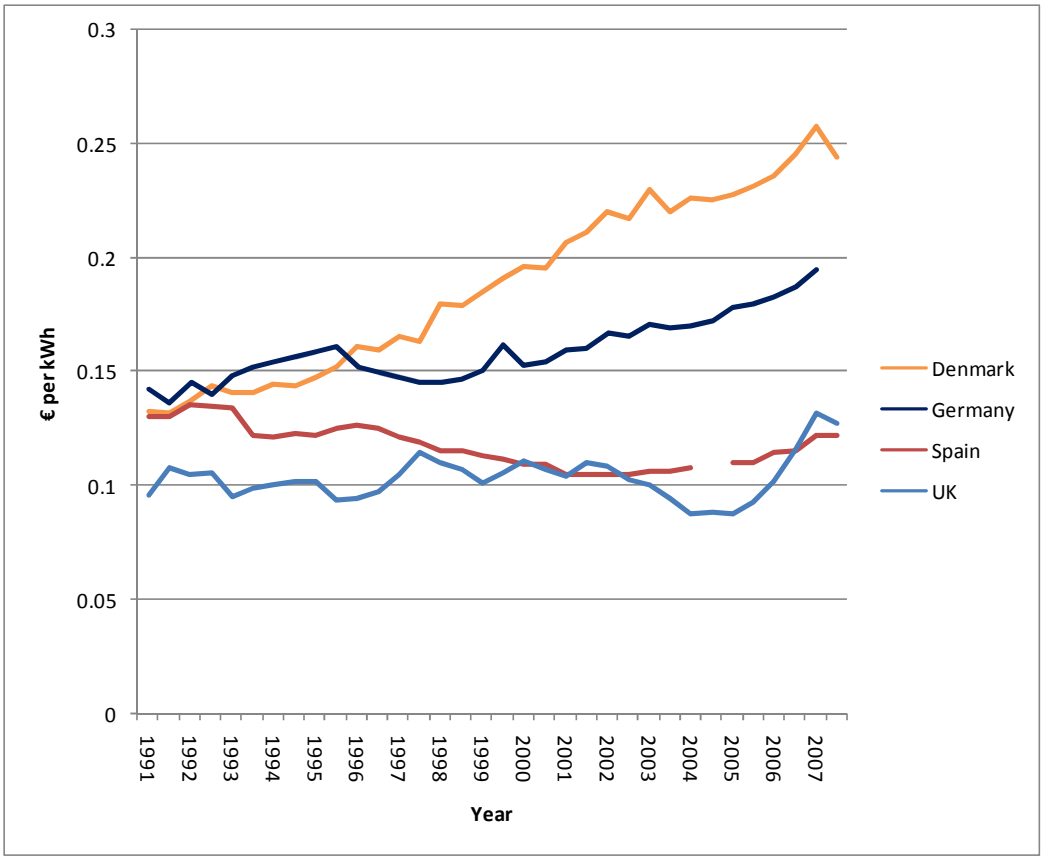

Figure 6.1: Household electricity prices, all taxes included

Figure 6.2 shows electricity prices exclusive of taxes. This makes a significant difference for Denmark which drops to the lowest-priced of the four for the bulk of the period shown. This serves to illustrate the importance of considering the overall economic situation, rather than energy prices in isolation.

