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Chapter 4

Embedded and Renewable Generation

Introduction

Chapter 3 (Generation) presents information on all the sources of generation which are used to meet the Average Cold Spell (ACS) Peak Demand as defined in the on line Glossary and Appendix G. Accordingly, Chapter 3 presents information on Large power stations (directly connected or embedded), Medium and Small power stations that are directly connected to the National Electricity Transmission System (NETS) and directly connected External Interconnections with External Systems.

Embedded generation may be Large but is more likely to be either Medium or Small. Large embedded power stations are reported in Chapter 3 as explained above. Medium and Small embedded power stations and embedded External Interconnections with External Systems are reported in this chapter.

Much of the existing and future embedded generation is either in the form of combined heat and power (CHP) projects or in the form of renewable projects. This chapter considers these two types of generation source and, in so doing, also reports on non-embedded renewable sources of generation (e.g. Wind farms).

Embedded Generation

Types of Embedded Generation

The output of most embedded Medium and Small power stations falls into two main categories that are not mutually exclusive, namely that generated primarily for own use, normally in the form of CHP, and that generated for supply to third parties, mainly from renewable sources (e.g. wind).

A CHP plant is an installation where there is simultaneous generation of usable heat and electrical power in a single process. CHP schemes are generally fuelled by gas, coal or oil although some are also partially fuelled by fossil fuels and partially fuelled by renewable sources of energy (e.g. biofuels such as sewage gas). The latter are referred to as 'Co-firing' generating stations. CHP schemes tend to be located in close to customers (e.g. large industry) wishing to take the heat output.

Renewable generation technologies cover a range of energy sources including hydro, biofuels, wind, wave and solar. In output terms, the largest contributions currently come from biofuels, which include landfill gas, waste combustion, sewage sludge digestion and coppice wood and straw burning.

Further information can be found on the renewable energy statistics website:

http://www.restats.org.uk/

http://www.restats.org.uk/electricity.htm

Embedded Small and Medium Power Stations

Chapter 2 (Electricity Demand) considers, amongst other things, the forecast peak demand on the NETS in ACS conditions, which is based on the projections provided by the system 'Users' and by National Grid.

Network operators are required under the Grid Code to net off their own allowances for the output from embedded Medium and Small power stations when submitting their forecasts of demand to be supplied at the Grid Supply Points. They are also required to net off their own allowances for any forecast imports across embedded External Interconnections from External Systems. Accordingly, the output of embedded Medium and Small power stations is taken into account when planning the development of the transmission system. However, this output is not directly seen by the National Electricity Transmission System Operator (NETSO), although its overall effect on the NETS and its operation is.

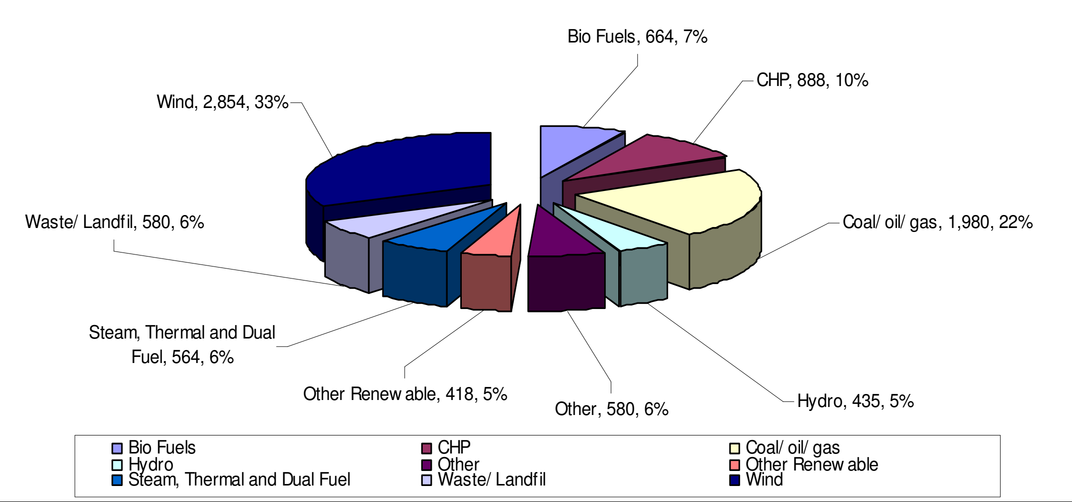

Figure 4.1 - Main Types of Embedded Generation (MW)

