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REVIEW OF DISTRIBUTED GENERATION

Report

MAY 2007

A JOINT GOVERNMENT/OFGEM REPORT

ofgem

This report is published alongside the Energy White Paper *Meeting the Energy Challenge*. The wide range of measures set out in the White Paper take forward our commitment to meeting the two long-term energy challenges. They are:

– tackling climate change by reducing carbon dioxide emissions both within the UK and abroad; and

– ensuring secure, clean and affordable energy as we become increasingly dependent on imported fuel.

Further information on the White Paper and related documents is available on the DTI website: www.dti.gov.uk/energy/whitepaper

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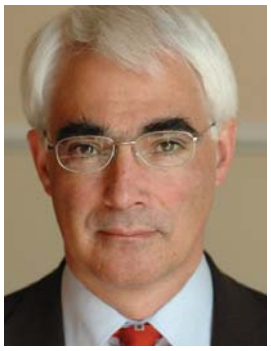
Contents

Foreword



Climate change is undeniably one of the greatest long-term challenges facing the human race. Reduction of carbon dioxide emissions is a key objective of the Government's energy policy. Action is needed from us all – as individuals; in our businesses; and at national and international levels.

We all have a part to play. Individuals are starting to look critically at the impact of their own energy behaviour. At household and community level, distributed generation has great potential. It means that electricity can be generated nearer to where it is used, using renewables or high quality combined heat and power systems. This can reduce emissions, because of the technologies used and by saving the power lost in transporting it. Engaging people more in producing power means they are more likely to use it efficiently. There are already some excellent examples of innovation where this has worked successfully, but at present they are the exception.

This Review has been the subject of wide consultation. Many of the key issues for distributed generation are matters of broader energy policy, including establishing robust carbon pricing and smart metering. These are addressed in the Government's Energy White Paper, published alongside this Report. Other important barriers have already been removed, through extensive work by Government, Ofgem and industry over the last few years.

This Review has identified further practical proposals to complement the broader policy measures and previous work, and forms the basis of the proposals on distributed generation in the Energy White Paper. Government and Ofgem are committed to pursuing these measures to unlock its potential to compete in the energy market.

Rt. Hon. Alistair Darling MP
Secretary of State for Trade and Industry

Sir John Mogg
Chairman, Gas and Electricity Markets Authority

Executive Summary

1. Energy is essential to almost every aspect of our lives and the success of our economy. We face two long-term energy challenges. They are:

- tackling climate change by reducing carbon dioxide emissions, both within the UK and abroad; and
- ensuring secure, clean and affordable energy as we become increasingly dependent on imported fuel.

2. Most of the UK's energy is supplied through a nationwide network, and this centralised model offers economies of scale and high reliability. However, reducing the carbon content of the energy we use is becoming increasingly important, and technology now offers us the opportunity to generate electricity effectively, near to where it is used. It is becoming increasingly clear that local energy supply at, for example, household or community level, could play an important part in our strategy to reduce carbon emissions.

3. There are potential benefits to having a more decentralised energy supply. Electricity and heat can be generated locally from renewable sources, making valuable carbon savings. Losses incurred in transmitting centrally-generated electricity to the point of use can be significantly reduced. And even where fossil fuels are used, Combined Heat and Power (CHP) can, in the right setting, ensure that these fuels are used more efficiently by capturing and using the heat created as a by-product in the generation of electricity. A more community-based energy system would also lead to greater individual awareness of energy issues, driving a change in social attitudes and, in turn, more efficient use of our energy resources.

4. Currently, distributed energy accounts for less than 10% of energy supply. Recognising the role that distributed energy systems could play in meeting our energy policy goals, the Energy Review Report in July 2006 announced this joint DTI/Ofgem review of the incentives and barriers to Distributed Generation (DG), including CHP[1].

1 See Chapter one for our definition of DG.

5. Our Review identified the following key barriers to DG:

- **Cost** – Firstly, the true cost of carbon is not yet fully incorporated in electricity prices and this disadvantages lower carbon technologies. Secondly, DG technologies tend to have higher capital costs. Finally, the rewards for exporting excess electricity produced by distributed generators were seen as small and difficult to access.
- **Lack of reliable information** – there was a low awareness of DG options amongst potential users; grants and financial incentives such as Renewables Obligation Certificates (ROCs) were perceived as being hard to access, and the lack of an accreditation scheme for suppliers and installers put people off untried technologies.
- **Electricity industry issues** – due to the nature of the existing industry structure, it could be hard for small generators to connect to and operate in the centralised system. Network operators could do more to accommodate the connection of distributed generators. The cost to suppliers of rewarding small generators for exporting their excess electricity was a disincentive.
- **Regulatory barriers** – the difficulties of getting planning permission for DG technologies was raised, especially in the context of community developments and new housing, where the associated costs and delays acted as a disincentive.

6. The Government has a range of policies which support the take up of DG. Through implementation of the Microgeneration Strategy, we will push up levels of microgeneration across the UK. The Government has recognised that, in order to accelerate take up (and ultimately drive costs down) of some of the less mature technologies, additional direct support is necessary; the Low Carbon Buildings Programme provides grants for microgeneration, for example. The drive towards zero-carbon homes in "Building a Greener Future" will increase demand for DG. Proposed changes to the planning regime, such as the extension of permitted development status to domestic microgeneration installations, will further enable the expansion of the market. Good Quality CHP plants can benefit from exemptions from the Climate Change Levy and business rates, and enhanced capital allowances for plant and equipment. Finally, Ofgem is working to remove barriers to DG more widely.

7. As we move towards factoring the full value of carbon into energy generation costs, decentralised technologies – emitting less carbon than their centralised counterparts – are expected to become increasingly cost-effective relative to centralised generation. We also expect the costs of immature technologies to continue to fall. The market will decide which technologies are most effective in supplying the UK's energy whilst also meeting our carbon reduction targets; we need to ensure that the opportunities for DG are opened up so that the market is able to make this choice.

8. A market price for carbon is essential in ensuring that the cost of carbon emissions is factored into decisions on energy investment and consumption, resulting in more investment in low-carbon technologies such as DG. The EU Emissions Trading

Scheme (EU ETS) delivers this carbon price currently, but Phase II is due to expire at the end of 2012. Consequently, the Energy White Paper has announced Government's intention to work to support the UN in developing a post-2012 global agreement to stabilise emissions and promote the EU ETS as the principal mechanism for achieving emissions reduction over the medium and long term.

9. The package of proposals in this Report aims to address those barriers specific to DG which are not currently being addressed through Government/Ofgem action elsewhere in the energy market. In particular, the ability of potential distributed generators to interact easily and cost-effectively with the broader electricity market will be increasingly important as the move towards zero-carbon developments gains momentum.

10. In the context of the Government's overall energy policy goals, we believe that any action to assist the development of DG should:

- stimulate cost-effective low-carbon forms of DG;
- provide a means of enabling distributed generators to realise a reasonable economic value from their schemes;
- reduce the complexity involved in setting up as a distributed generator;
- ensure requirements on these smaller players are proportionate to their size and the use they make of the wider public network; and
- encourage, where possible, further growth of DG within the licensed framework, rather than outside it.

11. The package covers:

- more flexible market and licensing arrangements for distributed, low-carbon electricity supply, to be implemented by the end of 2008;
- more clarity on the terms offered by energy suppliers to reward microgenerators for the excess electricity they produce and export; and
- improving information, advice and guidance on options in DG;
- making it easier to connect to and use the distribution network.

12. Our review considered the barriers to DG in the short to medium term. In addition, the Foresight "Sustainable Energy Management and the Built Environment" project will consider the impacts of increased levels of low-carbon decentralised energy and its interaction with current energy systems, over the next five decades. Consideration will be given to the long-term potential and challenges of distributed generation and its relationship with centralised generation. The work will examine the critical uncertainties, map possible future directions and test the policy implications. It will report its findings in the summer of 2008.[2]

2 http://www.foresight.gov.uk/Energy/Energy.html

1. Introduction

Review of Incentives and Barriers to Distributed Generation

13. The Government's Energy Review Report of July 2006 highlighted the challenges we face in addressing climate change and ensuring security of energy supplies. A key part of responding to this challenge is to investigate to what extent DG could complement, or in the longer term potentially offer an alternative to, a centralised system.

14. Consequently, the Energy Review Report announced a joint DTI/Ofgem Review of the specific barriers to DG (including Combined Heat and Power (CHP)). On 1st November 2006, we launched a Call for Evidence and engaged widely with interested parties. This Report follows up on the key issues raised in the Call, and provides supporting evidence for the policy proposals outlined in the Energy White Paper.

Definition of Distributed Generation

15. For the purposes of this Distributed Generation (DG) Review, DG is defined to be any generation which is connected directly into the distribution network,[3] as opposed to connecting to the transmission network, as well as CHP of any scale. The electricity generated is generally used in the local system rather than being transported for use across the UK.[4] This definition of DG technically captures some large power stations, including the Magnox nuclear stations and some CCGTs, though these could equally have connected to the transmission network if this had been more cost-effective or convenient. The Review has thus focused on those generation technologies that are both local and low carbon – primarily community-based projects, Good Quality CHP and microgeneration.

3 In England & Wales distribution networks operate at voltages up to and including 132kV. In Scotland 132kV is categorised as a transmission voltage.

4 The exception is areas such as Scotland, where there is substantially more distributed generation from wind farms than there is local demand, so distribution-connected generation is at certain times flowing off the distribution network onto the transmission network to be transported south.

16. DG covers many technologies on a wide range of scales. Microgeneration technologies are the smallest, with capacities measured in kilowatts (kW).[5] These are wind turbines, solar photovoltaics (PV), heat pumps etc. installed by individuals, businesses, communities and schools. Community schemes often incorporate the use of CHP, and renewable technologies such as solar PV. The heat/cooling generated as a by-product of electricity generation is used within domestic or council buildings, including offices and leisure facilities.

17. Most of the UK's CHP capacity is located in industrial sites and some plants have electrical capacity equivalent to a medium-sized power station. In these larger cases the heat is used for processes which have a stable demand for very high grade heat, such as refineries operating constantly.