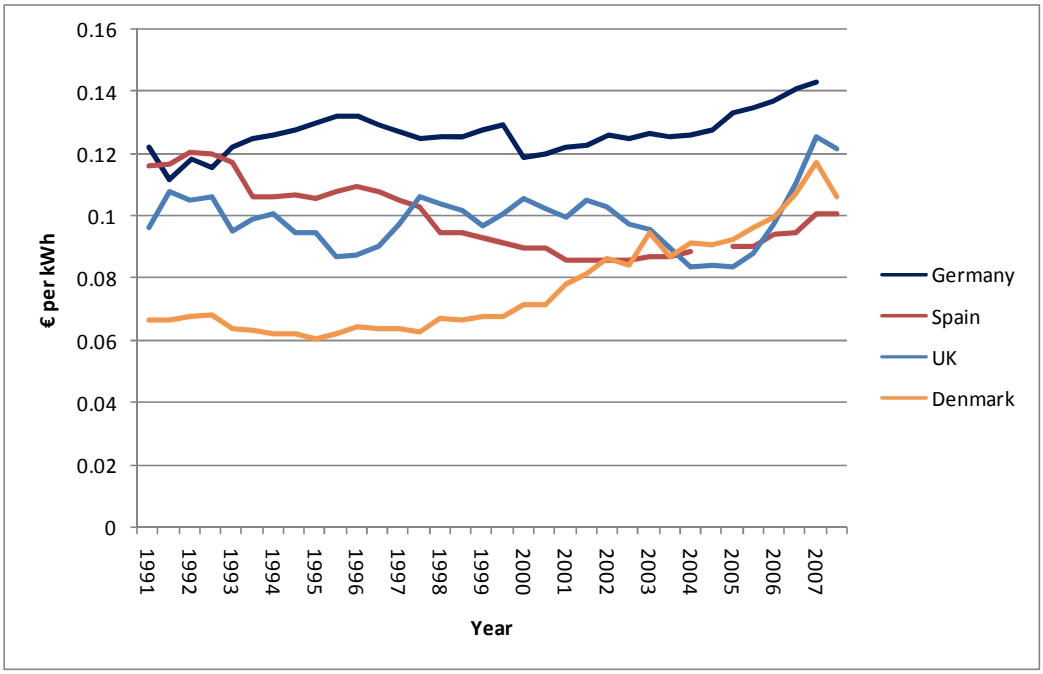

Figure 6.2: Household electricity prices, all taxes excluded

There is no clear relationship between fuel poverty and energy prices from the above.

6.3 Energy prices and fuel poverty in Scotland

There has been extensive press coverage recently on rising fuel bills and the knock-on effect on fuel poverty levels. Although there is no official estimate for later than 2006, the price increases are believed to be sufficiently high that they are outstripping any improvements in income or energy efficiency over the same period. The most recent data available suggests that household expenditure on electricity and gas rose by 58% between 2003 and 2007 [26].

Ofgem has presented data on regional variations in electricity bills in a June 2007 domestic retail market report [27]. Pre-payment meter customers tend to be amongst the most vulnerable households. Figure 6.3 shows 2007 prices available to these customers from the main six suppliers. The data is disaggregated by distribution company area. It shows that customers in Scotland – in the Scottish Hydro and Scottish Power distribution areas, have access to prices in the median of those available.

The North of Scotland has the lowest price spread between suppliers, and the second-highest floor price (customers in the South of Wales have the highest floor price). The implication is that vulnerable customers in the North of Scotland cannot access the lowest available prices (which are in the North of England).

The reason for these price differences is unclear. Distribution costs are particularly high in remote parts of northern Scotland, but under the "Common Tariff Obligation" suppliers are not allowed to discriminate on this basis, between customers in the Scottish Hydro area. Any costs of meeting this obligation are levelled across all customers. Transmission costs for demand are the lowest in the country, and the area boasts very cheap hydro generation. This question deserves further investigation.