Table F.3 in Appendix F contains a range of information on Small and Medium power stations embedded within distribution networks. The information in this table is based on information originally provided by the relevant distribution network operators beyond their Week 24 Grid Code obligations.

Figure 4.1 summarises the main fuel and plant types in Table F.3 in pie-chart form. The main renewable types of generation shown are: wind, coal/oil/gas, CHP and biofuels. The capacity of wind generation includes both onshore and offshore wind. The waste and landfill plant types have been grouped together as “man-made” forms of renewable energy.

In Table F.3, the information in respect of the Scottish distribution companies (i.e. SHEPD and SP Distribution Ltd) has been updated this year. However, updated information in respect of the distribution companies in England and Wales has been sourced internally from our own data.

In view of the relatively high volume of data relating to the distribution systems in England and Wales, a cut-off point of 5MW was originally adopted to reduce the data collection burden on the distribution network operators (i.e. embedded plant of less than 5MW located in England and Wales was not included). The data for England & Wales has since been supplemented by embedded generation data of our own, which includes some generation projects with an installed capacity of less than 5MW. The information relating to the Scottish distribution systems provided by the Scottish network operators does not have a lower cut-off level. For some User Systems, the information is provided on an individual power station basis while for others the information is provided on a GSP basis.

There is a current Grid Code requirement (PC.A.3.1.4 of the Planning Code refers) for distribution network operators to inform NGET of the summated capacity of embedded Medium and Small power stations within their area and the allowances made for these in their demand forecasts projected for the time of the system peak. This information is summarised in Table 4.1. Please note that the ‘Zone Number’, referred to in Table 4.1, is the ‘Demand TNUoS Tariff

Zone' rather than the 'SYS Study Zone', both of which are introduced in "Use of System Tariff Zones" in Chapter 6.

For comparison purposes, Table 4.1 gives totals of installed capacity for each DNO summated from the data in Table F.3. These figures give an approximate indication of the proportion of installed capacity of embedded generation that the distribution network operators assume is considered to be contributing at the time of the system peak. The contribution assumed by network operators to be firm at other times, including the time of the local peak demand for which the Grid Supply Point is chiefly designed, rather than the time of peak demand, is not reported.

The information presented in Table F.3 and Table 4.1 may, in some respects, be incomplete, but does nevertheless provide an initial useful insight into the different types of embedded generation and into the total demand in the system (i.e. demand on the NETS plus embedded generation capacity 'netted off' in the distribution network operators' Grid Code demand submissions).

Environmental Targets for Renewables & Emissions

The UK has two key environmental targets relating to renewable energy and greenhouse gas emissions (GHGs). The first of these targets is part of the European Union's (EU) integrated energy/climate change proposal that addresses the issues of energy supply and climate change and in doing so sets a target of 20% of European energy (including electricity, heat & transport) to come from renewable sources by 2020[1].

The UK's contribution to this target is 15% which is lower than the European wide average due to the UK's low starting point (2% compared to EU average of 9%). However, the UK has the largest increase of any country which was due to its low starting point, economic strength and its high potential for renewable generation i.e. significant wind, wave and tidal resources.

The Renewable Energy Strategy[2] (published in July 2009) identified that in order to meet this target approximately 30% of UK's electricity will have to come from renewable sources by 2020, with a corresponding 12% from heat and 10% from transport.