Table 1: examples of distributed generation technologies

Technology	Description	Commentary
Distributed Electricity Generation Technologies		
Solar PV	Panels, often roof-mounted, generate electricity from daylight (not just direct sunlight).	The Microgeneration Strategy[6] reported some 1300 UK installations.
Wind	Large wind turbines that convert wind energy directly to electricity.	The BWEA[7] reports 140 operational projects (onshore and offshore) having a total capacity of 2065MW.
Micro-wind (<100kW)	Small wind turbines generate electricity – can now be roof-mounted as well as attached to tall masts.	It is estimated[8] that there are nearly 23,000 small wind turbines with a total capacity of 7MW. Approximately 22,000 have a capacity under 100W.
Micro-hydro	Devices that capture the power of flowing water and convert it to electricity.	The Microgeneration Strategy reported some 90 installations.
Biomass/Waste	Installations range from landfill gas generation stations to large power only facilities approaching 40MW.	Total capacity is approaching 1400MW (DUKES 2006). See the Biomass Strategy for a map of installations.

5 The term is most commonly used to describe a domestic generator as defined in the Engineering Recommendation G83/1, as published by the Electricity Networks Association. The legal definition of microgeneration covers technologies up to 50kWe and 45kWth.
6 http://www.dti.gov.uk/energy/sources/sustainable/microgeneration/
7 http://www.bwea.com/ukwed/index.asp
8 By AEA Energy and Environment see http://www.restats.org.uk

Combined Heat & Power Technologies		
Biomass/Waste	Installations range from 100kWe biomass CHP to ~ 85MWth/20MWe.	See Biomass Strategy[9] for map of installations.
Micro-CHP, and CHP up to 1MWe	Small devices, usually gas-fired, that produce electricity and capture the waste heat produced as a by-product. CHP used on this scale tends to be for heat and power for a single house or on a community or commercial scale (i.e. a housing estate, or office block).	The DUKES[10] database reports 1263 installations, having a combined capacity of 206 MWe/403 MWth.
CHP from 1MWe – 10MWe	CHP on this scale tends to be large community projects or small industrial applications.	The DUKES database reports 196 installations having a combined capacity of 771 MWe/1,870MWth.
CHP over 10MWe	CHP on this scale tends to be large gas-turbine industrial applications that require a substantial heat load on a continuous basis.	The DUKES database reports 75 installations having a combined capacity of 4814 MWe/10,123MWth.

Review Terms of Reference

18. This review has examined all aspects of the incentives and barriers that impact on DG, including CHP. This included:

- the economic and other incentives for suppliers to buy electricity from distributed generators;
- options for resolving potential barriers to the sale of electricity from small generators, for example:
  a. licensing procedures
  b. technical standards for connection and for network operation;
- the economic costs and benefits, and other incentives, for Distribution Network Operators (DNOs) to connect new generators and to invest in upgrading distribution networks in order to accommodate increasing amounts of DG; and
- the incentives for DNOs to engage in innovation aimed at minimising the costs and capturing the benefits of DG.

9 http://www.defra.gov.uk/environment/climatechange/index.htm
10 http://www.dti.gov.uk/energy/statistics/source/electricity/page18527.html

Scope and Conduct of the Review

19. The Review was carried out by a team of officials from DTI and Ofgem. We worked very closely with, and drew on the expertise of, colleagues both in DTI and Ofgem and in other Government Departments, and worked under the direction of a Steering Group of senior officials.

20. We published a Call for Evidence[11] on 1st November 2006, allowing two months for responses, to ensure that we sought opinions from a broad range of key interested parties. We also held workshops on 22nd and 28th November 2006 to publicise the Call, stimulate debate and inform written responses. A total of around 60 people attended these workshops and we received 52 written responses from organisations and individuals. A wide range of organisations was engaged in this process. Representatives from utility companies, environmental groups, local government, small businesses, energy regulators, consumer organisations and academia were all present at the workshops. All responses, excepting those where confidentiality was requested, are published on the DTI website. In addition, we held separate meetings with a range of key interested parties. Ofgem also held a workshop in January 2007 to discuss some of the emerging thinking from the Review.

21. The Devolved Administrations have various responsibilities in relation to the matters set out in this Review. In line with the devolution settlements in Scotland, Wales and Northern Ireland, all proposals which touch on devolved matters will be taken forward in accordance with the principles set out in the Memorandum of Understanding. This review covered Great Britain only, given Ofgem's remit for Great Britain.

22. We were also able to draw on a wide range of research and reports which had already been published and worked closely with other relevant projects. Key inputs include:

- 'Making ESCos[12] work': Advice and Guidance on setting up & delivering an ESCo in London (The London Energy Partnership), Oct 2006[13]
- 'Local and Regional Action to Cut Carbon' (The Centre for Sustainable Energy), July 2005
- 'Green Light to Clean Power': The Mayor's Energy Strategy, (GLA), Feb 2004
- International Energy Agency case study on Southampton District Energy Scheme
- "Power from the people" – DTI's Microgeneration Strategy[14]
- "Ofgem and Microgeneration: next steps"[15]
- The work of the DTI/Ofgem-chaired Electricity Networks Strategy Group[16]
- Government's Strategy for CHP to 2010, Defra, 2004

11 http://www.dti.gov.uk/energy/review/implementation/distributed-energy/page35076.html
12 An ESCo is an Energy Services Company. Government policy on ESCos is discussed in Chapter 3 of the Energy White Paper.
13 http://www.lep.org.uk/projects/energy-action-zero-carbon.htm
14 http://www.dti.gov.uk/energy/sources/sustainable/microgeneration/strategy/page27594.html
15 http://www.ofgem.gov.uk/Sustainability/Environmnt/Policy/Documents1/15691-MicroOctFINAL.pdf
16 Formerly called the Distributed Generation Co-ordinating Group

- Report of the Biomass Task Force and associated Government Response, April 2006
- 'Local Energy – Turning Consumers into Producers' (House of Commons Trade and Industry Committee), January 2007.

23. In addition, the Foresight Sustainable Energy Management and the Built Environment project, also announced in the Energy Review, will consider the impacts of more decentralised ways of generating heat and power that are low carbon, and their interaction with current energy systems, over the next five decades. This will include looking at the long-term potential and challenges of DG and its role and relationship with centralised generation. The work will examine the critical uncertainties, map possible future directions and test the policy implications.[17]

24. We are extremely grateful to everyone who has made an effort to contribute to this Review, particularly those who have taken the time to provide written evidence or to explain their views.

17 http://www.foresight.gov.uk/Energy/Energy.html

2. Recent Government and Ofgem Measures on Distributed Generation

Summary

25. Recognising the importance of DG in contributing to our efforts to reduce carbon emissions, the Government and Ofgem have already undertaken work in this area, much of which is ongoing. This chapter summarises the most relevant policies, some of which are covered in more detail in the Energy White Paper.

Detailed Discussion

26. Current Government action in this area applies to the generation of electricity *and* heat; this is called distributed energy (DE). Existing policies which will stimulate the take-up of DE include particularly:

- The zero-carbon new homes policy
- Support for renewables, microgeneration and CHP
- Public sector leadership

Zero-carbon new homes

27. The Government's drive towards zero-carbon homes will increase demand for DE. In 'Building a Greener Future',[18] the Government proposed that all new homes in England should be zero-carbon from 2016. A firm decision on this timetable will be announced later this year. By 2016, if we meet our housing supply ambitions, there will be an additional 200,000 homes every year, the majority of which will be newly-built, zero-carbon homes.

Support for renewables, microgeneration and CHP

28. Government has also taken a number of steps to promote some of the specific DE technologies, rewarding them for the carbon savings they can offer relative

18 http://www.communities.gov.uk/pub/173/BuildingaGreenerFutureTowardsZeroCarbonDevelopment_id1505173.pdf

to conventional electricity generation and heat supply. The proposed changes to the Renewables Obligation will boost support for renewable CHP, including the recovery of energy from waste and some types of microgeneration technologies. Defra's Waste Strategy published in May 2007 sets out our broader policy on improving the recovery of energy from waste, which will boost DE.

29. A number of incentives are available for people looking to invest in microgeneration technologies for their home, school, community, or business. They are available under:

- the Warm Front programme (and its equivalents in the Devolved Administrations);
- the Low Carbon Buildings Programme; and
- the Enhanced Capital Allowance Scheme

30. Fiscal incentives are also important. A reduced VAT level of 5% is applicable to the installation of most microgeneration technologies. A list of the applicable technologies was lengthened with the addition of ground-source heat pumps, air-source heat pumps and micro-CHP in the 2004 and 2005 Budgets. As announced in the December 2006 Pre-Budget Report, legislation in the Finance Bill 2007 will put beyond doubt that, where private householders install microgeneration technology in their home for the purpose of generating power for their personal use, any payments they receive from the sale of surplus power or Renewable Obligation Certificates (ROCs) to an energy company are not subject to income tax.

31. CHP benefits from a range of existing policies to promote its adoption, including exemption from the Climate Change Levy and Business Rates. In addition, incentives for CHP have been improved by fully rewarding its carbon saving in the EU Emissions Trading Scheme (ETS) Phase II, which begins on 1st January 2008.

Public sector leadership

32. The public sector has a role to play in promoting DE. The Government has committed to carbon emission reduction targets (30% by 2020) and its office estate becoming carbon-neutral by 2012. DTI has already installed solar PV on the Insolvency Service building in Bloomsbury Square, and is actively investigating the possibility of further installations on its estate. Ofgem itself has installed a CHP plant in its London office. The Government will publish a report on ways in which local authorities can improve energy efficiency and levels of microgeneration by August 2007.