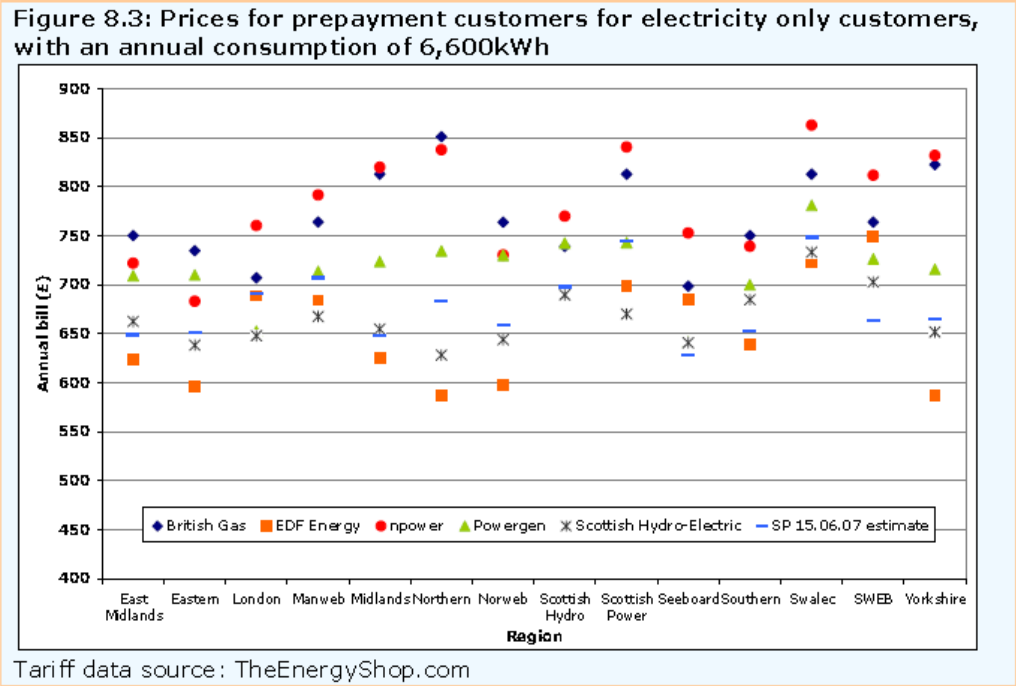

Figure 6.3: Pre-payment meter customer prices

6.4 Ofgem Social Action Strategy

Ofgem has a duty towards energy consumers, and obligations to protect vulnerable customers. Its activities in safeguarding vulnerable customers, including the fuel poor, are set out and monitored via its Social Action Strategy [28]. Ofgem's work comprises: ensuring suppliers meet their social obligations, participating in the debate on vulnerable customers, and ensuring that customers are appraised of options for lowering their energy bills.

Recent fuel price rises have spotlighted the role of Ofgem in regulating the market. The question of whether fuel-poor customers can be protected against such price rises has been debated.

The consumer watchdog Energywatch has been campaigning for so-called "social tariffs." Social tariffs are tariffs structured specifically for customers in need. In essence they offer unit-rate discounts. A number of suppliers in the UK have launched voluntary social tariffs, typically offering direct debit rates to targeted customers, or a percentage discount on the prevailing tariff. These social tariffs are not always the lowest-cost tariff available from a supplier [29].

Both Ofgem and Energywatch are monitoring social tariffs. Energywatch would prefer their role to be formalised and regulated, and Ofgem, for the time being at least, seems to prefer a voluntary approach.

6.5 Summary

Cross-country comparisons suggest that low energy prices are not a necessary pre-requisite for tackling fuel poverty. Other countries, with consistently higher energy prices than the UK, have consistently lower levels of fuel poverty.

The UK's definition of fuel poverty links in to energy prices with the focus on households unable to afford adequate warmth. Even though the definition is not linked to excess winter deaths, it is an important indication of households making impossible choices on expenditure for basic human needs.

It would seem that where other more long-term measures are not in place, households are made vulnerable to fluctuating energy prices. Furthermore, recent increases in fuel poverty levels in the UK are because energy price rises outstrip any improvements in income in the same period.

There is no hard and fast rule which says high energy prices must lead to fuel poverty. High energy prices should, if the market were perfect, favour energy efficiency measures over increased energy consumption, or investment in grid networks to access cheaper energy sources. However, there seems to be an institutional bias towards the reduction of capital costs, with, for instance, house builders still installing heating systems that are cheap in capital terms but expensive in operational terms. The market is not operating well in this respect.

Targeted taxation on energy to fund long-term improvements need not exacerbate fuel poverty if it is carefully designed. The Combat Poverty Agency in Ireland has called for revenue recycling from carbon taxes levied on fuels, to assist the fuel poor. This could then fund the capital investment needed to safeguard customers from fluctuating prices [30]. A similar approach has been mooted by Ofgem in its representations on the UK government's 2007 Energy White Paper, and in its Social Action Strategy. Ofgem says that "*auctioning EU Emission Trading allowances would provide a revenue stream that could be recycled into fuel poverty programmes*." [31]

Key points are:

- Higher energy prices do not need to be a driver for increasing fuel poverty levels but will in general be a contributing factor.
- The UK in particular focuses on low capital solutions for provision of heat but focuses less on longer term measures such as housing quality.
- Vulnerable customers in the North of Scotland cannot access the cheapest available prices on the market. This should be a point of enquiry with energy companies and Ofgem.

7 Network charging regimes

7.1 Introduction

Having considered fuel poverty and some key contributing factors, and having considered the development of renewable energy, this Section now turns to a key question for this report.

⇒ Is there any relationship between fuel poverty and the prevailing network (grid) charging regime?

It should by now be apparent that there are many factors contributing to fuel poverty. Furthermore, there is no straightforward relationship between the eradication of fuel poverty and tackling problems such as excess mortality in winter.

