Non-cost barriers to renewables

– *AEON* study

United Kingdom

- confidential -

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1 Introduction

1.1 The case for renewable energy in the UK

The United Kingdom (UK) has a large potential for renewable energy. This wind swept island nation possesses the largest natural offshore wind, wave and tidal power resources in Europe. Today, the UK has more installed offshore wind power than any other country and other potential resources include bioenergy and hydropower. Still, the UK is lagging behind other countries in the EU when it comes to energy consumption based on renewable resources. In 2008, 42 TWh of energy was derived from renewable sources – this is the equivalent of 2.25 percent of the total energy consumption, which includes electricity, heat and fuels[1].

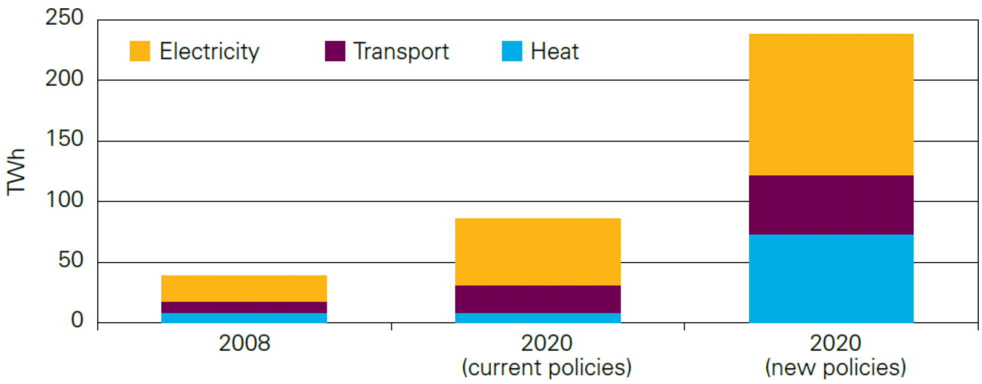
In January 2008, the European Commission published the 20 20 by 2020 package. This included proposals for reducing the EU's greenhouse gas emissions by 20 percent and increasing its proportion of final energy consumption from renewable sources to 20 percent. This policy, and its targets, have since been approved and are to be achieved by 2020. In order to meet the renewable energy target each Member State has a national target to meet based on their existing renewable generation, their GDP and an overall flat-rate increase. The UK's proposed target is 15 percent in total, which will realistically require 30 percent of electricity, 12 percent of heat and 10 percent of transport energy to be generated from renewable sources.

Current policies are not sufficient to meet this target, as indicated in Figure 1.1. Figure 1.2 illustrates which technologies could constitute the UK energy mix in 2020. New policies are needed to overcome the barriers that are currently present in the UK that are hampering the development of renewable energy. An overview of these barriers that are not (directly) related to financial issues are detailed in the rest of this document after a short depiction of the current situation of the different renewable energy sources and technologies in the UK.

[1] Department of Energy and Climate Change. 2009. Digest of United Kingdom Energy Statistics 2009.

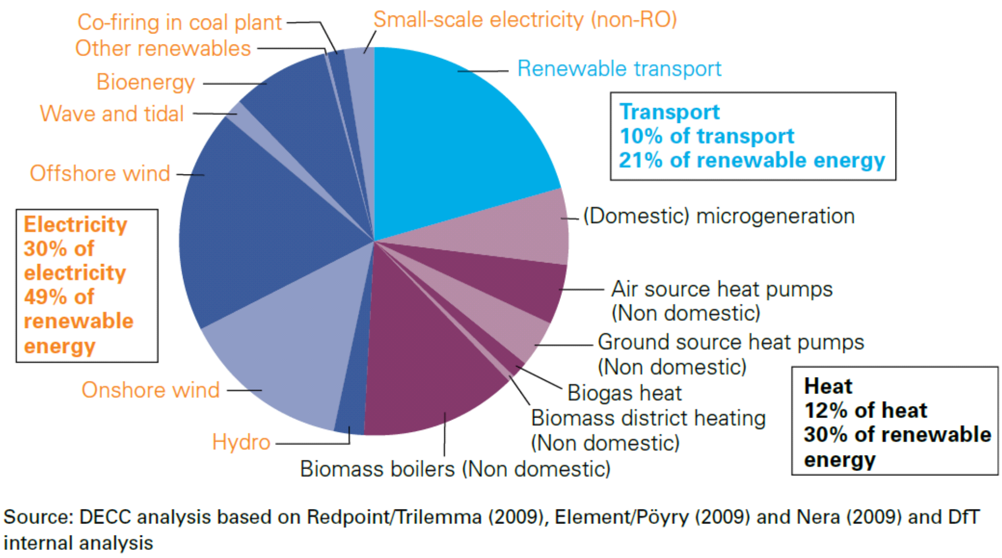
http://www.solarcentury.co.uk/Knowledge-Base/The-Merton-Rule

Figure 1.1 Visualisation of the need for new policies to reach the 15% renewable energy target by 2020



Source: UK Energy trends 2009; DECC, The UK Renewable Energy Strategy, 2009.

Figure 1.2 Potential mix renewable energy sources and technologies to reach the target in 2020



Source: DECC, The UK Renewable Energy Strategy, 2009.

1.2 Non-cost barrier

The main non-cost barrier in the UK is the current planning **procedure** and associated administrative issues. Although one-stop shopping is possible in most cases, in the UK a list of stakeholders have to be consulted as a legal requirement. This deviates from most other Member States, where the stakeholders have to actively get involved into the permitting process themselves. It is therefore rather easy for UK stakeholders to object to the development of renewable systems, in the best cases this delays planning permission being granted, in the worst, the delays form an insurmountable barrier for the project.

Another non-cost barrier concerns **power grid issues**. Firstly, the current grid is underdeveloped, and as a result there is currently not enough capacity to transmit and distribute renewable electricity at the required scales and in the required locations. The power grid will need to be upgraded, and this new build carried out within an overall strategy to provide power grid infrastructure where it is needed. For renewable energy, this often means in unconventional places where historically no electricity was generated. A clear example concerns energy from offshore systems, with grid reinforcement needed to transport the electricity onshore for consumption.

A third non-cost barrier relates to the **power grid access**. In the UK priority is not given to producers of electricity from RES, imposing another barrier for the development of renewable energy. Although TSOs and DSOs are obliged to connect all electricity producers, they prefer power plants based on conventional sources, thereby discouraging renewable electricity producers getting connected.

1.3 Promotion schemes in the UK

In the United Kingdom, electricity generated from renewable sources is promoted through a quota system with a quota obligation enforced through a certificate system known as the Renewables Obligation (RO). The Renewables Obligation Orders[2] impose on electricity suppliers the obligation to prove that a certain rising proportion of electricity supplied was generated from renewable sources. To this end, electricity suppliers are required to present green certificates, which are issued to the producers of electricity from renewable sources by the regulatory authorities for electricity and gas. In addition, electricity generated from renewable sources is eligible for tax relief. The Climate Change Levy[3], which was introduced by the Finance Act 2000, applies to the consumption of electricity from traditional sources only. And, the Department of Energy and Climate Change (DECC) grants subsidies for the development and commercialisation of low carbon energy technology and efficient energy use. These subsidies include capital grants for systems that generate electricity from renewable sources[4]. Funding is provided by the schemes of the Environmental Transformation Fund (ETF), whose future activities will be coordinated by DECC.