33. The Carbon Trust has allocated £10 million to Partnership for Renewables to provide support for public sector organisations wanting to invest in DE. It plans to have 500 MW of renewable energy projects, primarily 3-5 MW wind turbine projects, constructed or under development within the next five years by attracting private sector investment of up to half a billion pounds.[19]

19 www.carbontrust.co.uk/commercial/enterprises/pfr.htm

Microgeneration Strategy

34. The Energy Review Report committed Government to aggressively implementing the actions highlighted in the Microgeneration Strategy.[20] The table below describes the current status of action in this area:

Cost constraints	The Low Carbon Buildings Programme will provide £86m of grant funding for microgeneration installations in homes, communities, public and private sectors to 2009. This includes the additional £6m announced by the Chancellor in Budget 07 to fund householder installations only (taking the total level of funding available to householders to £18m), as a final tranche of funding for Phase One of the programme. Guidance on how microgenerators can obtain financial benefits from Renewables Obligation Certificates (ROCs), Renewables Levy Exemption Certificates (LECs) and Renewable Energy Guarantees of Origin (REGOs) will be published shortly.[21]
Technical constraints	Microgenerators no longer need to obtain permission to connect to the network.[22] New wiring regulations will be published in January 2008 that will make it easier to connect microgenerators into existing electrical installations. DTI, Ofgem, energy supply companies and Distribution Network Operators[23] are working together to ensure networks can cope with growing levels of microgeneration.
Regulatory constraints/ opportunities	The Code for Sustainable Homes was published in December 2006, along with a consultation on the steps required to achieve a target of all new homes being zero-carbon by 2016.[24] This will stimulate demand for microgeneration. The Government has consulted on extending permitted development rights to cover householders. This change will take effect in Autumn 2007.
Development of the microgeneration industry	A map of funding available for microgeneration R&D has been published on the DTI website to help point companies to major funding sources in the UK. Routemaps for each microgeneration technology are being developed by DTI and industry, to address the specific challenges faced by each technology. DTI is working with the Sector Skills Councils to ensure the skills base develops to support the levels of demand in manufacturing, installing and maintaining microgeneration technologies.

20 There are also regular updates of the progress of the implementation of the Microgeneration Strategy, at http://www.dti.gov.uk/energy/sources/sustainable/microgeneration/strategy/implementation/page36314.html
21 www.lowcarbonbuildings.co.uk
22 The ENA's Engineering Recommendation G83/1 allows this approach for generators up to 16A/phase.
23 A DNO is an entity licensed to distribute electricity through cables and has a duty to provide connections to premises.
24 http://www.communities.gov.uk/index.asp?id=1505157

Recent Ofgem measures on DG

35. The most recent distribution price control review paid special attention to DG. It introduced a number of measures designed to incentivise DNOs to minimise connection costs for new DG, to reduce losses (thus indirectly boosting DG, given its potential to reduce distribution network losses), and to innovate, both when looking at connecting new DG and across the distribution networks generally.[25]

36. Ofgem is engaged in a number of additional activities aimed at addressing some of the technical challenges associated with DG. These include:

- actively leading the Smart Metering debate. Smart Metering has the potential to allow more sophisticated tariffs to be employed for both the import and export of electricity for the domestic market. This has the potential to reward DG for its exports on the basis of the time of export as well as the volume;
- the work on the development of the export market that Ofgem is conducting following the announcement in Budget 07;
- establishing the Microgeneration Forum;
- promoting work by the industry to continue the development of distribution use of system charges;
- initiating and chairing the TADG (Transmission Arrangements for DG) Group which will publish its initial findings soon;
- introducing the DNO's Long Term Development Statements in 2002 and actively monitoring their quality and usefulness; and
- publishing, in February 2007, its proposal to enhance the level of competition in the provision of new connections, both for demand and generation customers.

37. Ofgem also led the work to improve the commercial arrangements between licensed parties (the Distribution Connection and Use of System Agreement). It carries out the administration of the ROC, REGO and EEC mechanisms, and is supporting the work of the Distribution Working Group (DWG) on export reward.

38. The DWG, which reports to the DTI/Ofgem chaired Electricity Networks Strategy Group (ENSG),[26] is focused on the development of DNO networks to facilitate the growth of DG. A significant number of projects have been completed and have delivered material benefits to distributed generators.

25 For example, Registered Power Zones offer a financial incentive to DNOs to find innovative ways of connecting DG, whilst the Innovation Funding Incentive encourages broader innovation across distribution networks.

26 More details about the ENSG can be found at www.ensg.gov.uk.

International comparisons

39. Countries such as Denmark, Finland and the Netherlands have demonstrated that it is possible to make greater use of distributed energy opportunities, such as CHP and district heating. In Denmark, for example, around 57% of electrical capacity comes from CHP and 31% from renewables.[27] This has been achieved primarily through the introduction of heat planning legislation to promote CHP and district heating, and a feed-in tariff to promote renewables and CHP. However, we were not able to find evidence that these policies had led to cost-effective carbon abatement. In our strongly liberalised UK energy market, the goal is to find the most cost-effective ways of reducing carbon emissions, rather than specifying the choice of technology.

40. Another characteristic of these international examples is that successful implementation of distributed energy schemes has been the result of local ownership and involvement. In much of Europe, local and provincial/state authorities have been major owners of electricity and district heating companies. There are clear parallels between this and recent Government initiatives to encourage greater local and regional action on climate change and zero-carbon developments.

27 Danish Energy Authority 2005 statistics www.ens.dk/sw16508.asp <http://www.ens.dk/sw16508.asp

Case study: Aiding the expansion of Renewables Co-operatives

Energy4all is an independent company which was formed in 2002 with the aim of expanding the number of renewable energy co-operatives in the UK. The company is uniquely owned by the co-operatives it assists, namely; Baywind Energy Co-operative Ltd and Westmill Wind Farm Co-operative Ltd.

Energy4all was created due to daily enquiries received by the Baywind Co-operative from people looking to replicate the success of Baywind, the UK's first community-owned wind farm. With its six wind turbines, the Baywind co-op has generated enough green electricity to power 1,700 average homes a year whilst paying an attractive return to its 1,350 members (averaging 7% per annum), and supporting local conservation initiatives. Owning a wind farm also increases community awareness of and involvement in renewable energy developments, maximises financial returns from local resources, and mobilises environmental concern.

Energy4all offers a combination of industry experience, community involvement, and business acumen providing a package of renewable energy expertise, administration, and financial services to Co-ops in return for an annual fee.

Ten additional co-operatives are in the process of being established and will become part of the company in due course.

Source:www.energy4all.co.uk

3. Rationale for Additional Government Intervention on Distributed Generation

Summary

41. Having outlined the policies that promote DG, this chapter considers the case for further intervention, reviewing the evidence we have gathered of potential benefits and current barriers.

42. DG has the potential to offer benefits to the country. The current framework was established to meet the needs of large centralised generation and aspects of the system disadvantage smaller distributed generators. There is a clear case for ensuring that there are no barriers to the expansion of DG: we need to ensure that any cost-effective carbon reduction opportunities can be taken up. A number of Government policies and recent Ofgem changes to market arrangements will act to level the playing field for DG. To complement this work, we have developed a package of additional measures that will go further to address the barriers to the greater take up of DG and enable it to compete freely and effectively with larger-scale, centralised generation.

Detailed Discussion

Benefits of DG

43. Connecting electricity generation closer to the point of use reduces the extent of the infrastructure needed to transport the electricity. DG may therefore be able to offer transmission and distribution (T&D) cost savings for the UK by reducing or, in some situations, avoiding completely the costs incurred in reinforcing these networks. DG also has the potential to reduce losses of electricity resulting from its transportation to the customer. Around 6.5%[28] of all generated electricity is lost as it is transported to consumers: 1.5% in transmission and 5% in distribution. The actual impact that DG has on system reinforcement and losses depends on its location. In situations where DG supplies local consumers and reduces supplies from more remote sources, system reinforcement may be avoided and losses reduced. The greatest reduction in losses is achieved when a domestic

28 Sustainable Development Report 2006 (Ofgem).

microgenerator replaces a supply that previously came from remote transmission-connected generation. However, DG cannot always supply a local demand, for example in Scotland where DG can significantly exceed local demand. In this scenario DG output flows onto the transmission system, potentially triggering reinforcement and incurring higher losses than transmission-connected generation closer to key centres of demand in the South of England.

44. From an emissions perspective, many forms of DG are lower carbon than the centralised alternative. Either technologies are renewable (solar, wind), or they offer greater efficiencies (in appropriate situations) by using CHP to use the waste heat generated as a by-product in the generation of electricity.

45. We have undertaken some modelling work to investigate the likely impact on electricity system costs of moving to a system involving greater take-up of DG. More information is provided in the box.

Modelling the costs of Distributed Generation

DG is not a single technology, but instead encompasses a wide range of technologies including CHP, microgeneration and renewables connected directly into the distribution grid. To reach conclusions about the costs of an increased share of DG in the UK generation mix it is necessary to take into account the costs of each individual DG technology, as well as the likely share of each technology within the total DG sector.

Modelling the costs of the DG sector is highly uncertain. Costs are evolving for less mature technologies such as renewables, and can be site-specific, especially for CHP where costs depend on the nature of the heat load. Equally, we do not know what the future take-up of each technology will be. Instead, we must work with 'what if' scenarios, considering what the costs of DG could be if take-up were to follow a given pattern.

The WADE[29] model compares the total cost of meeting a country's need for new electricity generating capacity using alternative mixes of centralised and distributed generating capacity. DTI has worked with WADE to develop an initial understanding of the relative costs of meeting the UK's need for new generation capacity over the coming 20 years, comparing a centralised scenario to one with a higher proportion of DG. This overall cost comparison incorporates a wide range of input information provided by the DTI, including capital costs of building plant and transmission and distribution infrastructure, fuel costs and carbon costs. However, the WADE approach does not explicitly model the heat component of CHP. Given the importance of CHP within any likely DG scenario – it is anticipated that CHP will account for over 50% of new DG capacity – the findings generated by the WADE model can only offer a starting point on DG costs rather than a robust conclusion.

29 World Alliance for Decentralised Energy: www.localpower.org

The work undertaken by WADE for DTI suggests that the costs to the UK of meeting additional energy demand over the coming 20 years using DG would be higher than if a centralised approach were taken. In the distributed and centralised scenarios modelled, the fuel, carbon and T&D infrastructure costs are lower in the DG case. However this is more than out-weighed by the lower capital and operation and maintenance costs in the centralised case. More detail about this work is provided in *'Using the WADE model to investigate the relative costs of DG'* at www.dti.gov.uk/energy/whitepaper/consultations.

To be confident of these preliminary results would require a model capable of explicitly considering heat. We will do further work to model the heat and electricity aspects of a distributed energy system to enable more robust conclusions about the relative costs of DG to be drawn. This work would still be subject to great uncertainty surrounding the potential for each technology, the likely take-up and the evolution of costs. However, the overall framework within which this uncertainty was modelled would be robust.