A network charging regime is a means of allocating network costs to different market participants. It can make a significant difference to market participants, but less so to customers paying the final bill. Examining the effect of small differences in charging for a small part of overall system costs is likely to be rather academic in the context of other variables. Calculating the difference in cost between one charging regime and another is a major undertaking in itself and is likely to be subject to much debate.

The discussion here is very much centred on whether it is likely to be a major issue, and whether it is fair and reasonable to defend locational charging by bringing it into the fuel poverty debate.

7.2 Network charging in Europe

Table 7.1 is an extract from a previous XE report [32] on charging regimes for the four countries of interest. It details the nature of up-front connection costs (a capital payment on connection) and annual use of system charges, for the four countries.

Of the four countries of interest, Great Britain is the only one to operate a locational charging regime for Use of System (UoS) charges. Germany and Spain have no generator UoS charges, whereas Denmark uses a "postage" stamp system for generator UoS – a charge that does not vary by location. In GB, up-front connection costs are "very shallow" which means that a generator generally pays for fewer connection assets up-front than the "shallow" approach of the other three countries.

In a cross-country comparison, there is no obvious connection between fuel poverty and charging regimes. In fact if there were, it would be unexpected. Transmission (and distribution) takes up a small percentage of overall system costs. Even if they could be calculated on a comparable basis, any differences in costs attributable to the way transmission costs are allocated would be an even smaller fraction of total energy costs.

Country	Generator UoS Charge	UoS Type	Connection Policy
Denmark	Yes	Postage	Shallow (generator builds own connection line – not offshore)
Germany	No	Postage for demand	Shallow (generator build own connection line – not offshore)
Great Britain	Yes	Locational	Very Shallow
Spain	No	Postage for demand	Shallow (generator builds own connection line).

Table 7.1: Network charging regimes

7.3 Network charging for German wind energy

Perhaps the best equivalent European comparison to the situation faced by the Scottish islands is the offshore wind development activity in the North and Baltic seas off the coast of Germany. In this case, high offshore wind speeds are the resource attraction for developers seeking permits in sometimes very challenging physical conditions (deep water and an offshore environment). The plans require substantial infrastructure in the form of undersea cabling and onshore reinforcements.

This step-change in network investment has been one factor which has contributed to delays in implementation. As there are no realised projects as yet, it is not possible to consider the knock-on effects of exploitation of the resource. However, there are clearly a number of corollaries with the Scottish islands. A key difference is the much more benign physical environment of the onshore Scottish islands, for an equivalent high wind speed resource.

In 2004, the German Energy Agency (DENA) conducted a study to examine the effects on the German transmission grid of integrating onshore and offshore wind energy concentrated in the north of Germany [33]. The study found that substantial reinforcements were required and that offshore connection costs could be up to €5 Billion by 2015. These costs were to be borne by developers through revenues from premium prices. However, a new act has since been passed which supports the development of an initial tranche of projects connecting

before 2011. Called the "Infrastructure Planning Acceleration Act" it effectively recovers the bulk of the connection cost through UoS charges on demand customers. The grid system operator will be responsible for planning and financing the offshore connections. DENA notes that the benefits of this approach are a co-ordinated approach which allows infrastructure requirements to be rationalised across groups of projects, and a cost reduction for developers [34].

This has strong parallels with similar considerations in Great Britain, and notably Scotland, where several billion pounds of network investment will be required to connect renewable energy projects in the north. In the case of Germany, it was found to be more cost-effective to take a co-ordinated approach to connecting projects, appointing one TSO to plan and rationalise the network required. Because the government has deemed these projects necessary for meeting energy and climate change objectives, the cost allocation bypasses the generators altogether – the main point being that the cost of necessary infrastructure is optimised.

7.4 Network charging in Scotland

There has been extensive debate as to whether locational Transmission Network UoS (TNUoS) is appropriate for the GB market. The TNUoS model has been adapted for purpose over the years, and there is a particular concern with regards its extension to Scotland, particularly remote parts of Scotland. Discussion on this subject is a separate report in itself.

TNUoS introduced greater socialisation of transmission costs by reducing the assets for which an up-front connection charge must be paid. It also introduced a locational element to UoS charges. Very approximately, the locational part of the charge is skewed for generation in favour of areas where there is a deficit of generation compared to demand. This is to the extent that some generators in the south of England are actually paid, rather than charged, for using the transmission system.