A new feed-in tariff system has been introduced from 1st April 2010.[5] In this scheme, small scale renewable electricity producers receive a guaranteed price for every kWh they generate, and receive additional money from the electricity company who are obliged to buy the renewable electricity that is put into the power grid.

There is currently no promotion scheme in place for heat (and cold) from renewable sources. This is probably the largest (financial) barrier hampering renewable technologies such as heat pumps, CHP, certain biomass technologies such as biogas production and injection and district heating. In April 2011, a promotion scheme for heat will be adopted, the Renewable Heat Incentive[6]. This scheme ought to promote renewable heat through increased financial incentives.

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2 The Renewables Obligation Order 2009. No. 785.

3 http://www.decc.gov.uk/en/content/cms/what_we_do/change_energy/tackling_clima/ccas/cc_levy/cc_levy.aspx.

4 http://www.berr.gov.uk/whatwedo/energy/environment/etf/page41652.html.

5 http://www.decc.gov.uk/en/content/cms/what_we_do/uk_supply/energy_mix/renewable/feedin_tariff/FITs_LCBP/FITs_LCBP.aspx.

6 http://www.decc.gov.uk/en/content/cms/what_we_do/uk_supply/energy_mix/renewable/policy/renewable_heat/incentive/incentive.aspx.

http://www.solarcentury.co.uk/Knowledge-Base/The-Merton-Rule

The Biofuels Directive[7] established targets for biofuel use in the EU, whilst also meeting goals relating to the Common Agricultural Policy. The UK Government's Renewable Transport Fuel Obligations Order[8] (RTFO) sets these targets out specifically in a national framework. However, existing energy and transport systems are characterised by resistance to change[9]. There is currently an excellent vehicle-fuel infrastructure in place in the UK. This, coupled with the years of technological innovation in engine technology, means that it is difficult to breakdown barriers for new fuels and vehicle types due to vested interests and technology lock-in. Once a technology becomes established, it is increasingly difficult to replace it with competing technologies. Moreover, the oil and gas industry as well as the automobiles industry has a strong voice in the UK, and both lobby for conservative policies regarding biofuels. In part this is aided by the fact that the UK has relatively large reserves of coal, oil and gas, which makes the fossil fuel price relatively low[10].

Innovative technologies often suffer from a lack of investment, including research and development compared with the established system. In transport it is noted that the in-vehicle performance of new technologies, such as biofuels, can often be poorer. However, new technologies may get support on the basis that they could be environmentally beneficial in the future. In the case of biofuels, they may also receive support on the grounds of energy security; thereby offsetting likely long-term oil shortages. Another problem associated with the biofuel production is the biomass supply chain, and the uncertainty surrounding feedstock availability. Farmers in the UK have become confused about the types of crops they should grow and for what reason. Uncertainties about grants and subsidies have recently added to this problem. This, together with the fact that other crops can give a higher return, means that farmers have little incentive to grow crops for biofuel production[11].

[7] Directive 2003/30/EC of the European Parliament and of the council. 8 May 2003. On the promotion of the use of biofuels or other renewable fuels for transport.

[8] The Renewable Transport Fuel Obligations Order 2007 No. 3072.

[9] Hart D, Bauen A, Chase A, Howes J. 2007. Liquid biofuels and hydrogen from renewable resources in the UK to 2050: a technical analysis.

[10] G.P. Hammond, S. Kallu and M.C. McManus. 2007. Development of biofuels for the UK automotive market.

[11] P. Thornleya, P. Uphamb and J. Tomei. 2009. Sustainability constraints on UK bioenergy development.

2 Issue 1 Administrative Procedures

2.1 Introduction

The planning system in the UK is different from most other European countries, therefore a short description of the planning process is given before the barriers within the planning process are detailed. This section deals only with large-scale installations, since small-scale renewable energy technologies often do not require planning permission. See Chapter 3 for a further discussion on this topic.

Developers apply for planning permission to local authorities, which may be county councils, unitary authorities or district councils for onshore activities, and governmental departments for offshore activities. This application includes details of the whole project, including geographical location, technological report, financial details and an environmental impact assessment. So, strictly speaking, this section is not limited to spatial planning alone, but rather covers the planning process as a whole.

After submitting the application, there is a planning consultation round, enabling people and organisations to make representations regarding the proposed development. In addition, there is a standard list of bodies which have to be consulted covering the many stakeholders within the process. These include environmental bodies, water services, the ministry of defence, airports, road services, councils for nature, conservation and the countryside, fisheries, shipping representatives, etc. Then the planning officer prepares a report in which a recommendation is made to approve or refuse planning permission. Subsequently, the report will be read by the councillors on the development and control committee, who will take a final decision. If the decision is a refusal, the developer has the option to appeal. After permission is granted the developer has 5 years to construct the installation[12].

2.2 Description of barriers & solutions

2.2.1 Detailed description of the barriers and solutions

Barrier 1.1 – Inefficient general administrative procedures

The average time between application and the final outcome is around 11 months , with slight differences between the four nations within the UK; in Scotland and Northern Ireland a decision is made on average ten months, whereas in England and Wales in takes

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12 Planning Policy Statement 22: Renewable energy. 2010. Office of the deputy prime minister.

http://www.solarcentury.co.uk/Knowledge-Base/The-Merton-Rule

12 months on average[13]. However, there are cases reported where the decision took 54 years. There are also slight differences between technologies; on average onshore wind has the tendency to receive a slightly faster decision, whereas large hydropower, offshore wind, large biomass plants and tidal and wave power have to wait slightly longer.

The average approval rate is approximately 85 percent in the UK. However, approval ratings vary considerably across the types of renewable energy technologies. Hydropower schemes have an average success rate of 93 percent. For landfill gas, 99 percent of all projects have been granted permission. Conversely, wind and municipal and industrial waste schemes have faced difficulties with only 67 percent and 72 percent of planning applications approved, respectively. Biomass fared slightly better with an approval rating of around 85 percent. There were also some differences between the 4 nations. In England and Scotland approximately 86 percent of renewable energy projects which have been determined have been approved. This compares to an approval rating of 70 percent in Wales and 96 percent in Northern Ireland[14].

For wind power, one of the most specific and important non-cost barriers related to planning is reported to be the NIMBY problem, which is likely to be the result of an absence of participatory planning. From studies it has become clear that it is very important to include local residents in the planning process. By inclusion in the planning process, local residents are less likely to resist. There is evidence that this is not yet happening enough to overcome this barrier.[15].

A specific problem for biogas is the lack of clear direction as how to use biogas in terms of efficient carbon saving potential. Biogas can be used for electricity generation, heating purposes and as a biofuel in transport. However, the UK government does not provide clear guidelines how to use biogas in terms of efficient carbon saving potential, nor does the government show which options will be incentified in the (near) future. This is experienced as a barrier by biogas producers[16].

Barrier 1.2 – Competing public interests

Although there are many reasons for planning application refusals, objections by stakeholders is a commonly reported barrier [17][18]. Some objections seem more plausible than others, but the fact remains that all objections cause a delay, and can be an eventual cause of rejection. It is unclear how much of the total lead time or refusals stem from these objections, but it is assumed by most to have a significant impact. There are a wide variety of objections from different lobby groups and representatives, including:

- Environmental issues: Although the developers are obliged to conduct an environmental impact assessment, several objections are made from environmental stakeholders. Among the complaints are those that complain about the impact of wind

[13] Renewables advisory board and DTI. 2005. Barriers to Commissioning Renewable Energy Projects Final Report, Prepared for Future Energy Solutions.