46. Given the benefits that DG has in theory, it is important to understand why take-up is not higher in the UK already. The market chooses the most cost-effective mix of generation, within the context set by Government, including the carbon pricing and regulatory frameworks. A low penetration of DG suggests that its costs are higher than those of centralised generation technologies, in part because economies of scale are not captured in DG markets and as a result of the historic lack of a carbon price. However, if there are any barriers to take-up of DG, these will also contribute to low penetration.

47. The Government wants to provide opportunities for DG, where it proves to be cost effective, so that the market is able to find the best solutions to carbon reduction. The DG challenge is therefore to ensure that:

- new market opportunities are identified;
- the market and regulatory environment is 'user-friendly' for smaller participants;
- people are aware of and understand the new possibilities emerging;
- people are not constrained by the complexity of current arrangements;
- people are able to reap fair reward for taking action to reduce their carbon emissions; and
- genuine market failures are resolved.

Key Barriers to take-up of DG

48. We have found that there are three key market and regulatory failures affecting DG such that the market may not deliver the desired outcome:

- **Market value for carbon:** the market does not value carbon as highly as society does, so where DG technologies offer opportunities for saving carbon there may be a case for government action to support such technologies.
- **Regulatory burden:** the regulatory system was primarily designed for centralised generation. Where aspects of this system present barriers to DG, there is a case for levelling the playing field to facilitate greater competition within the market.
- **Informational barriers:** there is no one source of easily understandable, reliable information on DG opportunities for potential customers.

Market value for carbon

49. Although society as a whole cares about reducing carbon emissions, the market does not fully reward actions which reduce carbon emissions. Responses to the Call for Evidence and participants in the Review workshops highlighted this as a key issue. DG technologies tend to have high capital costs. Although many DG technologies offer significant carbon savings, which is recognised through mechanisms such as the Renewables Obligation, this benefit is not always fully rewarded in the current market place. A greater financial reward for the carbon saving offered by DG technologies would improve their economics relative to centralised alternatives.

50. As previously discussed, DG can offer reductions in carbon through:

- reduced losses in transmission and distribution, with zero transportation losses for electricity generated and used on site, such as microgeneration;
- using lower carbon generating technologies, i.e. facilitating the use of CHP where there is a suitable heat load or deploying renewable technologies; and
- behavioural benefits; anecdotal evidence suggests that individuals who are made more aware of the source of their energy are more conscious of their energy usage and take more steps to reduce it.[30]

51. Government has taken a number of steps to address the issue of rewarding technologies for their carbon saving, through carbon pricing and measures to promote less carbon-intensive technologies. These include generic policies such as the introduction of the EU ETS, which promotes all low-carbon generation by putting a value on carbon. The EU ETS does not offer direct benefits to most distributed generators as they fall below the 20MW lower limit for inclusion within the scheme,

30 Research by the Sustainable Development Commission and the National Consumer Council shows that people moving into homes with built-in renewable energy technologies report far greater awareness of what they can do to reduce their climate impact, and their energy use: 'I Will If You Will' (Sustainable Consumption Roundtable, May 2006) – http://www.ncc.org.uk/responsibleconsumption/iwill-summary.pdf

but they still benefit from the impact of the scheme on prevailing electricity prices. Government has also taken steps to support individual low-carbon technologies, including grants for microgeneration provided under the Low Carbon Buildings Programme, for example: and support for Good Quality CHP, including exemptions from Climate Change Levy and business rates, and enhanced capital allowances for plant and equipment.

52. Given the carbon savings that can be achieved specifically as a result of the distributed nature of the generation through the avoidance of transmission losses and reduced losses in the distribution network, there may also be a case for some additional incentives to promote the use of distributed rather than centralised technologies. Ofgem has taken account of the cost of carbon in setting incentives for reducing distribution losses.

53. Even if the carbon benefit of DG technologies is fully rewarded within the market, there may still be sub-optimal take-up of these technologies if there are other barriers to the take-up of DG. Therefore there is a need to consider whether there are any regulatory barriers in this area.

Regulatory burden

54. It can be difficult for distributed generators to participate effectively in the electricity market, largely due to its relative complexity and the high fixed costs involved. In order to ensure system security, all licensed generators and suppliers must be registered with the system operator, National Grid (NGET), and comply with onerous requirements set out in industry codes for the submission of information. Equally, market arrangements are similar for the large energy supply companies as for a local authority wanting to operate a low carbon energy scheme, at a fraction of the size.

55. The issue of a disproportionate regulatory burden on distributed generators was cited as a key barrier to DG by respondents to the Call for Evidence. In addition to the problems mentioned above, the difficulties of getting planning permission for DG technologies were raised, especially in the context of community developments and new housing, where the associated costs and delays acted as a disincentive.

56. Another related issue, highlighted as a key barrier by respondents to the Call for Evidence, was the issue of export reward. Currently the rewards for exporting the excess electricity produced by distributed generators to the wider network are small or in some cases non-existent. The problem is more extreme the smaller the distributed generator. As discussed in chapters 4 and 5, current electricity market and metering arrangements mean that the value to suppliers of very small amounts of electricity is low.

57. Government and Ofgem have taken steps to address the problems described above. Government is proposing to create a drive for zero-carbon developments and ensure that the planning system helps to create an attractive environment for innovation and

for the private sector to bring forward investment in renewable and low carbon technologies. In addition, work is underway to extend permitted development rights to include microgeneration, which would in many cases remove the requirement for planning permission for those wishing to install microgeneration devices on their homes.[31] The proposals on clearer export reward in chapter 5 should lead to improved offerings for the surplus electricity exported back to the wider network by smaller generators. Following the recent Supply Licence Review[32], Ofgem is proposing fundamental simplifications to the existing supply licence. This will reduce the regulatory burden on those DG schemes wishing to become a licensed supplier.

58. Nevertheless, it appears that meeting the industry's regulatory requirements imposes a disproportionately heavy burden on small operators. To the extent that DG offers the potential for an alternative approach, the regulatory framework should be amended to ensure that conditions imposed on market players are proportionate to their size and system impact, this is explored in more detail in chapter 4.

Informational barriers

59. By far the most commonly cited barrier to DG was a lack of reliable information on the options available. Whilst there are some excellent examples of advice provision, there is a lack of co-ordination and clarity. In some areas, information tailored to the needs of potential distributed generators simply does not exist.

60. Economic theory provides a rationale for this problem. No institution will have the incentive to provide a single, unified point of information where a potential customer can consider all of the options available to them. Commercial firms and trade associations have the incentive to promote their own products or those of their members respectively. Customers can research all of the available data but this is very inefficient as information is a public good and the benefits of one customer's research could easily have been shared across a range of customers.

61. Government has already recognised this information issue in the energy efficiency area and has funded various schemes, notably through the Energy Saving Trust (EST). However, there is no one organisation which comprehensively covers microgeneration, CHP and other DG solutions. There would be clear benefit to the provision of information through a trusted provider with a remit which covers all aspects of DG (including microgeneration) and energy efficiency measures; this is explored in more detail in chapter 6.

31 Planning issues are covered in more detail in the Energy White Paper.
32 http://www.ofgem.gov.uk/Markets/RetMkts/Compl/SLR/Pages/SLR.aspx

Other barriers and market failures

62. The distribution networks are owned and operated by Distribution Network Operators (DNOs) – regulated natural monopolies[32] whose revenues are determined through a regulatory process rather than by competing successfully in a market. A distributed generator is unlikely to have a choice about which DNO to connect to and is therefore exposed to the risk that the DNO does not offer an efficient, good value connection service. While the generator does have recourse to Ofgem, any dispute will cause delay and may result in increased costs. Equally, most DNOs are vertically integrated with centralised generators, so may not have the incentive to encourage the growth of DG. Even though generation and distribution are separately licensed businesses, responses to the Call for Evidence and our engagement with interested parties confirm that this is a concern, with many people feeling that DNOs do not approach the connection of distributed generators in a sufficiently positive way.

63. There is a further issue related to the design of the electricity network. The system was generally designed for one-way flow of electricity from large power stations, through the high-voltage transmission grid and into distribution networks across the country, rather than the sharing of electricity around sites within a distributed, more community-based network. A significant growth in DG[33] would change this pattern, with a growing number of sites both importing and exporting electricity onto the distribution infrastructure over the course of the week or year. This is likely to require the development of more intelligent and controllable distribution networks, often referred to as 'active' management, which could require substantial investment in distribution network infrastructure.

64. In the absence of effective market incentives for the DNOs to improve their offer to distributed generators, it may be necessary to take regulatory steps to ensure that DG is able to compete on a level playing field. Ofgem has recently made proposals to improve competition in the provision of new connections, which are explained in more detail in chapter 7.

65. Another barrier mentioned was concern over a lack of skilled workforce to provide quality advice on DG and assistance on installation and operation of any solution. This could potentially stifle the development of this nascent market. We recognise that this is an important issue, and believe it is one that needs to be addressed at regional and local level as skills and capabilities vary widely across the country. Chapter 6 of the Energy White Paper describes Government work to support the development and retention of key energy skills.

33 The costs of accommodating increased levels of DG are discussed in chapter 7.

Implications of DG for the other energy policy goals

66. In addition to the potential it offers to reduce carbon emissions, DG can have beneficial impacts on other energy policy goals, i.e. security of supply, fuel poverty and competition.

Security of Supply

67. DG potentially adds to the complexity of the role undertaken by the System Operator in ensuring the system remains in balance. The number of generators bringing electricity onto the grid is substantially higher, and NGET will only have direct communication with, and the potential to control the output from, the larger licensed generators. Increasing DG capacity that is effectively invisible to the System Operator could increase the level of uncertainty that has to be managed to ensure supply security. However, NGET already copes with the vast numbers of customers whose demand is continually fluctuating throughout the day. A wider range of generators is essentially no different (though changes to IT systems may be required). Equally, the provision of electricity by a much wider range of producers reduces the importance of any one generator, and potentially makes the system much more robust to equipment failure and other temporary outages.