Charges to suppliers for demand customers are similarly skewed, but in an opposite direction – namely in favour of areas where there is a deficit of demand compared to generation. The locational "signal" for demand is weaker than that for generation, because negative demand charges (payments to north of Scotland customers), are not allowed

Under locational TNUoS, customers in the Scottish Highlands and Islands attract the lowest GB zonal demand charge for use of the transmission system, and these costs would be even lower, or negative, were demand to be treated in the same way as generation.

For customers, the main considerations are overall system costs, now, and in the long-term. Government and Ofgem also have responsibilities on balancing the environmental consequences of energy use against our demand for energy.

In January 2008, Ofgem provided a breakdown of consumer bills for electricity and gas. It takes current costs, and adds future environmental costs such as the CERT carbon reduction programme. It reports that transmission accounts for some 4% of household electricity bills, and wholesale electricity 66 % [35].

The consumer watchdog Energywatch estimates that between 2005 and 2006, the average annual household bill for electricity increased from £285 to £338, an increase of £53 in one year, with the upwards trend continuing to-date [36]. These increases are largely attributed to rises in fuel prices, reflected in wholesale energy costs, although there is some contention recently on whether the scale of price increases is entirely justifiable [26].

By contrast, Ofgem estimates that the Renewables Obligation costs approximately £10 per year per household bill at present. The CERT programme will cost approximately £18 for an electricity customer. Investment in electricity networks, much of which has been for renewable energy developments, cost £1.37 on an annual household electricity bill [35], i.e. a fraction of a percent.

In this context it is very difficult to say anything meaningful on the relevance or otherwise of the type of network charging regime to energy prices and fuel poverty. Wholesale energy costs dwarf network costs, even before consideration of the relative benefits of one network charging regime over another. The key conclusion to be drawn is that the type of network charging regime is likely to be completely irrelevant in terms of costs to the consumer.

Environmental costs are rising, but fuel costs seem to be rising faster. This is both because fuel prices are rising, and because we source a significant proportion of our needs from these fuels. Thus there is a trade-off between environmental and fuel-related costs – investments in fuel-free power should reduce the proportion of energy that is sourced from fuel-fired power.

At the GB-level then, and in the context of other much more significant costs, any theoretical differences between a locational or non-locational charging regime are likely to be insignificant.

At the local level, if high TNUoS charges discourage economic activity which would otherwise improve local incomes, then it could have a negative impact. This is particularly important when considering renewable energy developments in Scotland and particularly the Highlands and Islands where local socio-economic benefits are to be had from local renewable energy developments, but high TNUoS charges are to some extent acting as a disincentive.

The connection between renewable energy developments and local socio-economic development was also made in Section 5.2.2 of this report where it was noted that EU policy is to assist socio-economic development of peripheral areas and that renewable energy development is seen as a key part of this. The Renewables Directive also makes it clear that network charging for such areas should not discriminate against peripheral areas, and compliance with this is debatable in the Scottish Highlands and Islands. This point was also made in a previous XE report on island connections [37].

Citizens Advice Scotland recommendations to the Scottish Government on reducing fuel poverty included a recommendation to look at socio-economic development issues: "*exploring an explicit link between eradication of fuel poverty and regeneration policy*." [24].

7.5 Summary

The impact on consumer bills of differences between a locational and non-locational charging regime for transmission assets, is likely to be insignificant. The impact on fuel poverty, where fuel poverty is affected by consumer prices, is also by implication likely to be insignificant. Other cost factors, in particular wholesale energy costs, have a much more significant bearing on consumer bills.

Wholesale energy costs are the largest proportion of a customer's bill, and these costs would appear to be socialised across GB, in so far as there does not seem to be any attempt to impose locational pricing on wholesale energy costs. Vulnerable electricity customers in HIE's area host cheap generation. They attract low transmission costs and any high distribution costs for remote areas are socialised. They are also not allowed to be paid for benefits to the transmission system, in the same manner as generation in the south of England.

It is hard not to conclude that locational TNUoS is a principled stance for locational pricing, which, whether one might agree or disagree on its merits, is at odds with cost allocation in other parts of the industry. The argument that TNUoS is in some way beneficial to north of Scotland customers does not seem to be supportable, at least unless the same principles are applied to all other parts of the industry.

The total impact of transmission related costs on household electricity bills is currently some 4%. This is a very small part of the bill and pales in comparison to wholesale energy costs which amount to nearly 66%.