The second target, which also follows the principles of the overall EU 20/20/20 vision (20% of energy from renewable sources along with a 20% reduction in GHG emissions and 20% improvement in energy efficiency by 2020) but goes even further, has been incorporated in the Climate Change Act[3] and sets a target of 80% reduction in GHGs from the 1990 levels by 2050. This equates to a 34% reduction in GHGs emissions by 2020 as specified by the Climate Change Committee[4].

To see what potential power station developments and network reinforcements are required to enable these 2020 targets to be met please refer to the section on the Electricity Networks Strategy Group (ENSG) report under "Indicative Reinforcements required to meet Environmental Targets" in Chapter 8.

Renewable Obligation

The Renewables Obligation (RO) scheme[5] obligates electricity suppliers to source an increasing proportion of their power from renewable generation. Accredited renewable generators are issued with Renewable Obligation Certificates (ROCs) for each megawatt hour (MWh) of eligible energy generated, multiplied by a factor that is dependant on the type of generation technology.

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[1] http://www.energy.eu/directives/com2008_0030en01.pdf
[2] http://www.decc.gov.uk/en/content/cms/what_we_do/uk_supply/energy_mix/renewable/res/res.aspx
http://www.decc.gov.uk/assets/decc/What%20we%20do/UK%20energy%20supply/Energy%20mix/Renewable%20energy/Renewable%20Energy%20Strategy/1_20090717120647_e_@@_TheUKRenewableEnergyStrategy2009.pdf
[3] http://www.opsi.gov.uk/acts/acts2008/ukpga_20080027_en_1
[4] http://www.theccc.org.uk/
[5] http://www.ofgem.gov.uk/Sustainability/Environment/RenewablObl/Pages/RenewablObl.aspx

The RO, the Renewables Obligation Scotland and the Northern Ireland Renewables Obligation have been designed to incentivise renewable generation into the electricity generation market. Renewable generators can sell ROCs that they have acquired to electricity suppliers. Each year, the Office of Gas and Electricity Markets (Ofgem) sets the percentage of electrical energy for which suppliers must obtain ROCs for and the buy-out price[6] that suppliers must pay for any deficit.

The RO was introduced in 2002[7] with an original end date of 2027. However, in light of the 2020 targets and the need to encourage investment in renewable energy up to 2020, the operational timeline of the RO has been recently extended to 2037[8]. A limit of 20 years support for accredited generating stations was also introduced in parallel (subject to the 2037 end date) to avoid overcompensation. More recent changed, applicable from April 2011, will allow operators of large offshore wind generating stations (accredited after 31st March 2013) to register for their ROCs in phases of operational capacity to account for long construction periods. The 20 years of support would apply to up to five phases starting from the date of full RO accreditation and then once a year for a maximum of five years[9].

Historically one ROC was issued for each MWh of eligible renewable output generated. However April 2009 introduced the concept of a banding system. The banding system used onshore wind power as a reference technology (reference band), with any technology which needed more support (post demonstration and emerging technologies band) being granted additional ROCs and similarly more commercially viable technologies (established bands) being granted less ROCs.

Renewable Obligation Certificates Allocation (England, Wales & Scotland) [10]

Developmental Category for Renewable Obligation Banding	**Technologies**	**Level of Support ROCs per MWh**	
Most Established	Landfill Gas	0.25	
Established	Co-firing of Biomass Sewage Gas	0.5	
Reference	Co-firing of Biomass with CHP Co-firing of Energy Crops Energy from Waste with CHP Geopressure Hydro-electric Onshore Wind	1.0	
Post Demonstration	Co-firing of Energy Crops with CHP Dedicated Biomass Offshore Wind	1.5	
Emerging Technologies	Anaerobic Digestion Dedicated Biomass with CHP Dedicated Energy Crops Dedicated Energy Crops with CHP Gasification Geothermal Pyrolysis Solar Photovoltaic Tidal Impoundment – Tidal Barrage Tidal Impoundment – Tidal Lagoon Tidal Stream Wave	2.0	
Enhanced Wave & Tidal Bands (Scotland Only)[11]	Wave and tidal projects located in Scottish waters and not receiving Government support.	Tidal 3.0	Wave 5.0