68. An increased use of DG may reduce the demand for imported gas to some extent. Although gas-fired CHP uses gas more efficiently than centralised fossil-fuel electricity generation, it is not clear whether a wider deployment of CHP would lead to an overall decrease in gas demand. DG may have other benefits for security of supply, through the behavioural impacts of 'closeness' of consumers to their source of power. This may encourage people to spread their demand through the day, reducing the extent of current peaks in demand, or to be more energy efficient.

Fuel poverty

69. DG has the potential to have a positive impact on fuel poverty. Many of the measures, including microgeneration and CHP, involve substantial set-up costs but then lower fuel bills on an ongoing basis. This facilitates the involvement of public authorities in the installation of equipment, leaving families able to meet their ongoing bills.

34 A private network is an electricity distribution system that is licence exempt as defined by The Electricity (Class Exemptions form the Requirement for a Licence) Order 2001. Unlike a public network, the owner/operator of a private network is not required to hold and comply with the terms of a licence to distribute electrical power.

Competition in energy markets

70. A greater uptake of DG has the potential to increase competition within energy markets. If DG technologies are able to compete freely alongside centralised, larger-scale methods of generation this increases the competitive pressure faced by the established businesses in the sector.

71. The impact of DG on competition at the consumer level depends upon the model taken. Under a private networks approach[34] customers do not have a choice of electricity supplier (and perhaps also heat), and so there is a risk that competition will be reduced. Some schemes have tried to mitigate this risk by guaranteeing to supply energy at rates guaranteed to track below those prevailing in the market. However, any spread of private networks is only going to reduce the access of consumers to the competitive retail market.

Distributed Generation and the future

72. Further work on how the centralised and decentralised energy systems might evolve in the long term is the subject of the Foresight project referred to above.

Conclusion

73. The current framework was established to meet the needs of large centralised generation and aspects of the system do disadvantage smaller distributed generators. A number of Government policies and recent Ofgem changes to market arrangements will act to level the playing field for DG. To complement this work we have developed a package of additional measures that will go further to address the barriers to DG and enable it to compete freely and effectively with larger-scale, centralised generation.

74. In the context of the Government's overall energy policy goals, we believe that any action to address the market failures described above should:

- Stimulate cost-effective low-carbon forms of DG
- Provide a means of enabling distributed generators to realise a reasonable economic value from their schemes.
- Reduce the complexity involved in setting up as a distributed generator.
- Ensure requirements on these smaller players are proportionate to their size and the use they make of the wider public network.
- Encourage, where possible, further development of DG within the licensed framework, rather than outside of it.

4. Flexible Market and Licensing Arrangements

Summary

76. There is evidence that aspects of the market and licensing arrangements of our largely centralised electricity market are disadvantaging distributed generators.

77. Licences are required for the generation, distribution and supply of electricity,[35] though in some circumstances exemptions are applicable.[36] Licence conditions, ensure, amongst other things, the safe distribution and supply of electricity, and provide consumer protection. Licences also require the licensee to be a party to relevant industry codes, which are technically complex and therefore require significant expert resource to understand and comply with; the kind of resource that the smaller distributed generators do not have.

78. The complexities and associated costs facing small generators in fully participating in this market, and the obligations that suppliers have to meet to trade across public networks, are significant discouragements to DG. Those that have established DG schemes have reported that success has come from finding solutions in spite of the system, rather than because of it.

79. Ofgem has proposed fundamental simplifications to the existing supply licence, and implementation of the modified licence is planned for June this year. However, there is a requirement for a broader review of industry arrangements, including those relating to energy trading, to facilitate distributed generation.

To address these barriers DTI and Ofgem will consult later this year on options for more flexible market and licensing arrangements for distributed low-carbon electricity within the licensed framework, to be implemented by the end of 2008.

35 Apart from transmission connected CHP schemes; for the majority of DG schemes transmission licences are not applicable.

36 The Electricity (Class Exemptions from the Requirement for a Licence) Order 2001 provides for those that generate, distribute or supply specified, smaller amounts of electricity to remain exempt from the need to be licensed. Most DG schemes fall inside the exemption limits for generation. Such an unlicensed generator who supplies up to 5 MW in aggregate, of which no more than 2.5 MW is supplied to domestic consumers, can supply electricity across public networks, therefore making use of both the generation and supply exemptions framework.

Detailed Discussion

Market and licensing Arrangements

80. Our largely centralised electricity system is primarily designed for one-way flow of electricity from large power stations into distribution networks across the country, rather than the local sharing of electricity around sites within a distributed, community-based network. Because distributed generators aim to generate power for a local community, they do not bring the large quantities of electricity onto the system that large power stations have to offer. This, and other factors, affects the price they are paid for their electricity.

81. Generally speaking, and particularly for the larger participants in the market, licences are required for generation, distribution and supply of electricity.[37] Licensed parties have to comply with a range of conditions to ensure the safe distribution and supply of electricity and to provide consumer protection and security of supply. In order to deliver some of these features, licensees are required to be party to relevant industry codes, which can be complex and costly.

82. Smaller participants in the market are exempted from the need to have licences by the Electricity (Class Exemptions from the Requirement for a Licence) Order 2001 (see figure 1). These apply to generators, distributors and suppliers.[38] Most DG schemes fall below the exemption limits for *generation*.[39] Below the exemption limits for *supply*,[40] the DG party can supply (licence-exempt) electricity across public or private networks without the need for any licence. The DG party will only require a contract with a licensed supplier to manage their interactions with the market, such as registering meter points and managing their imbalance (top-up/standby and purchase).

83. The advantage of using a private network to transport electricity, is that the party reduces their interface with the licensed market. Individual generation and demand sites remain invisible to the wider market and only aggregate flows of electricity are visible at the point of connection to the public network. The party can contract with a licensed supplier to manage their minimal interface with the market. Under this model, the scheme's liability for environmental and other obligations, such as the Renewables Obligation and the Climate Change Levy, is much reduced and is only charged on the net flows at the point of connection to the public network. Standby, top-up and export over the public network can be very much reduced since most electricity flows are on the private network.

37 Transmission licences are only required by the transmission network companies. Most DG schemes are too small to require a generation licence.

38 Generation, distribution and supply are explained at www.energynetworks.org/spring/engineering/netguide_01.asp or www.nationalgrid.com/uk/Electricity/AboutElectricity/

39 The Electricity (Class Exemptions from the Requirement for a Licence) Order 2001, Schedule 2 Class A paragraph (2) states that a generator with a declared net capacity of less than 100MW that generates not more than 50MW is licence-exempt.

40 Supply of electricity over public wires up to 5 MW in aggregate of which no more than 2.5 MW can be supplied to domestic customers.

Examples of current market solutions

84. Different DG schemes have adopted different approaches to the licensing regime. For example, the Woking Borough Council DG scheme operates private networks interconnected by public wires and makes full use of the licensing exemptions. This means it reduces its environmental charges and those charges linked to dealing with or setting up as a licensed supplier. The social objectives of the Woking scheme ensure that these cost savings are passed onto the consumer, with the Council offering between 5 –10% savings on market energy prices. The Woking scheme now has 80 private networks, each connected to the public network with imports and exports of electricity generated in their CHP installations and renewables projects flowing across the public network. Distribution Use of System charges are only paid on the electricity flowing across the public network. Woking Council reports that this whole approach dramatically improves the economics of the scheme. 93% of the Council's own energy needs are met by DG.

85. Some responses to the Call for Evidence indicated that the scale of this approach is limited by the exempt supply limits, particularly for supply to domestic customers.[41] The London Climate Change Agency, for example, highlighted that this will become a barrier to larger cities such as London adopting similar approaches without further relaxation of the exempt supply limits or other simpler market and licensing arrangements.

86. Another distributed generator, Kirklees Borough Council, considered using public wires to distribute electricity and to contract with a licensed supplier to supply electricity to its customers. This would have freed them of the complexities of being a licensed supplier, but they had problems finding a supplier willing to purchase their electricity. By selling to a licensed supplier they would have been effectively generating and selling electricity to the supplier at one price, but then paying a much higher price to buy electricity from the same supplier at another site just a few hundred metres away. This would have given them some minimal income from the scheme. However, although Kirklees spent much time researching buy-back tariffs, they could not find a satisfactory arrangement to enter into. In Kirklees all excess, renewable-generated electricity currently spills back onto the wider network without financial reward for Kirklees, greatly reducing the economic benefits to them, and their incentive to expand the scheme.

Barriers

87. Our analysis of these and other examples, and consultation with interested parties, has revealed a number of barriers to DG.

88. First, the difference between import and export prices for electricity is crucial in determining the economic viability of schemes. This was demonstrated by the

41 See also 'Making ESCos Work: Guidance and Advice on Setting Up and Delivering an ESCo' (London Energy Partnership, February 2007), p.85.

Kirklees example and was one of the motivations for a private network at Woking. Export prices are expected to be below import prices due to transportation costs and other factors, including the difficulty that suppliers face in extracting value from the small and unpredictable amounts of electricity that many distributed generators export. However, it is not clear that the extent of this differential reflects an adequate reward for the benefits resulting from meeting demand with localised generation.

89. Second, particularly if the supply of electricity exceeds the licensing exemption thresholds, the DG producer could choose to become a licensed supplier. This option is neither easy nor cost-effective for small generators, owing to the requirements of being a licensed supplier in a system established to enable a supplier to supply any premises on the GB markets whether they supply 6 MW or 6000 MW. Ofgem is currently simplifying the supply licences to meet the requirements of the national competitive market,[42] but the requirement for a supplier to comply with industry codes and agreements will remain.

90. Finally, it is clear that the cumulative complexities of dealing with the existing market and licensing arrangements and the wider electricity market are a significant discouragement to DG. This is evidenced by the fact that the most successful DG schemes are the result of the efforts of 'wilful individuals' who have dedicated themselves to finding solutions in spite of the system, rather than because of it. Given the increasing focus on DG as evidenced, for example, by the Government's signal to move towards zero-carbon homes and the Mayor of London's identification of DG as the number one priority for reducing London's carbon emissions, we need to do more to to address the barriers to greater take up of DG and enable it to compete freely and effectively with larger scale centralised generation.