In broad terms it can be concluded that:

- Transmission asset, reinforcement and charging costs have a small impact on consumer bills.
- The type of transmission charging regime used is likely to have a negligible impact on consumer bills.
- The impact of different transmission charging regimes on consumer bills and hence fuel poverty is minimal.
- The argument that TNUoS is in some way beneficial to north of Scotland customers does not seem to be supportable.

There are wider, long-term considerations linked to a locational charging regime which merit attention. Where renewable energy schemes are linked to local socio-economic benefits and general improvements in income for vulnerable customers, this can be expected to have a positive impact on fuel poverty. So too would community benefit payments that were directed towards the alleviation of fuel poverty. Arguably then, locational TNUoS which discourages such schemes could be to the detriment of communities which are already exhibiting fuel poverty levels higher than the national average.

- Renewable energy developments can be linked to local socio-economic development and hence can be a contributing factor to eliminating fuel poverty.
- Remote and rural areas (peripheral regions) are often the most fuel poor and often where the best renewable energy potential lies, e.g. the Scottish Highlands and Islands.
- Locational charging of renewable energy projects can result in high charges and act as a disincentive to development.
- This would seem to be against EU policy which seeks to encourage socio-economic development of peripheral regions, and which explicitly requires network charging to be non-discriminatory.

It should be noted that large hydro power schemes in north of Scotland offer a prime example of the benefits of an initial, ambitious investment in infrastructure to access fuel-free power. The areas now boasts some of the cheapest, if not the cheapest, generation in the UK which is free from the effects of fluctuating fuel prices. This was made possible by some long-term political vision and a willingness to commit the capital outlay required.

Experience in Germany also offers an alternative model for actioning subsea infrastructure. There, the government has passed legislation to "accelerate" infrastructure via planning and finance by one TSO on behalf of groups of offshore projects.

8 Conclusions

8.1 General

Fuel poverty is a serious problem, and high on the political agenda. No-one would wish to compromise the alleviation of fuel poverty. This report was commissioned in that vein – to understand the interactions, if any, between renewable energy, development of the grid in Scotland and fuel poverty. The following summary considers the evidence presented in previous sections, and draws out the main conclusions.

8.2 The incidence of fuel poverty

- Fuel poverty indicators tend to show a high incidence in the UK compared to the Northern latitude countries of Germany and Denmark. Spain and other southern latitude countries also experience very high levels of fuel poverty.

- Scandinavian countries experiencing extreme cold weather are much better at protecting against the effects of the cold, than the UK. Milder countries such as the UK and Ireland are particularly focused on fuel poverty, in part because people seem to be particularly vulnerable to fuel poverty in these countries.

- The UK's measure of fuel poverty is based on a theoretical calculation which results in an "official" estimate of households which are likely to be struggling to meet their fuel bills. It is not a measure of excess winter mortality, which is a more complex problem which is not fully understood.

- Tackling excess winter mortality in the UK probably requires additional, more community and health-focused measures, which are not currently addressed through fuel poverty programmes. They are the target of other initiatives, including health forecasting by the met office.

- Rural and off-gas customers such as those in parts of the north of Scotland, are more likely to be fuel-poor than the national average.

8.3 Buildings energy efficiency

- Improving the thermal energy efficiency of a home is one of the most effective, enduring responses to fuel poverty. There seems to be unanimous agreement on this point.

- Customers in the UK are made vulnerable to price rises through poor housing stock.

- There have been improvements in UK building standards, although it will be a number of years before this is reflected in new-build housing. These standards still fall short of the Scandinavian benchmark with a "model" Scottish home not acceptable by comparison.

- There have been improvements in the energy efficiency of the UK housing stock, with the support of targeted grant schemes but the UK still rates poorly in European terms.

- Rural and off-gas customers such as those in parts of the north of Scotland are less likely, compared to the national average, to benefit from energy efficiency schemes targeted at the fuel poor.

8.4 Fuel poverty and renewable energy

- There is no general association between country wide levels of fuel poverty and renewable energy penetration levels, when the UK, Denmark, Germany and Spain are compared.

- Remote and rural areas can suffer from fuel poverty and, at the same time, have good renewable resources. There may be a connection between renewable energy development, local socio-economic development and the relief of fuel poverty but this would require further investigation.

- Spain has made local socio-economic development an important part of renewable energy development and this may provide some local relief from fuel poverty.

- The EU also sees development of remote and rural areas as important and views renewable energy as part of this.