[14] Renewable Energy – Planning and development Database. PP201.

[15] J. McLaren Loring. 2006. Wind energy planning in England, Wales and Denmark: Factors influencing project success.

[16] NERA economic consulting. 2009. Renewable Heat Technologies for Carbon Abatement: Characteristics and Potential Final report to the Committee on Climate Change.

[17] Personal communications with wind developer, geothermal installer anaerobic digestion expert, several governmental bodies.

[18] Renewable UK. 2010. Manifesto 2010.

turbines on bird populations due to fatalities resulting from collisions and complaints over loss of existing natural habitats and species due to the installation of hydropower or the feedstock for biomass plants. Another example is erosion of the seafloor due to alternated currents occurring after the installation of ocean power plants;

- Local community objection: Due to the visual impact, NIMBY problem, odour issues in case of biomass plants, especially AD. Noise issues and proximity to housing are also mentioned;
- Navigation: Wind turbines affect radar navigation and are not allowed too close to airports;
- Defence: Offshore wind and ocean power cannot be sited in areas of military or strategic interest. In addition, the vibrations of wind turbines are reacting with the UK's anti-missile defence system;
- Tourism, natural heritage and countryside: Mainly due to visual impacts, but odour is also mentioned as a reason to object;
- Fisheries, shipping and other maritime activities: Installation of offshore wind, tidal and wave power can interfere with shipping routes, oil and gas developments or fishing grounds; and,
- Water table: due to altered water regimes in case of hydropower, water pollution problems, altered ground water tables in case of ground source heat pumps, or water consumption for the feedstock of biomass.

Of course it is important to include stakeholders in the process of commissioning renewable energy, however, the requirement that developers have to actively consult probable opponents makes it easier for these opponents to object. Moreover, organisations such as environmental groups have the 'job' to defend their own cause, and not to make socially optimal decisions. Therefore, they may object to renewable energy plans even when what may be regarded as a sound plan for development is presented[19].

A non-cost barrier specific to ground source heat pumps regards the use of ground water. The Environment Agency (EA) controls water abstraction and discharges of pollutants and heat/energy to the environment. There are no specific requirements regarding the control of heat discharges detailed in legislation or statutory guidance. The EA has the option to control water discharges with a permit, where appropriate, to avoid pollution or failure to achieve Water Framework Directive[20] objectives. The need to gain the required permissions for water discharge can be time consuming and add an element of delivery risk to heat pump designs, thereby potentially resulting in a risk of non-delivery. In turn this perception could constrain the demand for systems and act as a constraint on the installed capacity as a whole[21].

Planning consent will be required for most Anaerobic Digestion (AD) installations because AD is not considered within the renewable energy planning guidelines, but rather as an industrial waste treatment process. If the facility is going to use only agricultural feedstock produced on-site and the digestate will only be spread on the land of that farm,

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[19] Personal communications with wind developer, offshore expert.

[20] Directive 2000/60/EC of the European Parliament and of the Council: establishing a framework for the Community action in the field of water policy.

[21] S.R. Allen, G.P. Hammond and M.C. McManus. 2007. Prospects for and barriers to domestic micro-generation: A United Kingdom perspective.

http://www.solarcentury.co.uk/Knowledge-Base/The-Merton-Rule

then it could be treated as permitted development as long as the conditions can be met. In addition to likely planning permission requirements an AD plant will often have to obtain a waste management licence from the Environment Agency and may, depending on the input material, need to gain animal by-products approval from the Animal Health Agency. In addition, depending on the disposal route for the residues, additional duty of care will be required and perhaps the need to obtain biofertiliser land-use exemption from the Environment Agency. This process imposes an additional administrative barrier[22]. Another AD problem involves odour issues, which results in objections from residents living within the vicinity of a planned plant[23].

2.2.2 Best Practice Elements and Indicators

No.	Technology	Benchmark	Result
1.1	All	Is one stop-shopping possible?	Yes, by the very nature of the planning process
1.2	All	Amount of money to be invested in the administrative process (including cost of work and costs like fees) (in €)	£170 for each 0.1 hectare [24] and ± 10% of planning investment
1.3	Onshore wind	Time to be spent for the administrative process (duration to get all the main permits) (in months)	10
	Offshore wind	Time to be spent for the administrative process (duration to get all the main permits) (in months)	13
	Large biomass	Time to be spent for the administrative process (duration to get all the main permits) (in months)	14
	Large hydropower	Time to be spent for the administrative process (duration to get all the main permits) (in months)	14
	Ocean energy	Time to be spent for the administrative process (duration to get all the main permits) (in months)	15
1.4	All	Estimated number of permits required (#)	1

22 http://www.mrw.co.uk/page.cfm/action=Archive/ContentID=1/EntryID=6256.
23 Personal communication with anaerobic digestion expert.
24 http://www.planningportal.gov.uk

3 Issue 2 Technical Specifications

3.1 Introduction

In general, for almost all technologies the technical specifications needed to be eligible for financial support are clearly defined, and this information is readily available from websites, local councils and national governmental departments. Exceptions to this are new, emergent technologies – for the UK at least – such as deep geothermal energy used to produce renewable heat. Such technologies have not yet made it into policies and national law and are therefore not bounded by technical specifications. In this specific case, deep geothermal energy has to comply with rules and specifications that are normally applied to oil and gas mining[25].

3.2 Description of possible barriers & solutions

Barrier 2.1 – Weak definitions

There are a few examples where problems are experienced with the technical specifications. For ground source heat pumps the regulations, as stated in Government Building Regulations, are weakly formulated. These regulations are designed to meet certain performance criteria, but a clause on quality control is missing. This is deemed essential, however, to further the growth of ground source heat pump systems in the UK[26].

In general though, the technical specifications of most of the RES technologies are not perceived as a strong barrier by the respondents.

Barrier 2.2 – no EU standards applied

The EU standards are applied in the UK. In some cases where the EU standards are not specific enough, the UK, or one of the four countries, set additional standards. An example is the specifications of PV panels, where the type of panel, electric wiring, metres, etc. are clearly specified, there are no clear specifications on how to install the panels. So, the UK – being notorious for its quite stringent health and safety regulations – made additional specifications on how to install the panels safely and securely[27].

Barrier 2.3 – Specified locations for testing and/or certification

As part of a consumer protection mechanism, most equipment and parts need to be certified in the factory. Since most of the parts for the renewable technologies are

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25 Personal communication with deep geothermal installer.

26 D. M. Reay. Deficient Regulation – Northern Ireland Country Report. 2007.

27 Personal communications with PV installer and domestic energy expert.

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fabricated abroad – mainly Germany, the Netherlands and Denmark – the certification needs to be done abroad[28].

Barrier 2.4 – Barriers to trade

An issue related to barriers to trade concerns the slight differences in technical specifications between Wales, England, Scotland and Northern Ireland. Although not a problem for local installers, this issue does form a barrier for installers active UK-wide or in the international market.

Barrier 2.5 –Other barriers

Other issues are less technical in nature, but are associated with complex defined measures and are therefore included in this chapter. There are a range of issues surrounding metering, connection to the distribution network and balancing and settlement arrangements that could be preventing widespread take-up of RES technologies. New metering technology is not a pre-requisite for the installation and operation of micro-generation technologies, although it is currently necessary under the Balancing and Settlement Code[29] for suppliers to receive any credits for their customers who export power. Benefits in terms of reduced energy bills would be achieved with the existing system of one-way import meters, but in order to take advantage of the range of potential benefits on offer – access to ROCs or Feed in Tariffs - data on the import, export and generation of electricity will be required.