6 http://www.ofgem.gov.uk/Media/PressRel/Documents1/RO%20buy-out%20Info%20Note%204%20Feb.pdf
7 Renewable Obligation (Scotland) Order came into effect in April 2002
Renewable Obligation (Northern Ireland) Order came into effect in April 2005
8 http://www.ofgem.gov.uk/Sustainability/Environment/RenewablObl/Documents1/Annual%20Report%202008-09.pdf
9 http://www.decc.gov.uk/assets/decc/consultations/renewables%20obligation/1059-gov-response-ro-order-2011-cons.pdf
10 http://chp.defra.gov.uk/cms/roc-banding/
11 http://www.scotland.gov.uk/Publications/2009/12/10134807/4

Under the banding scheme, offshore wind projects attracts 1.5 ROCs with tidal/wave projects attracting 2 ROCs for each MWh of eligible renewable output generated. To further stimulate the market, additional ROCs were to be made available to offshore wind projects which met a number of preconditions[12]. It has subsequently been announced that this additional support for offshore wind projects would be extended, with projects which have been fully accredited between 1st April 2010 and 31st March 2014 attracting 2 ROCs for each MWh of eligible renewable output generated[13].

Feed-In-Tariffs

Feed-In-Tariffs were introduced in April 2010 to incentivise small scale, low carbon electricity generation by providing "clean energy cashback" for householders, communities and businesses – to allow them to become generators of electricity, as opposed to simply consumers. The feed-in tariffs (FITs) will work alongside the Renewables Obligation, which will remain the primary mechanism to incentivise deployment of large-scale renewable electricity generation, and the Renewable Heat Incentive (RHI) which will incentivise generation of heat from renewable sources at all scales.

The GB FITs will consist of two elements of payment, made to generators, and paid for, by licensed electricity suppliers. The largest suppliers (mandatory FITS suppliers) will be obliged to offer FITs, and smaller suppliers may participate if they wish. The first element is a **generation tariff** that differs by technology type and scale, and will be paid for every kilowatt hour (kWh) of electricity generated and metered by a generator. This generation tariff will be paid regardless of whether the electricity is used onsite or exported to the local electricity network. The second element is an **export tariff** which will either be metered and paid as a guaranteed amount that generators are eligible for, or will, in the case of very small generation, be assumed to be a proportion of the generation in any period without the requirement of additional metering.

Further information can be found on the DECC website:

http://www.decc.gov.uk/en/content/cms/consultations/elec_financial/elec_financial.aspx

Climate Change Levy

Another instrument of the government's policy to reduce environmental emissions is the Climate Change Levy (CCL)[14]. This is an energy tax payable by all industrial and commercial businesses since April 2001. It is levied on energy supplies, the rate varying depending on the fuel. The CCL levy rate for electricity for 2011/12 is 0.485p/kWh. From April 2011, energy intensive businesses can receive up to 65% discount on the levy if they enter into agreements with the government to undertake significant energy efficiency improvements.

Electricity generated from renewables is exempt from the CCL, thus currently benefiting developers of renewable electricity by an extra 0.470p/kWh during 2010/11. As a result, developers of qualifying renewable schemes could receive a minimum support of 4.169p/kWh in 2010/11, (i.e. the buy-out price of 3.699p/kWh under the RO plus 0.470p/kWh under the CCL). This is in addition to the value of the share-out of the buy-out kitty among those suppliers who have bought green energy under the Renewables Obligation.

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http://www.scotland.gov.uk/News/Releases/2008/09/19111827
http://www.scotland.gov.uk/Resource/Doc/917/0065773.pdf

[12] Offshore wind projects which have government consent and have placed order for wind turbines in financial year 2009/10 will be eligible for 2 ROCs with 1.75 ROCs available in 2010/11.