- In the UK, there is interest in government and NGOs in the potential for micro-renewables in alleviating fuel poverty in "hard-to-treat" properties and support in this area should be further explored.

8.5 Fuel poverty and energy prices

- There is no association between levels of fuel poverty and energy prices, when the UK, Denmark, Germany and Spain are compared.

- Of the four, the UK has, overall, the lowest prices for household energy inclusive of taxes, and the second highest exclusive of taxes. This underlines the importance of considering the overall economic situation for fuel poverty, rather than energy prices in isolation.

- Well-targeted energy taxes or surcharges with revenue recycling to assist the fuel poor are being considered by fuel poverty campaigners and by Ofgem.

- Vulnerable customers in the north of Scotland do not have access to the cheapest energy on the market. This is despite attracting the lowest GB zonal demand charges for transmission, and hosting some of the cheapest generation in GB.

- There is market failure where a reduction in capital costs are favoured over a reduction in running costs, resulting in instances where cheaper heating schemes or building standards are implemented, to the detriment of occupants who face higher running costs.

8.6 Fuel poverty and network charging

- Transmission accounts for a small percentage of total cost to the consumer (4% in the UK). Differences in these costs attributable to one charging regime or another are likely to be a fraction of this.

- In the context of rising wholesale energy prices, and the above point on the small contribution of transmission costs, the effect of locational transmission pricing on the consumer is likely to be insignificant.

- The principle of locational pricing in the UK does not extend to wholesale prices. Furthermore demand customers in the north of Scotland do not get the equivalent locational benefits afforded to generators in the south of England. In this respect, the argument that locational TNUoS is in the interests of north of Scotland customers does not seem to be supportable.

- Locational TNUoS could hinder efforts to alleviate fuel poverty if it is preventing economic activity that would otherwise improve incomes and enhance the availability of fuel poverty funds. This is particularly relevant to the Scottish Highlands and Islands where locational (renewable) generator charges are very high.

- The level of locational charging to generation in the Scottish Highlands and Islands would seem to contravene EU policy which seeks to encourage socio-economic development of peripheral regions, and sees renewable energy developments as part of this. The Renewables Directive explicitly requires network charging to be non-discriminatory in this context.

9 Recommendations

Fuel Poverty alleviation

- Promote longer-term, enduring solutions to fuel poverty. The current focus on energy prices is understandable but cannot be a solution in the context of rising fuel costs.

- Target funds towards improving the quality of the housing stock. This is the single most effective response to fuel poverty. This could be borne in mind in community benefit negotiations associated with renewable energy developments.

- Support the Scottish Government in improving housing standards. Lobby the government to take up the recommendations of its recent report on low carbon housing.

- Promote the alleviation of fuel poverty through schemes which address both the affordability of heating services, and, the reduction of winter mortality levels. The latter is neglected at present.

- Promote the particular needs of the fuel poor in the north of Scotland. Addressing fuel poverty in the hard to treat sector often requires solutions which differ from those in urban, gas-connected properties. HIE might wish to liaise with groups such as Citizens Advice Scotland, Energy Action Scotland and Energywatch on this matter.

- Remain appraised on work to assess the use of micro-renewables for hard-to-treat homes. Monitor the Scottish-government funded pilot study and support further allocation of funds should the trials prove successful.

Transmission charging and cost to the consumer

- Make the point that locational transmission charging does not appear to be benefiting north of Scotland consumers.

- Promote a charging regime which optimises costs of the total energy system, as opposed to applying a particular philosophy to one small part of the system. In so doing, draw from experiences abroad, including Germany and the connection of offshore wind energy projects.

- Promote recycling of energy industry levies towards the fuel poor. This would include revenues from auctioning of carbon allowances.

- Lobby on behalf of north of Scotland customers who cannot access the cheapest market prices.

- Re-iterate the non-discrimination clause in the Renewables Directive, namely that "*Member States shall ensure that the charging of transmission and distribution fees does not discriminate against electricity from renewable energy sources, including in particular electricity from renewable energy sources produced in peripheral regions, such as island regions and regions of low population density*." Consider if further action might be taken in this respect.

Local Socio-economic development

- Promote the benefits of fuel-free power and socio-economic development in the north of Scotland. This is business as usual for HIE, but appraised of the benefits that these policies can bring to the fuel poor. HIE could undertake work to ensure that vulnerable customers do in fact benefit from funds and jobs arising from renewable energy developments.

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