The distribution companies have made good progress in addressing the technical aspects of the connection of micro generation. A single micro-generator can now be connected without an application approval process. However, metering arrangements are also an important part of micro-generation installation. While micro-generators (<30 kW) are not required to install half-hourly metering they are required to install an import/export meter if they wish to sell their exports to a supplier. Without half-hourly metering, some small generators may not be receiving fair reward for the electricity they produce as the amount they export and its timing will necessarily be based on estimates rather than actual performance[30].

In addition, if the micro-generator is a renewable technology and is therefore eligible for Renewable Obligation Certificates, the output of the micro-generator also has to be recorded. There is therefore a level of complexity and expense in providing the necessary metering that presents a barrier to the installation of micro-generation that someone in the system has to pay for, thereby presenting a further barrier[31].

28 Personal communication with small hydro installer
29 http://www.elexon.co.uk/bscrelateddocs/bsc/.
30 Personal communication with PV installer.
31 L. Freris and D. Infield. 2009. Renewable energy in power systems.

3.2.1 Best Practice Elements and Indicators

No.	Benchmark	Result
2.1	Are specifications expressed in terms of European standards (including eco-labels, energy labels and other technical reference systems), though such European references exist?	Yes

http://www.solarcentury.co.uk/Knowledge-Base/The-Merton-Rule

4 Issue 3 Building integrated technologies

4.1 Introduction

As mentioned in chapter 1, for most small-scale RES installations planning permission is not required. That means that one can directly install building integrated technologies without any approval from the (local) government, as long as one fits the specified regulations. The specifications for renewable energy equipment in the built environment that are exempted from permission are postulated under the Micro-generation Certification Scheme (MCS)[32], which came into force in 2008. An example of the specifications for solar thermal panels: "*permission is not required for any size roof mounted systems (providing panels protrude no more than 200mm from the roof), and standalone systems do not require permission if they are less than 4m high, 9m^2 in area and less than 5m from property boundary*". However, permission for micro-generation is still required in some circumstances, such as in conservation areas, areas of outstanding beauty, monumental buildings and world heritage sites.

4.2 Description of barriers & solutions

Barrier 3.1 – Inefficient general administrative procedures

In general, this barrier is playing a minor role in the UK due to the fact that there are no administrative issues involved for most building integrated technologies. However, in relation to existing buildings and technologies that do not meet the technical requirements, concerns have been expressed regarding a lack of clarity as to whether specific planning permission is required, different interpretations of the rules by local authorities and the sometimes complex process of seeking planning permission. It seems therefore that this barrier is more a lack of information for potential producers and lack of understanding of public officials, rather than an inefficient administrative procedure.

Barrier 3.2 – No/insufficient specific rules for building integrated/small scale RES installations

A very specific barrier relates to households which install small wind systems and have old-style metering, these households are required to have three meters – one for generation, one for exporting to the grid and one for consumption. This is a cumbersome and costly system and could be replaced by a single smart meter which would provide electricity companies and householders with real-time information. Householders installing a small wind turbine have to comply with grid connection rules which are out of touch with the current state of small wind technology. They are costly, time-consuming and unnecessarily demanding for householders or businesses seeking to generate their

32 http://www.microgenerationcertification.org/.

own electricity. In general, though, this barrier is not perceived as a major issue in the UK.

Barrier 3.3 – Competing public interests

In most cases, this barrier does not play a role. The case where it might play a role is when one wants to install renewable energy producing installations in conservation areas, areas of outstanding beauty, monumental buildings and world heritage sites. Instead of simply installing a building integrated technology, one has to have planning permission from the local or city council.

Barrier 3.4 – Renewables obligations insufficient

For the built environment, there is no obligation or legislation to implement the use of any renewable energy building integrated technology in the UK, apart from the Merton rule which applies for solar PV. It is mentioned that this forms a barrier, especially for new constructions, and that a large opportunity to increase the share of renewable electricity – and heat to a lesser extent – is missed thereby.

Barrier 3.5 – Exemplary role of public buildings neglected

Micro-generation in public buildings is virtually nonexistent[33]. There are a few cases though, for instance where public buildings are connected to a district heating system (see chapter 11). Although not recognised by the respondents as a large barrier, nor mentioned in the literature, the exemplary role of public buildings as mentioned in the Renewable Energy Directive is neglected, though the new Coalition government is moving to change attitudes and is now publishing real-time energy use and carbon emissions data on departmental websites – see www.decc.gov.uk – this may stimulate increased RES uptake.

Barrier 3.6 – RES deployment hindered by spatial planning matters

No barriers detected, other than buildings in conservation areas, areas of outstanding beauty, world heritage sites or with monumental status.

Barrier 3.7 – Tenancy law and ownership law impedes development of Building Integrated RES technologies

None of the respondents or reports indicated that tenancy law and ownership law is a barrier. In most cases the owner of the building is the owner of the installed equipment as well. With regard to rented housing, most probably there will be an ad-hoc solution between tenant and letting agent dealing with cost and grant/subsidy issues.

4.2.1 Best practice elements and indicators

No.	Benchmark	Result
1	Is this installation type in normal cases exempted from an authorization procedure (building permit)?	Yes
2	Are legal-administrative requirements inadequate for this installation type?	No
3	Is there a Renewables Obligation that operates sufficiently?	No

33 Personal communication with most of the respondents.

http://www.solarcentury.co.uk/Knowledge-Base/The-Merton-Rule

4	Number of administrations that must be contacted	Normally, none

5 Issue 4 – Promotion of energy efficient renewable energy equipment

5.1 Introduction

In the UK, there are no energy efficiency standards for most renewable energy equipment. Exceptions to this are solid biomass stoves, solid biomass fired boilers and boilers used for combined heat and power.

5.2 Description of barriers & solutions

Barrier 4.1 – Non-compliant promotion schemes

Most of the technologies have clear regulations and technical specifications. However, the only three technologies that have a statement about efficiency standards are solid biomass stoves, solid biomass fired boilers up to 50kW used for heat and boilers specifically used for CHP[34][35].

The current low levels of deployment of most RES technologies is another issue related to efficiency of renewable technologies that is mentioned in the literature. However, as the levels of deployment are increasing this may result in suboptimal siting or configuration which could reduce the efficiency of installed systems. An example is provided for solar thermal installation, where the overall impact of this on the energy saved from installed equipment is likely to be relatively small (<10%) in most cases, but could reduce efficiency by as much as 40 percent in extreme cases[36].

Barrier 4.2 – Lack of substitution of existing inefficient systems

There is no policy regarding the replacement of existing inefficient systems. Since renewable energy is in a relatively underdeveloped situation in the UK, it can be assumed that in the great majority of systems are not outdated. The systems that could be outdated – such as wind turbines and large-scale biomass plants – would normally be replaced by the owners if that is economically sensible.

Barrier 4.3 – Use of national procedures

Non-existent in the UK other than mentioned above.

34 MCS: 008. 2009. Product Certification Scheme Requirements: Biomass.
35 MCS 014. 2009. Product Certification Scheme Requirements: Heat-led micro-cogeneration packages in dwellings.
36 NERA economic consulting. 2009. Renewable Heat Technologies for Carbon Abatement: Characteristics and Potential Final report to the Committee on Climate Change.

http://www.solarcentury.co.uk/Knowledge-Base/The-Merton-Rule

Barrier 4.4 – Insufficient information

Virtually no information available, other than the specifications mentioned above. This hints the lack of awareness of policy makers and public officials with regard to the need for efficient equipment.