[13] http://www.ofgem.gov.uk/Sustainability/Environment/RenewablObl/Documents1/Annual%20Report%202008-09.pdf

[14] http://customs.hmrc.gov.uk/channelsPortalWebApp/channelsPortalWebApp.portal?_nfpb=true&_pageLabel=pageExcise_InfoGuides&propertyType=document&id=HMCE_CL_001174#P27_1281

Growth and Location of Wind Farms

There are clear indications of significant activity associated with the development of wind generation and, accordingly, future activity in this area is worthy of further consideration. Wind farms may, of course, be embedded or non-embedded and may be classified as Large, Medium or Small power stations. Accordingly, relevant information can be found from two sources of data within this Statement.

The first is Table F.3 in Appendix F, which presents information on embedded Medium and Small power stations. As explained previously, the information contained in Table F.3 is not necessarily complete and, as such, should not be relied up on. Much of the information contained in Table F.3 has been voluntarily sourced by the distribution network operators and NGET cannot therefore guarantee its accuracy. Nevertheless, the information it contains does provide a useful initial indicator to the types and capacity of embedded Medium and Small generation connected to distribution networks. The DNOs denoted “SHEPD” and “SPD” in zones 1 and 2 are in Scotland. The other DNOs are in England & Wales.

The second source is Table F.1 in Appendix F, which presents information on directly connected power stations and Large embedded power stations. Accordingly, Table F.1 includes information on all Large wind farms, whether directly connected or embedded, and Medium and Small wind farms, that are directly connected to the NETS. Table 5.4 in Chapter 5 shows the reported increase in onshore and offshore wind capacity from 2010/11 to 2017/18 inclusive.

Effect on Power Transfers

General Considerations

One effect of an increasing proportion of embedded generation will be to reduce the flow across the interface between the transmission and distribution networks. This will tend to delay the need for reinforcement of parts of the transmission network but it is unlikely to remove the need for the substations that exist at the interface between the transmission and distribution systems (i.e. the Grid Supply Points). These will continue to be required to balance the fluctuations between generation and demand in that specific part of the distribution network from minute to minute.

In a few areas it is possible that embedded generation may increase to a level where there could be electricity exports from distribution networks to the transmission system. Provided such transfers are within the capacity of the super grid transformers, this is not expected to lead to major technical difficulties. The general reduction in the power flow from the transmission to distribution networks does not necessarily lead to a similar reduction in the bulk power transfer across the transmission system. These bulk transfers, and therefore the need for system reinforcements, are a function of the size and geographical location of both generation and demand.

Power stations, particularly Large Power Stations, tend to be located in clusters near fuel sources. This, coupled with their size (i.e. capacity) relative to that of individual demands, means that generation developments (openings or closures) tend to exert the greater influence on the need for transmission reinforcements. Demand changes are normally less localised and are subject to a more even rate of change. Having said that, in some areas (e.g. where demand exceeds local generation) demand can exert the greater local influence and as such there remains a need for accurate demand forecasts in terms of both level and location.

The section in Chapter 7 on "Transmission System Performance" considers the performance of the NETS against the 'SYS background', includes two figures (Figure 7.1 and Figure 7.2) which provide an overview of the power flow pattern at the time of ACS peak demand for the years 2010/11 and 2017/18 respectively.

Power transfers across the system depend on the disposition of generation and demand regardless of whether it is directly connected to the NETS or embedded within a distribution system. To reduce bulk flows would require a general movement of economic generation (directly connected or embedded) nearer to the major load centres (e.g. the south). Even then it would not necessarily follow that the north to south power transfers would reduce. For instance, if new embedded generation were to be located in the south its operation could displace the operation of less economic plant also in the south, in which case transfers would be unchanged. Alternatively, if new embedded generation were to be located in the north of the system it is more likely that north to south transfers would increase.

Transmission Network Use of System Charges (TNUoS)

The Balancing and Settlement Code (BSC) and TNUoS charges, including to whom they apply, are explained in Chapter 10 (Market Overview).

Generators that are not registered within the BSC are exempt from TNUoS charges and payments. Relevant power stations would be Licence exempt, embedded and registered within a Supplier BM Unit. The output of these power stations will have already been accounted for in the supplier's demand figures upon which TNUoS charges are based.