Current action on market and licensing arrangements

91. In December 2006, Ofgem published further proposals for modifying the gas and electricity supply licences – the Supply Licence Review. Ofgem is determined to ensure that licence conditions are simple, enforceable and are proportionate now that competition is firmly established in retail energy markets. The key themes of the draft proposals and the Review are:

- removing and simplifying licence conditions;
- striking the balance between competition and regulation;
- protecting vulnerable customers;
- providing an opportunity for industry self-regulation; and
- promoting innovation.

42 Further details on the supply licence review, which is discussed in the next section can be found at http://www.ofgem.gov.uk/Markets/RetMkts/Compl/SLR/Pages/SLR.aspx

92. Ofgem published a decision document and licence modification notice in April 2007, with a proposed date for implementing the revised supply licence conditions of June 2007.

93. The Supply Licence Review proposals would halve the number of obligations that suppliers will be required to comply with. In one area, Ofgem has proposed that a licence obligation (to offer a specific range of payment methods) should not apply to small suppliers. We consider that these measures will reduce the burden of regulation on existing suppliers and make it easier for new suppliers to enter the market.

Proposed next steps

94. We want to see DG compete on a level playing field alongside conventional alternatives. The complexities facing small generators in fully participating in the wholesale electricity market, and the obligations that suppliers have to meet to trade across public networks, are significant discouragements to DG.

95. A number of parties have called for the thresholds for exempt supply to be raised to facilitate more DG. Exemptions take issues such as consumer choice, protection and safety outside of the remit of the GB regulator; on a small scale this has minimal impact on the market. However, in the future, as we hope to move towards increased levels of DG across the country, Government is committed to improving the market opportunities so that DG can grow inside the licensed GB framework.

96. Whilst fundamental simplifications to the existing supply licence are shortly to be implemented, there is a requirement for a broader review of industry arrangements, including those relating to energy trading, to facilitate DG.

To address these barriers DTI and Ofgem will consult later this year on options for more flexible market and licensing arrangements for distributed low-carbon electricity within the licensed framework to be implemented by the end of 2008.

97. Ofgem will be chairing an industry working group to develop options for new arrangements for distributed, low carbon electricity within the licensed framework. The purpose of the group is to develop a package of measures that reduces the costs and complexities facing small licence exempt generators seeking to supply localised demand. The proposed package of measures will form the basis of a joint consultation to be published by DTI and Ofgem later in 2007.

98. The scope of the Working Group will include considering the costs and complexities associated with the development of DG schemes. It will identify any market or system failures and arrive at a proposed package of measures to address these issues.

99. The Working Group will include licensed suppliers, DNOs, and parties representing DG. The first meeting of the Working Group is proposed for 30 May.

Conclusion

100. Going forward, we expect these changes to market arrangements to open up the opportunities for individuals and community generation schemes to make more extensive use of decentralised energy. This will have carbon benefits through the use of low carbon generating technologies including CHP, reduced network losses and the potential to exploit local, renewable sources of energy.

101. This increased competition between decentralised energy and traditional, centrally-generated electricity will be beneficial for cost-effectiveness and for carbon emissions.

Case Study: A New Energy Partnership for Birmingham City Centre

On 6 December 2006, Utilicom Ltd concluded a deal for the delivery of a new district energy scheme in Birmingham City Centre. The scheme will serve many of the City's most prominent and prestigious buildings including the International Conference Centre, National Indoor Arena, Town Hall, Council House and Hyatt Regency Hotel.

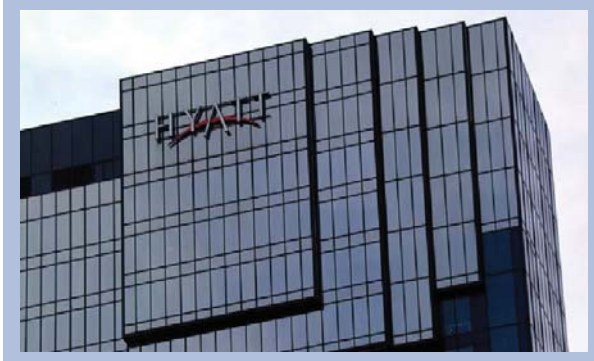
Through competitive tendering, Birmingham City Council (BCC) selected a preferred partner to deliver the scheme, the Birmingham District Energy Company Ltd (BDEC), a wholly owned subsidiary of Utilicom. In exchange for the long term energy services contract, BCC have been able to transfer the risk of design, build, finance and operation of the scheme to Utilicom. Consumers connected to the scheme will procure their energy via an output-based contract with all risk for the procurement of fuels, operation, availability, and maintenance of the scheme resting with BDEC.

Under the agreement Utilicom will design build, finance and operate a district energy CHP scheme supplying 24 GWh of heat, 15.5 GWh of chilled water (for air conditioning) and 3.4 GWh of electricity annually to the various consumers for the next 25 years. The service is planned to commence on 1 October 2007. The energy services contract also includes terms of reference for joint cooperation where BCC and Utilicom meet regularly to discuss and plan the development and expansion of the scheme.

BCC, keen to implement its sustainability/climate change agenda and to secure ongoing financial benefits for its partners and agencies in the City Centre, played a strong leadership role bringing the other consumers to the table. Motivating factors for connection to the scheme included:

- Ongoing energy cost savings of 5% compared to conventional alternatives (grid electricity, heat from condensing boilers, etc). The scheme is forecast to save consumers a total of c. £125,000 in energy costs each year;
- Significant reductions in the emissions of the greenhouse gas carbon dioxide, some 2,756 tonnes saved per year initially;
- Potential for further energy savings via an energy rebate mechanism as third party connections are made to the scheme.

Source: www.utilicom.co.uk



Photos: www.freefotos.com (l) and www.theicc.co.uk (r)

5. Clearer Export Reward for Microgenerators

Summary

102. Microgeneration technologies are those installed by individuals in their homes, schools, communities and businesses, and include technologies such as micro-wind turbines or solar PV panels. Many microgenerators produce more electricity than they need. This excess electricity can be sold ('exported') to suppliers in order to earn some extra income for the generator, and supply a small amount of electricity to the system.

103. Suppliers are not currently required to make an offer for exported electricity. Most suppliers do now offer tariffs, but few of these tariffs are widely advertised and the terms vary considerably between suppliers. This makes it difficult for customers to determine which tariff will best meet their circumstances.

104. The tariffs available generally offer a lower price for exported electricity than the retail price for imported electricity. This reflects the expected difference between wholesale and retail price in any market, including the cost of transporting the exported electricity to a customer and the transaction costs for the supplier. In many situations where traded volumes are small it is, in fact, uneconomic (at present) for suppliers to purchase this electricity. This can lead to the excess electricity simply "spilling" onto the network and the microgenerator not being rewarded for it.

105. The uneconomic status of exported electricity at the moment only applies to small distributed generators. Above 30kW, distributed generators are metered on a half-hourly basis, allowing suppliers the ability to offer tariffs linked to the actual time of supply. This offers a more attractive proposition for a supplier.

All six major energy suppliers have now committed to publishing easily accessible export tariffs.

Detailed discussion

106. The question of what constitutes an adequate reward for exported electricity is not a simple one. The table below explains some of the issues from the perspective of suppliers and microgenerators.

Issues for suppliers under current arrangements	
Suppliers don't register customers	High transaction costs mean that many suppliers who offer to purchase export from microgeneration prefer not to register their customers' export meters in the settlement arrangements in order to avoid these costs, even though this means they will not receive any direct benefit from the value of the export.[43]
Complex offerings and lack of transparency	Suppliers are developing ad hoc arrangements that meet their own short-term business objectives. This has led to the development of very different offerings, which has added to the difficulties customers face in trying to find out what is available and understand which arrangement is best for them.
Value of export low	The net commercial value of the export to a supplier is low and may even be negative. It is likely to be significantly lower than the price customers pay for their imports.
Issues for microgenerators under current arrangements	
Lack of incentive	One of the key benefits of microgeneration is behavioural, so a feeling that one's excess electricity is simply being wasted, or under-valued, could damage to the attitude of microgenerators. Equally even a small amount of financial reward for exported electricity goes some way to compensating for the high capital costs of investing in microgeneration technologies.
Feeling of unfairness/apathy	There is a strong feeling amongst microgenerators that their excess electricity should not be valued any less than the electricity they import. This is largely due to a lack of awareness of the problems suppliers face in obtaining value from microgeneration exports.
Information asymmetry	The many different tariffs on offer, and the difficulty in finding out about them, makes exporting excess electricity a complex task for microgenerators.

107. Tariffs offered, and terms and conditions, can vary quite considerably between suppliers. For example, in October 2006 a report found that:

- some suppliers will only purchase export from renewable generation;
- some quote different rates for renewable and non-renewable generation;
- in some cases bespoke prices are offered;
- some suppliers only offer tariffs for their own trial customers or technologies they install;
- some will pay on total generation produced rather than export;
- in some circumstances a standing charge is applied; and
- very rarely is exported electricity purchased by a supplier from a microgenerator who is not also a customer.[44]

43 Transaction costs are about £10-15 or so for meter agent costs and about £15 for suppliers' own processing costs. The value of the exported generation will depend on the time of day and year, the predictability of the export, etc.

44 'Export Reward for Microgeneration: a report to the DTI and Ofgem' (January 2007), p.11 – this is the final report of the DTI/Ofgem-sponsored ENSG export reward project.

108. There are a number of reasons why suppliers might not wish to offer terms. The process of installing an appropriate meter can be time consuming and difficult, so not all microgenerators have the necessary export metering in place to measure how much they are exporting. Consequently, the tiny amount of electricity they are exporting simply 'spills' onto the network. Even where meters are installed, the costs of registering the meters and processing the meter data means that many suppliers choose not to do so.

109. In addition, as purchasing export from very small customers is still a relatively new phenomenon, not all suppliers' systems currently accommodate microgeneration export. The costs of upgrading the systems might outweigh any benefits to suppliers at the current level of microgeneration.

Government Action

110. Transparency of prices offered by each supplier for exported electricity in a simple and easy to understand format is important. The Government is keeping under review whether it is necessary to use the powers granted under The Climate Change and Sustainable Energy Act (2006),[45] which allows Government, from August 2007, to vary supply licences to require suppliers to offer to acquire electricity exported by their customers. Government's decision will be informed by Ofgem's work, announced in Budget 2007, to examine how green homes could benefit more from prices paid for electricity exported to the network, and how the market for rewarding microgenerators develops.