5.2.1 Best Practice Elements and Indicators

No.	***Benchmark***	***Result***
4.1	Are the requirements of Art 13 (6) of the Directive concerning the promotion of efficient bioheat and heat pumps fulfilled? (yes/no)	No

6 Issue 5 Information and awareness raising

6.1 Introduction

Lack of information and awareness to a certain extent always forms a barrier to change, and is therefore a typical issue in market failures. Surveys that gauge the knowledge of people in relation to RES have the tendency to present rather low results, but a proportion of these people would not consider renewable energy even if they did have all the information. There is also a difference between people actively searching for specific information and the general awareness of the public. Still, a lack of general knowledge and awareness among the general public is often mentioned during the interviews and in literature as a significant barrier in the UK[37][38][39][40]. In addition, information, sometimes conflicting, is available from a variety of national, local and other sources, this provides a confusing array of information for consumers, who become unsure what to trust. Information could be presented more clearly and consolidated into fewer sources that are easier to find.

6.2 Description of barriers & solutions

6.2.1 Detailed description of the Barriers and solutions

Barrier 5.1 – Insufficient availability of information on support measures & of guidance for planners and architects

It is argued that the general public and householders' understanding and awareness of the small-scale, technologies for the built environment is still quite low. Many householders are therefore not even in a position to consider micro-generation as a possible alternative to the much more straightforward option of purchasing electricity directly from one of the large UK-based electricity suppliers (and using gas in a household boiler for heating and hot water). There is also a lack of independent information about the costs of micro-generation options versus the costs of taking electricity through the traditional route. From the interviews it became clear that this lack of information prevents potential purchasers of these new technologies from having the information they need to make an informed choice. That is, they argue that the lack of information about upfront costs and ongoing costs for maintenance is a larger barrier than the cost itself. If potential future consumers of these technologies are not aware of the options, they are unlikely to create the demand needed for the renewable energy market to further develop.

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37 Personal communications with: domestic installers, governmental bodies and consumers organisations.

38 Econnect, EST. 2005. Potential for Microgeneration – Study and Analysis.

39 R. Margolis and J. Zuboy. 2006. Nontechnical Barriers to Solar Energy Use: Review of Recent Literature.

40 S.R. Allen, G.P. Hammond, M.C. McManus. 2007. Prospects for and barriers to domestic micro-generation: A United Kingdom perspective.

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Associated with the information barrier mentioned above, new and innovative products will inevitably need to undergo a period of learning, testing and teething problems. When coupled with the fact that customers currently enjoy reliable and secure access to electricity from known and trusted electricity supply companies through the grid, there is a significant barrier to switching to this new type of set-up – even if it is for only part of their overall electricity needs. Customers will want to know that they can trust a potential installer to provide good quality service and reliable ongoing maintenance, even though installers need to be certified under the MCS if Feed in Tariffs or other grants are to be claimed. Without a proven and substantive track record, it may be difficult for some potential suppliers to generate this trust.

There are no guidelines for architects and spatial planners in the UK in the use and application of RES in building design. This links with the general lack of skills, as described in chapter 6. Conversely, information on the several support measures, the planning system and specific requirements is readily available. The information can be obtained from several sources.

Barrier 5.2 – Insufficient public funding for campaigns/programmes

Government information campaigns and information schemes are virtually nonexistent in the UK. There are examples of local councils that provide information, albeit predominantly re-active. Both domestic installers as well as consumer organisations experience this as a barrier, and are trying to provide the information themselves. Beside obvious cost issues, the problem is that the companies do not necessarily provide objective information. And for the consumer organisations the information has the tendency to be only available for its members.

Barrier 5.3 – Insufficient campaign-/programme-design

As mentioned above, governmental information campaigns and information schemes are virtually nonexistent.

Barrier 5.4 - Other barriers

It is not just the customers that suffer from a lack of information. Local authorities have a key role to play in relation to micro-generation, particularly with respect to planning permission for new developments and for the installation of some micro-generation technologies on existing buildings. The performance of local authorities in these areas that touch on micro-generation will be adversely affected by inadequate information. Lack of robust product and performance information also makes it difficult to interest the construction industry and building designers in using micro-generation technologies in new build. This barrier is mentioned by several respondents and in various reports.

Finally, a barrier can be found in the consumer’s confidence in certain technologies. An unsuccessful installation of a certain technology can easily erode consumer’s confidence through media coverage. There are several examples in the UK of this type of barrier, e.g. the failed development of a biomass plant in North Wiltshire where Ambient Energy Ltd.

proposed the development of a 5 MWe wood gasification plant near the town of Cricklade[41].

6.2.2 Best Practice Elements and Indicators

No.	Benchmark	Result
1	Is sufficient information on support measures available?	Yes

[41] B.R. Upretia and D. van der Horst. 2003. National renewable energy policy and local opposition in the UK: the failed development of a biomass electricity plant.

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7 Issue 6 Certification of installers

7.1 Introduction

There are several certification bodies for installers in the UK. In general, the certification of installers is working properly as perceived by the (local) government through their insight into the market, the consumers by the protection it offers and installers themselves by preventing false competition and rogue installers damaging their reputation.

7.2 Description of barriers & solutions

7.2.1 Detailed description of the Barriers and solutions

Barrier 6.1 – Lack of a Certification body
There are sufficient certification bodies in the UK. There are several bodies that are appointed to certify both installers and products. Lists of these bodies are readily available from local councils and governmental departments. Moreover, for technologies in the built environment, the certifying bodies are listed on the website of the Microgeneration Certification Scheme[42]. When consumers decide to not make use of a grant or subsidy, these consumers do not need a planning permission and are not required to have certified equipment installed by certified installers.

Barrier 6.2 - Lack of guidelines
There is no lack of guidelines and information. This issue is not mentioned by the respondents, nor found in any report. In addition, after a quick survey on the internet, all relevant information and guidelines were found and obtained easily.

However, it is mentioned that there is a need for a code of practice for newer technologies such AD, torrefaction, etc.

Barrier 6.3 Lack of training
There is a general lack of trained personnel, especially for the small-scale technologies such as PV-panels[43] and biomass boilers[44], but is not uncommon for larger plants as well[45]. The lack of trained personnel applies for a whole range of skilled people, from installers, to maintenance personnel, engineers and public servants. From a supply side point of view, the lack of skilled personnel prevents or delays new installations. For

42 http://www.microgenerationcertification.org/.
43 Personal communication PV-installing company.
44 Personal communication Biomass boiler installing company.
45 Enviros Consulting Ltd. 2008. Barrier to renewable heat part 1.

already installed devices and plants, maintenance is not done properly or at all, ultimately hampering renewable energy in the long run. From a demand perspective, there is a common fear that in the case that equipment fails to work, repairs will be delayed. This barrier results in a decrease in demand[46][47].

7.2.2 Best Practice Elements and Indicators

No.	Benchmark	Result
1	Is there an appointed national certification body?	Yes, several
2	Is there a sufficient training on RES issued during the education of installers, planners, architects?	No

[46] S.R. Allen, G.P. Hammond and M.C. McManus. 2007. Prospects for and barriers to domestic micro-generation: A United Kingdom perspective.