Under the above circumstances an embedded power station which is both licence exempt and not party to the BSC will not be charged TNUoS and may be able to reduce the TNUoS charges payable by the host supplier (i.e. the supplier in whose BM Unit the power station is registered) by generating on the Triad legs.

Fluctuating Unpredictable Output and Standby Capacity

The output of some renewable technologies, such as wind, wave, solar and even some CHP, is naturally subject to fluctuation and, for some renewable technologies, unpredictable relative to the more traditional generation technologies. Analyses of the incidence and variation of wind speed, the expected intermittency of the national wind portfolio would not appear to pose a technical ceiling on the amount of wind generation that may be accommodated and adequately managed. However, increasing levels of such renewable generation on the system would increase the costs of balancing the system and managing system frequency.

It is a property of the interconnected transmission system that individual and local independent fluctuations in output are diversified and averaged out across the system. Moreover, the interconnected system permits frequency response and reserves to be carried on the most cost effective generation or demand side service provider at any particular time. These properties of the transmission network permit intermittent/variable generation to be used with lower standby and frequency control costs than would otherwise be the case.

Given the variable and unpredictable nature of some renewable technologies such as wind, the proportion of conventional generation needed to be retained in the electricity market so that current levels of security of supply are not eroded is the subject of recent research that has been recently published. The report "Growth Scenarios for the UK Renewable Generation and Implications for future Developments and Operation of electricity Networks" (BERR Publication URN 08/1021 June 2008) indicates that in the future "the probability of having low wind output at times of peak demand is considerable. There is a 10% probability that wind output will be below about 20% of installed capacity at times of peak demand in winter and a 5% probability of output being below about 15%."

This implies that, for larger wind penetrations, the wind capacity that can be taken as firm is not proportional to the expected wind energy production. It follows that the electricity market will need to maintain in service a larger proportion of conventional generation capacity despite reduced load factors. Such plant is often referred to as "standby plant".

Balancing Mechanism Participation

Users registered within the BSC may volunteer to participate in the Balancing Mechanism (BM) regardless of whether they are directly connected to the transmission system or embedded within a distribution system. The minimum offer size in the BM is 1MW.

National Grid's responsibility in the BM is limited to balancing generation and demand and to resolving transmission constraints. This includes a duty and financial incentive under the System Operator Incentive Scheme to purchase Balancing Services economically. The Grid Code requires all embedded participants on the BM to ensure that their physical notifications, bids and offers are feasible with respect to their host network.

The persistence effect of wind (i.e. its output is naturally subject to fluctuation and unpredictability relative to the more traditional generation technologies) coupled with the expected significant diversity between regional variations in wind output means that, while the balancing task will become more onerous, the task should remain manageable. Provided that the necessary flexible generation and other balancing service providers remain available, there is no immediate technical reason why a large portfolio of wind generation cannot be managed in balancing timescales.

It is anticipated that balancing volumes and costs will increase as the wind portfolio increases. National Grid estimation of these volumes and costs will be highlighted via a separate consultation report on future system operations which was published in June 2009. Both the consultation document and the results of the consultation can be found at the following link,

http://www.nationalgrid.com/uk/Electricity/Operating+in+2020/

In the longer term, we do not think it likely that there will be a technical limit on the amount of wind that may be accommodated as a result of short term balancing issues but economic and market factors will become increasingly important.

Further information on Balancing Services can be obtained on the National Grid website:

http://www.nationalgrid.com/uk/Electricity/Balancing/services/

A useful reference document on the management of constraints and incentives ("BSIS Reference Document - An introduction to National Grid Electricity Transmission System Operator (SO) Incentives") is available under "System Operator Incentives":

http://www.nationalgrid.com/uk/Electricity/soincentives/docs/

Technical and Data Requirements

All Generators with Large power stations are obliged to sign onto the Connection and Use of System Code (CUSC). This includes signatories to the BSC. In addition parties who are not holders of a Licence but who have registered within the BSC are also required to sign the CUSC.