111. We have been working with the UK BCSE[46] to gain the engagement and support of suppliers, and this has been a productive relationship.

112. There are a number of technical changes that would help suppliers to cut their administration costs, thus making it more cost-effective to offer a tariff for exported electricity. We welcome the engagement of industry thus far on these changes, and will continue to work with them to progress this work.

All six major energy suppliers have now committed to publishing easily accessible export tariffs.

113. Government anticipates that these measures will lead to improved offerings for distributed generators. At the moment, exported electricity from microgenerators represents only a fraction of the total grid capacity, but as more microgenerators join the market and export their electricity, the overall amount of exported electricity will generate its own economies of scale, predictability and ultimately value.

45 Sections 7and 8, Climate Change and Sustainable Energy Act 2006: http://www.publications.parliament.uk/pa/cm200506/cmbills/017/2006017.pdf
46 UK Business Council for Sustainable Energy – http://www.bcse.org.uk.

6 Better Information and Certification

Summary

114. Many DG technologies are relatively new to market and there is continual innovation. There are many areas of uncertainty about the use of the technologies: technical performance, extent of energy and therefore cost savings, expected lifetime, implications for interactions with energy suppliers/network providers, and regulatory complexity (ranging from planning permission to the complexity of government grants or claiming for ROCs). In the face of such complicated circumstances, agents are likely to be risk averse and stick to the status quo. Equally, this is a very immature market and media coverage, such as negative feedback about the performance of wind turbines in inappropriate locations, could compound the difficulties for individuals feeling ill-equipped to make good decisions.

115. Some advice and information (including from Government) is available to support householders, local authorities and developers to implement DG solutions but the information is patchy or located in a variety of places. Further Government action to promote the provision of information to a wider range of individuals, be they householders, local authorities or developers, should promote take-up of potentially carbon-efficient DG schemes more widely.

116. It has become clear that the information need on DG also exists for locally generated low carbon heat. For this reason our policy proposal in this area applies to Distributed Energy (DE).

117. A scheme[47] covering product installation, and a Code of Practice for microgeneration, opened for the transition phase in May 2007, building on the existing Clear Skies and Solar PV accreditation schemes. It will be supported by DTI initially, with the objective of the industry itself taking over the responsibility in due course.

We will ensure that improved information on DE provides a comprehensive picture of all the options, costs and benefits to help accelerate the take up of DE. We will keep under review the need for further measures.

47 www.ukmicrogeneration.org.uk

Detailed Discussion

118. It is clear that there is a lack of thorough, comprehensive information on how to make DG happen. For example:

- Well over half of respondents to the DG call for evidence complained about the lack of information available on DG.
- A search for 'UK microgeneration' on Google brings up a bewildering array of 273,000 references (up from 70,400 in March 2006). A recent desk study on the provision of information on microgeneration undertaken by the DTI confirmed the dearth of comprehensive advice/information for individuals and communities. Even where there is useful information, it is often presented piecemeal, or not in a way that is helpful for people/organisations wanting to undertake a purchase.

119. Help (including from Government) is available to support householders, local authorities and developers to implement DG solutions, but the information is patchy or located in a variety of places (see annex for further details). In some cases the required information does not exist at all.

120. It has become clear that the information need on DG also exists for locally generated low carbon heat. Many projects will require information on the products and rewards available for the generation of electricity and heat. For this reason our policy proposal in this area applies to DE as a whole.

Information needs on Distributed Energy

121. We have identified the following key areas where clear, coherent information on DE is required:

- information about different technologies and how they work in the household,
- guidance on the potential benefits of microgeneration including how to maximise the financial benefits (grants, access to ROCs, export reward) and
- information for local authorities and developers on how to use DE to help achieve their emission reduction targets including information on specific technologies, the role of Energy Service Companies (ESCOs) and other financing options.

122. It is also important from a carbon perspective that information for households doesn't only cover the opportunities for reducing carbon emissions through the take-up of DE technologies. For the domestic sector as a whole, the most cost-effective carbon abatement measures continue to be energy efficiency measures such as loft insulation, and it is essential that householders are made aware of their full potential when they make decisions about the steps they wish to take. Chapter 2 of the Energy White Paper sets out further measures the Government is proposing to increase uptake of energy efficiency in households.

123. At a communications level Defra launched a significant campaign in April to promote their "Act on CO2" brand, especially their carbon calculator. A key aim of this campaign will be to encourage behaviour change and get the general public to take steps to reduce their carbon emissions.

124. We are considering how we could improve the advice and support available to the Core Cities and Local Authorities help them deliver key opportunities for carbon abatement, including DG and innovative programmes of support for householders. DTI, Defra and DCLG will jointly publish a report by August 2007 to help local authorities[48] meet our climate change objectives including by increasing levels of microgeneration and DE.

125. A certification scheme covering products, installers and manufacturers for microgeneration can move some way towards filling the information gap by providing consumers with an independent indication of reliability and a route for complaints. A scheme covering the product installation and a Code of Practice opened for the transition phase in May 2007, building on the existing Clear Skies and Solar PV accreditation schemes. It will be supported by DTI initially, with the objective of the industry taking the responsibility for it in due course.

We will ensure that the improved information on DG provides a comprehensive picture of all the options, costs and benefits to help accelerate take up of DG and that is clearly linked to Government provision of advice on energy efficiency and microgeneration, given the clear synergies. We will keep under review the need for further measures.

48 Local authorities in England and Wales will be under a statutory duty to have regard to this report in exercising their functions.

Case Study: The Behavioural Impact of Domestic Microgeneration

"We really wanted it to work, wanted to do it when we first came to the house, because it was a low-energy house we were really careful with the lights, bought A-rated appliances and became frantic recyclers, we were really excited about it, we thought it was going to be a whole new way of living"

These teenage parents living in Craven Arms, South Shropshire, found that their behaviours and attitudes changed significantly after moving into their eco-home.

In terms of energy efficient behaviours, the promise and reward of low bills has encouraged a whole new set of adapted behaviours.

- *"We use the tumble dryer a lot less now. We've got the airing cupboard and drying area"*
- Switching off lights/TV more than before
- Bathing at particular times to take advantage of solar water heating: *"We have our baths and showers as soon as we get in – we know the water is going to be nice and hot … get the washing done when it's nice and hot to get it out on the line"*
- Turning down the thermostat
- *"We bought a few additional energy-saving light bulbs. As we are living in an energy-saving house and then we should buy energy-saving bulbs."*
- Nagging friends and family to follow their example

Source: 'I Will If You Will'[30]

7. Easier Connections for Distributed Generators

Summary

126. The responses to the Call for Evidence suggest that there remains scope for improvement in the performance of the DNOs in relation to the connection of DG, with comments that in some cases they do not approach connection applications in a sufficiently positive way, even though incentives are now in place to encourage this. Ofgem is responding with proposals to:

- extend cost-reflective charging to the distribution network. This benefits local generation because it potentially allows credits to generators where they provide benefits to the network;
- extend its Innovation Funding Incentive to the end of the next price review period (likely to be 2015) and to extend eligibility for Registered Power Zones to generation connected in the next 5 years;
- allow developers of DG a choice of connection provider;
- review, as part of the next price control review which will be launched in early 2008, the incentives and investment drivers on DNOs to connect DG; and
- review how the DNOs' Long Term Development Statements can be made more useful to distributed generators.

Detailed Discussion

127. Currently, the smallest microgenerators do not need permission from a DNO to connect to the distribution network – they can simply connect and inform the DNO that they have done so. This approach applies up to a total generation capacity of around 4kW[49] (micro-wind turbines and domestic CHP units are typically 1kW devices). Generators that exceed this capacity limit, however, need to go through a more onerous process[50].

49 The ENA's Engineering Recommendation G83/1 allows this approach for generators up to 16A/phase.
50 This is currently being reviewed by a working group of the Distribution Code Review Panel

128. Distributed generators usually do not have a choice about which distribution network they connect to, so it is vital that the DNOs provide an efficient, high quality service to them. The scope of this service includes:

- responding to initial inquiries regarding new connections;
- producing offers of connection in response to formal connection applications and carrying out necessary connection works; and
- facilitating the ongoing use of the DNO's network by the distributed generator.

129. In the following paragraphs we review each element of the DNOs' services to distributed generators and comment on:

- the structure of a DNO's charges for connection to and use of its system;
- the incentives on DNOs to connect DG;
- the relationship between DG and the transmission network; and
- the ability of the distribution networks to accommodate DG in the medium to long term.

Responding to initial inquiries

130. The location of DG is usually determined by factors not related to the existing network configuration. For example, wind generators seek out sites that have the best wind resource and CHP plants locate in order to be close to a heat load. Consideration of the network connection issues therefore usually follows the identification of the size and location of a DG plant.

131. Network connection costs are an important part of the total project costs for a DG scheme. In some situations connection costs can be significant, and so it is helpful for a DG developer to get early advice about them as this could impact the design of the plant. DNOs encourage developers to have early discussions with them. However, we are aware that there has been some inconsistency in the way that DNOs provide this service and the charges that are made.

132. Long Term Development Statement (LTDS) provide information about a DNO's network that allows qualified parties to make initial assessments of connection opportunities. In 2002, Ofgem introduced a licence change that required all DNOs to produce them annually. A consultation in 2005 resulted in most parties expressing support for them[51], and no changes were made then.

51 http://www.ofgem.gov.uk/Networks/Techn/NetwrkSupp/LongTermDS/Documents1/11396-189_05.pdf

133. DTI is currently part-funding with industry an R&D project to develop and commercialise a web-based DG connection assessment service, based on the LTDSs. This service would allow a DG developer to obtain an initial estimate of the cost of a connection without involving a DNO. This project is expected to reach a conclusion this summer.

134. The LTDSs provide a valuable resource to DG developers. However, there is scope to enhance them further in a number of ways including their technical scope and accessibility. Ofgem will now consider whether further development of the LTDSs would be beneficial and cost effective for network users.