[47] NERA economic consulting. 2009. Renewable Heat Technologies for Carbon Abatement: Characteristics and Potential. Final report to the Committee on Climate Change.

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8 Issue 7 Infrastructure Development

8.1 Introduction

The UK electricity system has been built up over several decades into the mostly centralised system as known today. In the early days of electricity, power stations were constructed close to the customers they supplied, employing relatively simple networks to connect the two together. As a result, multiple ‘islands’ were developed to serve demand centres. In today’s terms, all generation was ‘distributed’ in these initial stages of the development of the electricity supply system. The limitations of this approach became apparent as the demand for electricity grew and the concept of a unified electricity grid became established. In the UK the ‘national grid’ first came into operation in the 1930s. Initially, the national system consisted of a number of geographic zones that had sufficient generation to meet their own demand in most circumstances, still effectively a ‘distributed’ model. Linking these zones together allowed inter-zonal transfers in exceptional circumstances. This initial grid system developed rapidly through the 1950s and 1960s into the large national grid system that is currently present in the UK. The high voltage part of this system is operated by National Grid Electricity Transmission plc (NGET), the transmission system operator. The lower voltage distribution networks that provide connections for the remaining generating capacity and the vast majority of demand connections are owned and operated by the local Distribution Network Operators (DNOs)[48][49]. There are a few issues with the grid and grid connection when it comes to renewable energy, which can be reduced to the historical development of the grid, described in barrier 7.1

8.2 Description of the barrier

Barrier 7.1 - Problems concerning development of electricity network infrastructures according to a long-term strategy

Because conventional electricity was generated on land, the grid developed on land as well. Offshore technologies, such as offshore wind, wave and tidal power are experiencing difficulties to get grid connected, because there simply is no grid, or the grid does not have enough capacity and is congested[50]. In addition, historically there have not been large grid connections between England and Scotland, which hampers the installation of large renewable energy plants as well as many of the best sites for large scale RES are in Scotland while the largest population centres and demand is in

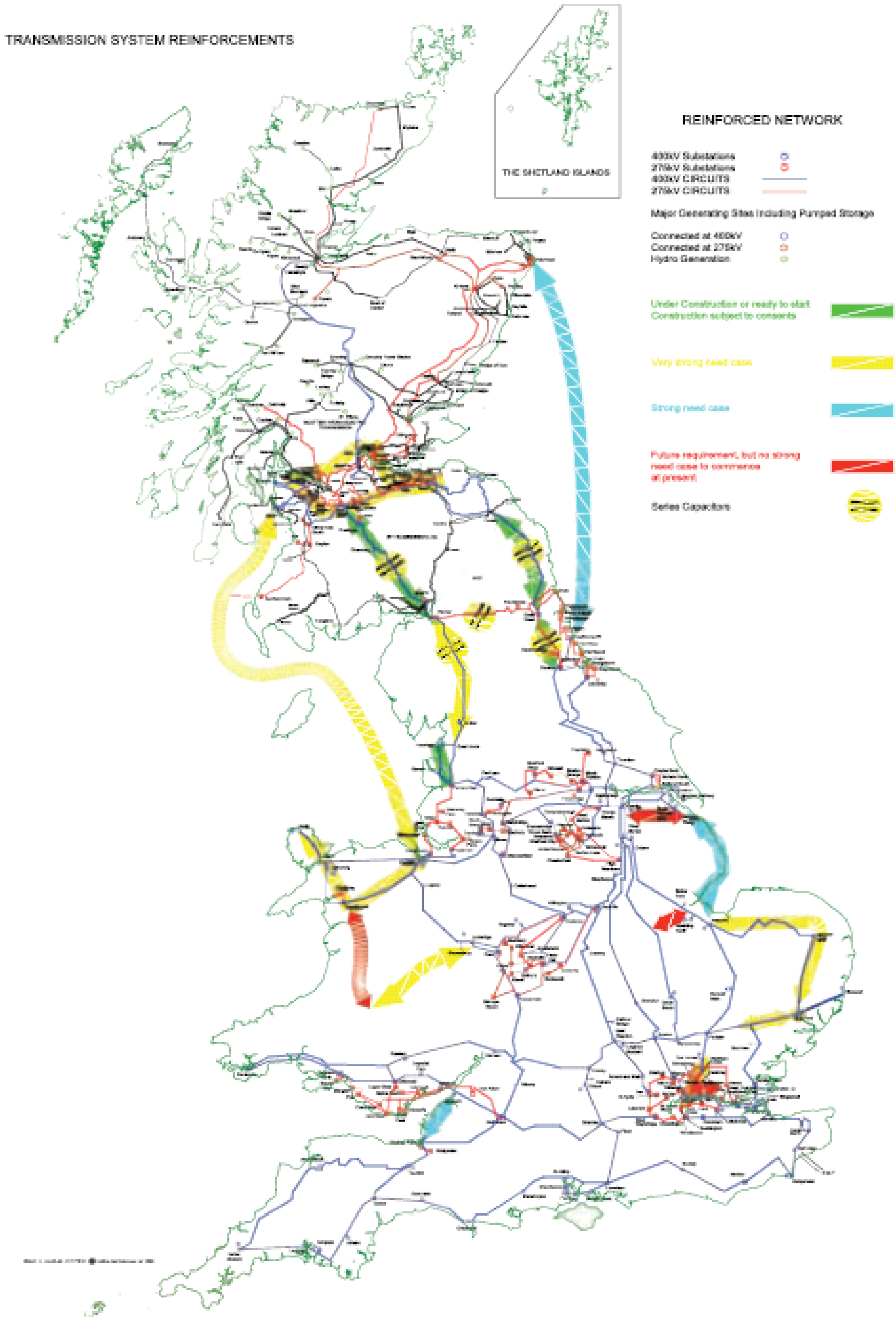
48 http://www.nationalgrid.com/uk/.

49 Department of trade and industry. 2009. Distributed energy, a call for evidence for the review of barriers and incentives to distributed electricity generation, including combined heat and power.

50 Benoit Dal Ferro, Douglas-Westwood Ltd. 2006. Wave and tidal energy: its emergence and the challenges it faces.

England[51]. This barrier is visualised in figure 8.1, where new transmission reinforcement is planned to overcome exactly this barrier.

Figure 8.1 Proposed transmission reinforcements for 2020



Source: Electricity Networks Strategy Group. 2009. Our transmission network: a vision for 2020.

51 Department of energy and climate change. 2009. Renewable Energy strategy UK.

Barrier 7.2 - Problems concerning grid expansion processes of existing electricity networks

As mentioned above, a large revision of the grid has been planned recently. Some of the power grid reinforcements are further developed than others. Although the largest barrier for the expansion of the power grid is mainly financial in nature, there are several non-cost barriers in place in the UK regarding this issue.

Firstly, there is often a strong local opposition to power grid development and the national government has no power to overrule these objections. Again, a general list of stakeholders must be consulted before and permission can be granted. This is further strengthened by a lack of one general plan on national level towards renewable electricity. Therefore, the objections have the tendency to be formulated in a national context instead of the local, straightforward health and safety conditions. This makes it very hard for the local planning commissioners to deal with these issues.

Secondly, time constraints in the planning process make it difficult for developers to order the necessary components ahead of time and plan for construction. This leads to even more delays after a planning decision has been made.

And thirdly, a specific barrier concerns the planning differences between England and Scotland. Although normally a small problem, the planning of power grid upgrade and reinforcement between nations becomes suddenly apparent, especially since an important part of the reinforcement is planned between England and Scotland. The fact the two countries do not “read” each other’s planning procedures adds additional delays to the planning process.