The CUSC places a number of obligations on signatories, which includes compliance with the Grid Code. Amongst other things, the Grid Code sets out technical requirements for the various classes of generation (e.g. Large, Medium, Small, embedded and directly connected External Interconnections) as well as requirements for data to be supplied to National Grid as NETSO.

Some of the earlier technologies used in wind turbines were very sensitive to voltage depressions, even where such depressions lasted for very short periods of time, such as the 140 milliseconds that protective equipment on the NETS typically take to remove a line fault caused by lightning. Such faults can result in voltage depressions over an extensive area of the system potentially causing a large number of wind turbines to trip as a result of a common cause. In recognition of this the Grid Code has now been revised to include revised minimum technical characteristics for such generation technologies.

Medium and Small embedded generation which is Licence exempt and which is not registered within the BSC, is not required to sign on to the CUSC and, in consequence, is not obliged to comply with the Grid Code. Nevertheless, it is recognised that such embedded generation does impact on the overall performance of the transmission system and its operation.

Embedded Medium power stations are most likely to have a material effect. Small power stations may also be important particularly if connected at the first voltage transformation level of the Grid Supply Point.

To enable the Transmission Owners to meet their obligations with regard to planning the transmission system and National Grid, acting as NETSO, to further meet its obligations with regard to operating the NETS it is important that Users submit sufficient and timely information on all embedded generation that may have a material effect on the transmission system. Amongst other things, the following are required:-

- technical and other information in respect of any new embedded generation which may be material to the design and operation of the transmission system in order that any necessary works can be evaluated and initiated in a timely fashion; and

- sufficient notification to enable any necessary works to be completed and ensure the transmission network is safe and secure before the embedded generation is energised.

Summary

National Grid recognises the importance of climate change issues and that the government's targets for growth in CHP and renewable generation are likely to lead to continuing increases in embedded generation. It is important for National Grid to play its part in facilitating this by ensuring that any transmission issues arising are appropriately addressed. At present, no insurmountable transmission problems associated with accommodating new embedded generation projects are foreseen. Indeed, the properties of the interconnected transmission system are such as to facilitate embedded generation growth regardless of location.

Nevertheless, this does not preclude the potential need for reinforcements to the NETS, the extent of which would be a function of the system location of the new plant. For example, the extent, and therefore cost, of transmission reinforcement would be a function of the volume of offshore wind located off the England and Wales coast or onshore wind located in Scotland. There is considerable ongoing work in this area which is published by the Electricity Networks Strategy Group (ENSG):
http://www.ensg.gov.uk/index.php?article=126

The persistence effect of wind (i.e. its output is naturally subject to fluctuation and unpredictability relative to the more traditional generation technologies) coupled with the expected significant diversity between regional variations in wind output, means that, while the balancing task will become more onerous, the task should remain manageable. It is anticipated that balancing volumes and costs will increase as the wind portfolio increases. However, provided that the necessary flexible generation and other balancing service providers remain available, there is no immediate technical reason why a large portfolio of wind generation cannot be managed in balancing timescales.

Further information can be obtained from the National Grid website:
http://www.nationalgrid.com/uk/Electricity/Operating+in+2020/

Table 4.1 - Embedded Medium and Small Generation Netted off Demand Forecast Submissions by DNOs

DNO Network	Zone Number	Zone Name	Installed Capacity (MW) from Table F.3	Generation Netted Off at Time of System Peak (MW)
Scottish & Southern Energy	1	North Scotland	353	86
Scottish & Southern Energy (Southern)	2	South England	857	448
CE Electric UK	3	North East England & Yorkshire	1,458	632
Electricity North West	4	North West England	905	731
E-on Central Networks	5	Central England	1,116	219
UK Power Networks	6	London & East England	2,014	573
Scottish Power Distribution	7	South Scotland	567	179
Western Power Distribution	8	South West England & South Wales	702	61
Scottish Power Distribution (North Wales)	9	North Wales	992	30
Other / Directly Connected				578
Totals (MW)			**8,964**	**3,537**