Barrier 7.3 - Problems concerning development of a Trans-European Electricity Network

Examples include wind turbines near the border: in case the national grid is congested, it is not yet possible to plug into for instance the Dutch, Belgian or French grid. Although this barrier is not expected to play a large role in the near future, it could become an issue on the long run.

There are plans to overcome this barrier. On 7 December 2009, 11 countries including the UK signed the North Seas Countries Offshore Grid Initiative[52], agreeing to co-operate to establish a trans-North Sea grid which in addition to enhancing power transfers will also provide the opportunity to link offshore wind farms and other renewable energy plants across the North Sea. Moreover, electricity supply and demand can be managed more efficiently across Western Europe.

8.2.1 Best Practice Elements and Indicators

No.	**Technology**	**Benchmark**	**Result**
7.1	Offshore technologies	Presence of an efficient (in terms of capability of achieving its stated objectives) plan for the reinforcement of the interconnection capacity with neighbouring countries.	No

[52] The North Seas Countries' Offshore Grid Initiative Political Declaration: signature. 07/12/2009 Ref: 67310

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7.2	Offshore technologies	Presence of an efficient plan for the reinforcement of the connection capacity within the country.	Yes

9 Issue 8 Power Grid Issues

9.1.1 Introduction

There are two statutory provisions regarding the power grid: the electricity act of 1989 and the connection and use of system code. What these provisions state is that system operators are contractually entitled to connection to the grid by the grid operator. The grid operator is not obliged to give priority to renewable energy – for example an obligation to purchase electricity – when connecting grid to the systems[53][54]. Moreover, the transmission and distribution charges form an extra hurdle in the process of obtaining grid access, as mentioned in the Connect and Manage arrangements[55][56].

9.1.2 Detailed description of the Barriers and solutions

Barrier 8.1 - Problems concerning grid connection

As mentioned in the introduction, there is no priority given to producers of renewable electricity over electricity based on conventional sources. This poses a barrier for renewable electricity developers.

The impact on the transmission system of an individual distribution-connected generator may be small. However, collectively, the impact of distributed generation on the transmission system will become increasingly significant and it is therefore necessary to impose certain technical and other transmission-related requirements, even though the generator is not physically connected to the transmission system. Currently, this is achieved by requiring generators to enter into a contractual arrangement with National Grid, or to abide by certain grid code requirements[57]. Ideally, a generator should only be required to enter an agreement with the owner of the network to which it is connected, and it is argued that the current arrangements therefore represent a barrier[58]. Moreover, renewable electricity generation, such as wind, has operating characteristics that are quite dissimilar from conventional generation. However, both the grid code and distribution codes with which renewable generation must comply, essentially require renewable

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[53] Electricity Act 1989. http://www.opsi.gov.uk/ACTS/acts1989/ukpga_19890029_en_1.

[54] Connection and Use of System Code Framework agreement. 2007. http://www.nationalgrid.com/uk/Electricity/Codes/systemcode/contracts/.

[55] Grid Code modifications to Data Registration Code, Connection Conditions, Scheduling and Despatch Code and Definitions.

[56] Improving Grid Access – Technical consultation on the model for improving grid access, DECC, 3 March 2010

[57] National Grid Electricity Transmission plc. 2010. The grid code, Issue 4, Revision 1.

[58] Department of trade and industry. 2009. Distributed energy, a call for evidence for the review of barriers and incentives to distributed electricity generation, including combined heat and power.

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generation to behave as if it were conventional generation. It is argued that this constitutes a barrier as well.

Barrier 8.2 - Problems concerning grid access

Electricity from renewable sources has no priority access into the grid. This perceived as a regulatory barrier hampering the development of renewable technologies, especially in areas where the grid capacity is comparatively low.

In theory, priority access should not be needed, since the TSOs and DSOs are obliged to connect all electricity producers. Still the TSOs prefer electricity from conventional sources, because these are often large installations making it worthwhile to invest in grid infrastructure capacity. What is more, these installations often have a stable production and thus providing fewer problems with peak loads as observed with wind turbines and solar panels. So, in practice the TSOs and DSOs prioritise conventional plants over renewable sources, using the red tape to their advantage and discouraging renewable electricity producers.

Barrier 8.3- Problems concerning TSOs and DSOs

Participation in the electricity sector is, by licence, governed by an independent regulator. Therefore, the major electricity generators, energy suppliers to end customers and network operators need a licence to operate in their part of the market. The licensing regime offers consumer protection. The licensing regime also helps to make the networks more resilient and efficient. Exemptions from the licensing regime are set out in a Statutory Instrument and allow generators below 50 MW a class exemption, and those between 50 MW and 100 MW can obtain an individual exemption. This is because, as maintained by the National Grid which operates the transmission network, generators below 50 MW should have little impact on the overall integrity of the network and above 50 MW but below 100 MW they are still unlikely to have such an impact but need consideration on a case-by-case basis[59].

The divide between the licensed and unlicensed sectors for distributed electricity generation is based on a government assessment which balances the need to minimise the regulatory burden on smaller operators, against the need to protect the reliability and integrity of the overall network. Distributed generators may restrict the size of projects that might otherwise have been larger, to benefit from the licensing exemptions. For example, it is not uncommon for the capacity of a distributed generation project to be set at or limited to 99 MW to avoid the need for a licence. Although this exemption possibly aids the development of renewable energy when developments can be scaled to less than 100MW but due to these limitations the overall share of renewable electricity is reduced because the RES plants could be larger from an economical perspective.

[59] The Electricity (Class Exemptions from the Requirement for a Licence) Order 2001.

9.1.3 Best Practice Elements and Indicators

No.	Benchmark	Result
8.1	Are the rules on cost sharing and bearing of grid connection objective, transparent and non-discriminatory ?	
8.2	Is the denial of grid connection by TSOs and DSOs a common problem, constituting an important barrier for RES development?	Yes
8.3	Number of months for getting grid connection (considering also approval of grid connection)	1-3 years. Although as much as 15 years is mentioned as well
8.4	Estimated connection costs in Euros (in case producer pays)	•Low Voltage This is only feasible for very small generators connecting directly to the existing network. Costs will vary so widely that it would be misleading to state any here. •11kV Grid connection equipment: £20,000 - £60,000 •Overhead line: £15,000 - £30,000/km •33 kV Grid connection equipment: £120,000 - £150,000 •Overhead line: £20,000 - £35,000/km •132 kV Grid connection equipment: £800,000 - £1,000,000 •Overhead line: Insufficient information

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10 Issue 9 Gas Network Issues

10.1 Introduction

Biogas can be upgraded to biomethane and injected into a gas grid. This can be the national high pressure gas transmission grid or a local low pressure gas distribution network. To be used in the gas grid in the UK biogas needs to cleaned of impurities, dried and upgraded to a higher methane content (c. 95%) so that it resembles the qualities of natural gas. Currently, injection of biomethane into the grid is not occurring in the UK but several pilots are currently under construction. Technically, renewable gas production, upgrade and injection is possible and the upgraded gas will be safe to use in consumer appliances provided that the gas meets the UK specifications set out in the Gas Safety Management Regulations[60].

However, there is no regulatory framework in place. In specific there is a lack for a:

- UK standard for biomethane;
- incentive for biomethane as an end product;
- government incentive to produce renewable gas for heating purposes (although this will change in 2011 with the renewable heat incentive); and,
- incentives for grid operators to accept biomethane.

10.2 Description of barriers & solutions

10.2.1 Detailed description of the barriers and solutions

Barrier 9.1 – No encouragement for upgrading

Typically, renewable gas has a lower calorific value than natural gas (even when it meets the requirements of the Gas Safety Management Regulations) which means that some consumers downstream of a biomethane injection plant might receive less energy per volume of gas than under normal circumstances. This is not so much a technical issue but more a commercial billing issue.

Barrier 9.2 - Lack of information

Since there are no incentives or encouragement for upgrading biogas and injecting it into the grid, there is also an associated lack of information on the process. However, it is mentioned that there is a general lack of awareness of business opportunities and public

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[60] Statutory Instrument 1996 No. 551. Gas Safety (Management) Regulations 1996.

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acceptance awareness[61]. This gives the whole issue a low priority on the political agenda, which ultimately forms a barrier for injection in the grid.

Barrier 9.3 - Inefficient authorisation procedures

The current lack of regulation and legislation governing access rights, and transparent methods to calculate the network operator's costs etc. can inhibit biogas introduction in some cases. There are no clear guidelines and regulations for the rights and obligations for the involved organisations, including the owners of the upgrading plants, grid owners, customers (who buys the upgraded gas), etc.

The UK Gas Act[62] places an obligation on gas distribution operators to enable access for all gas supplies that are of suitable quality where that access can be achieved economically. However, there is no evidence that current legislation is sufficient to ensure that distributors take the risk and allow access for biogas injection, even when economically sound. As a result of concern over poor gas quality, there are likely to be severe requirements for gas quality monitoring and fail-safe disconnection of the biomethane supply from the natural gas pipeline network, these restrictions could become prohibitive for biomethane producers[63].

Another authorisation barrier for biogas grid injection project is the lead time to get planning permission, obtain permits from the Environment Agency and build the biogas production plant. This can take 18 months or longer. Grid connection should not be a lengthy process once the plant is commissioned[64].

Barrier 9.5 - Other barriers

There are a number of alternative options for utilisation of biogas rather than injecting into the gas grid. Examples include boilers, CHP, use in separate gas networks or used in transport. Due to the current lack of (economic) incentives a barrier for a substantial utilisation of biogas introduction into the natural gas grid is in place, simply because alternative options for utilisation in many cases will be more profitable. The UK government is currently considering supporting biogas injection via the renewable heat incentive, which aims to be in place by April 2011[65].

From an economic perspective, biogas introduction into the natural gas grid requires that the biogas production is located near a gas pipeline. A major share of the potential biogas production in the UK is based on manure and waste products from the agricultural industry. Due to the nature of this industry, the biogas production is often located in sparsely populated areas, which means that introduction of biogas from these sources in significant volumes requires a widely distributed natural gas grid, which is not present in all regions. So, the lack of physical access to the grid and the apparent lack of capacity forms a barrier for further deployment[66].

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[61] Enviros Consulting Ltd. 2008. Barriers to renewable heat: analysis of biogas options.
[62] Revised Statute from The UK Statute. Gas act 1986.
[63] Enviros Consulting Ltd. 2008. Barriers to renewable heat: analysis of biogas options.
[64] Personal communication biogas expert.
[65] Department of Energy and Climate Change. 2009. The UK Renewable Energy Strategy.
[66] Enviros Consulting Ltd. 2008. Barriers to renewable heat: analysis of biogas options.

The various options being discussed to overcome these barriers will all require a high level of co-operation between parties along the supply chain (feedstock suppliers, AD plant, landfill operators, regulators, grid operators etc.). In particular there are issues if pipelines have to be built across several pieces of land, owned by different people and stakeholders.

10.2.2 Best practice elements and indicators

No.	***Benchmark***	***Result***
9.1	If green certificates and/or subsidies for biogas are in place, do they de facto make unattractive to feed green gas into the grid due to the high level of subsidy for biogas used for electricity generation?	Not applicable
9.2	Are the costs of grid connection for producers of gas from renewable energy sources objective, transparent and non-discriminatory?	No
9.3	Do transmission and distribution tariffs discriminate against gas from renewable energy sources?	No
9.4	Average time needed for grid connection approval (from application for grid connection to formal approval) in months (#).	18

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11 Issue 10 District Heating

11.1 Introduction

District heating systems in the UK have existed for a long time. Large residential estates and building blocks that were newly developed due to the bombing in the Second World War were heated by such systems, albeit on a small, restricted scale. Over the years, several district heating systems have been installed. One of the largest systems in the UK is built in Nottingham, providing heat for 4,600 homes and several large buildings. The heat is not strictly renewable since it is stemming from a waste-to-energy incinerator[67].

Today, the market penetration of district heating systems in the UK sits at less than 2 percent[68]. So, although district heat is not new in the UK, apparently a few barriers prevent the widespread development of such networks. Perhaps the most obvious barrier is the lack of financial support for these systems, which require a large initial investment. However, other barriers also exist and are described below.

11.2 Description of barriers & solutions

11.2.1 Detailed description of the Barriers and solutions

Barrier 10.1 – Lack of positive conditions for the increase of the share of renewables in existing DHC systems

Currently, an active incentive for the use of renewable heat in the UK is lacking, both in general as well as specifically for district heating systems. This is widely viewed as a major barrier for the increase of the share of renewable heat in district heating systems[69][70][71]. In response to the EU directive[72] the UK government aims to introduce a renewable heat incentive in April 2011, which will provide financial support for those who install qualifying renewable heating. Heat generated from renewable sources currently accounts for about 1 percent of total heat demand. This is estimated to need to rise to 12 percent for the UK to hit its binding EU targets.

Another issue for District Heating is a lack of popularity among the general public due to a historical technical issue. The original designs did not allow for individual users to

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67 http://www.enviroenergy.co.uk/.
68 Department of energy and Climate Change. 2009. Digest of United Kingdom Energy Statistics 2009.
69 Personal communication with biogas expert.
70 http:// www.zerocarbonhub.org.
71 UK Green Council Building. 2010. Sustainable Community Infrastructure.
72 Directive 2009/28/EC.

employ their own thermostats. This resulted in frequent complaints of residents that the heating levels were too high[73].

Finally, there is a legal question at hand whether people can be forced to connect to a district heating system. At present, it is unclear what the precise legal situation is[74].

Barrier 10.2 –Lack of positive conditions for the initiation and expansion of DH systems largely based on renewables

There is a general lack of positive conditions for the development and expansion of all DH systems in the UK with the existence of several non-cost barriers. Political uncertainty is one of the most significant barriers. Although this is relevant for most technologies, due to the high initial investment and often long lead times, DH projects are particularly vulnerable due to the lack of supporting policies.

Moreover, the policy context in which DH systems are to be developed is complex, obscure and layered, with not only a multitude of policies, but also several governmental bodies that have overlapping responsibilities[75].

11.2.2 Best practice elements and indicators

No.	Benchmark	Result
10.1	Are there policies to promote the increase of the RES share in existing DH networks?	No
10.2	Are there policies to promote the initiation / expansion of DH networks?	No
10.3	Percentage present renewable share (see ECOHEATTOOL)	3%
10.4	Percentage CHP share (idem)	100%

[73] Department of Energy and Climate Change. 2009. Presentation on Distributed Energy in the UK – the role of Heat.

[74] Personal communication with domestic energy expert.

[75] UK Green Council Building. 2010. Sustainable Community Infrastructure.