The structure of connection and use of system charges

135. The structure of charges applied by all the DNOs for distributed generators now has two elements. The first is the initial connection charge related to the new assets necessary to make the connection. The second element is the ongoing use of system charge. The methodology used by the DNOs to set these charges has to be approved by Ofgem. This two-part charging structure was first introduced in April 2005.[52]

136. Ofgem is encouraging the DNOs to make their use of system charges more cost-reflective and this is starting to happen. One DNO recently sought Ofgem's approval to adopt a cost-reflective charging methodology and this has recently been approved.[53] Ofgem is encouraging other DNOs to follow this lead.

137. Cost-reflective charges will provide the opportunity for distributed generators to be rewarded for the benefits they bring to a distribution network. It is possible that a distributed generator could benefit from negative charges in some situations. However, there will also be situations where a distributed generator imposes higher costs on a DNO for the use of its system than previously, resulting in higher charges.

138. There has also been discussion over recent months regarding use of system charges at the microgeneration level. No DNO will make use of system charges for microgeneration exports from 1 April 2007.

Providing new connections

139. A DNO is required by its licence to make a connection offer to a distributed generator within three months of receiving a valid application. During 2005, 190 connection offers were made by the DNOs for a total capacity of 3.6GW.[54]

52 http://www.ofgem.gov.uk/Networks/ElecDist/Policy/DistChrgs/Documents1/5150-Structure_elec_dist_charges_14nov03.pdf
53 http://www.ofgem.gov.uk/Networks/ElecDist/Policy/DistChrgMods/Documents1/16856-2007.pdf
54 Source – Energy Networks Association

140. It is useful to keep in mind the materiality of the connection costs in the context of the overall cost of a DG project. Connection costs can be divided into two parts:

- The cost of the assets dedicated to the DG plant, the sole-use assets; and
- The cost of reinforcing the shared network assets required for the connection.

141. Research carried out before the last distribution price control[55] showed total (i.e. sole and shared) connection costs to have been some £36/kW historically. It also forecast future shared-only connection costs to vary quite widely but average £42/kW. The research did not cover future sole-use assets. The cost of a DG plant will also vary widely depending on size and technology but a small plant will be of the order of £1000/kW. A rough estimate of future average total connection costs is therefore of the order of £50/kW or 5% of the total project cost.

142. While we know that there are disputes about the design and cost of connections, most of these are resolved through bi-lateral negotiation. Very few such disputes have been brought to Ofgem for determination. Nevertheless, connection disputes usually cause delay and extra cost, and Ofgem recognises that there is scope for the DNOs to improve the quality of their service. This extends to the provision of network information in advance of a connection application where this is not available in the LTDS.

143. Recognising these issues, Ofgem published its "Review of Competition in Gas & Electricity Connections"[56] proposals in February this year. Under these proposals, greater consistency of connection practices will be achieved across the DNOs, and performance standards to support competition will be established as a licence obligation. We believe that these proposals largely address the concerns raised in the responses to the Call for Evidence.

144. The execution of connection works is also very important for a DG developer. A developer will, where this is necessary, enter into a contract with a contractor and/or the DNO to provide the connection works. The terms and conditions for these contracts are subject to bilateral negotiation. However, Ofgem has now proposed that there should be minimum performance standards for the completion of connection works to give greater certainty for connecting parties.

DNO incentives to connect DG

145. The distribution price control review of April 2005 introduced a number of incentives that either directly or indirectly impact DG. The primary incentive mechanism for the connection of DG is referred to as the hybrid incentive. It allows a DNO to recover

55 DG-BPQ Analysis – Summary of Findings – Final Report – March 2004
56 http://www.ofgem.gov.uk/Networks/Connectns/CompinConn/Documents1/16982-2607.pdf

the costs of DG connection in two ways. Firstly, 80% of connection costs (net of connection charges) can be recovered by direct pass-through to use of system charges. In addition, a DNO can recover a £/kW sum for each kW of DG connected in a given year. The pass-through element is designed to encourage a DNO to minimise connection costs and the combination of the two elements delivers a rate of return of about 1% above the rate allowed for other network investments. Technical innovation in the connection of DG is encouraged by the Registered Power Zone (RPZ) mechanism under which a DNO has the opportunity to enhance the rate of return by an additional premium where genuine technical innovation is employed.

146. The Innovation Funding Incentive (IFI) is another mechanism to encourage more general technical innovation by DNOs, and is likely to benefit DG. A DNO could decide to use IFI funding to explore new ways of connecting DG. Ofgem consulted recently on the effectiveness of the IFI and RPZ schemes and has now made proposals to enhance them.[57]

147. The responses to the Call for Evidence suggest that, in spite of these incentives which are relatively new, not all DNOs are yet taking a sufficiently positive approach to the connection of DG. Ofgem will therefore review the DG incentives in the next price control review. A scoping paper published this month raises this issue for discussion by all parties in advance of any new policy proposals being made. The review will take place between 2008 – 2009, and be implemented with effect from 1 April 2010.

Network losses

148. There is much discussion about the impact that DG has on network losses. DG certainly has the potential to reduce both transmission and distribution losses but this will not be the case in every situation. As discussed in chapter 3, the closer that a generator is to the load it is supplying, the shorter the delivery route can be, resulting in lower losses.

149. The DNOs are incentivised to reduce losses within their own networks, and could see DG as a way of helping them improve their performance in this respect. The losses incentive will also be reviewed in the next distribution price control.

Relationship between DG and transmission

150. Generators of less than 100MW that are connected to a distribution network have the opportunity to operate under licence exemption. Such generators are deemed not to be using the transmission system and therefore do not pay transmission use of system charges. They are instead considered to be reducing the demand on the

57 http://www.ofgem.gov.uk/Networks/Techn/NetwrkSupp/Innovat/Documents1/16977-2507.pdf

transmission system and are rewarded for doing this through the "embedded benefits mechanism".

151. These arrangements have been challenged by some industry parties and, in response, Ofgem established the TADG Group (Transmission Arrangements for Distributed Generation). This group has brought together all interested stakeholders and plans to report its findings soon. More information can be found on Ofgem's website.[58]

Future capability of the distribution networks

152. An important issue relating to the growth of DG is the cost of reinforcing distribution networks to accommodate this new capacity. A study carried out by Econnect[59] for the DTI looked further ahead to estimate network reinforcement costs for 2030 and 2050 from a 2010 base. It did this by creating GB-wide scenarios for DG penetration and then investigating what reinforcement would be needed to accommodate this generation on a typical distribution network. It also looked at the particular impacts of microgeneration.

153. The total GB DG capacity assumed for the three years studied was 17.5 GW in 2010, 30 GW in 2030 and 39 GW in 2050. The study found that distribution reinforcement costs would rise as the penetration of DG increased. It estimated that network reinforcement costs would average £34/kW in 2010 rising to £67/kW in 2030. These estimates are of the same order as the estimate of £50/kW discussed earlier, although this might not be a strictly like-for-like comparison. The study estimated that the network reinforcement costs could rise to £98/kW in 2050, a significant rise. These cost estimates assumed that the necessary network reinforcements utilised existing solutions and the report suggested that more innovative approaches could reduce these costs. In this timescale, fundamental technological advances are also possible.

154. The report also examined the impact of significant increases in microgeneration. It concluded that a significant capacity of microgeneration, 3.5 GW across GB, could be connected without the need to reinforce distribution networks. This does assume a relatively even distribution of these new generators. However, in contrast, reinforcement costs are shown to rise dramatically for the 2050 scenario when GB penetration approaches 10 GW. However, it should be noted that only existing connection solutions were applied in this study. This therefore suggests that a significant change to distribution networks might provide a more efficient way to accommodate microgeneration on the 2050 scale. Another factor is that we would expect overall transmission costs to reduce with higher penetrations of DG.

58 http://www.ofgem.gov.uk/Networks/Trans/ElecTransPolicy/TADG/Pages/TADG.aspx
59 http://www.dti.gov.uk/files/file31648.pdf

155. Further longer-term network studies will be completed in the near-future. An ENSG study, funded by the DTI, will be completed in the summer, examining the network capacities required at all voltage levels for a number of different DG scenarios. Ofgem will take forward work long term scenarios work for the electricity networks in 2007. Further details are in chapter 5 of the Energy White Paper. There is also the Foresight project mentioned in chapter one. This will help set the context for the next price control reviews.

Conclusion

156. The provision of DG connection services has been developing for a number of years now. The further proposals described here demonstrate Ofgem's continuing commitment to eliminate unnecessary barriers and make the DNOs' connection practices as user-friendly as possible.

8. Review of Current Incentives and Barriers Affecting Combined Heat and Power

Summary

157. This chapter reviews the current incentives provided for CHP. CHP differs from other forms of DG as it produces both electricity and heat, and is currently usually fossil fuel powered. However, when there is a sufficient demand for the heat generated, CHP has benefits as a carbon efficient technology.

158. The costs of generating electricity using CHP are generally higher than for standard centralised generation. We believe that these higher capital costs mean that some potential users of CHP are still opting for the conventional alternative of buying centrally-generated electricity and producing heat on site using boilers.

159. Good Quality CHP[60] benefits from a range of existing policies, including exemption from the Climate Change Levy and Business Rates. In addition, incentives for CHP have been improved by fully rewarding its carbon saving in the EU Emissions Trading Scheme (ETS) Phase II, which begins on 1st January 2008.

160. The proposals mentioned in previous chapters should all improve the prospects for CHP schemes.

Detailed discussion

161. CHP has the potential to be used in larger-scale DG schemes such as community or commercial schemes, and small industrial settings. CHP installations vary in size from micro-CHP installations, an alternative to the domestic boiler, to industrial sites equal in size to a medium-sized power station.

162. The carbon savings of generating electricity in CHP installations, and making use of the heat for either heating or cooling processes, depend on many site-specific factors including the size of the scheme and the nature of its heat load. Indicative carbon efficiencies are illustrated in the table below.

60 Good Quality CHP denotes those schemes that meet the energy efficiency criteria prescribed by the UK's CHP Quality Assurance Programme (CHPQA). Further information on the programme can be found at www.chpqa.com.

Table 3: Carbon savings offered by CHP relative to the separate production of heat and power from gas[61]

Size of installation	Up to 1 MWe	1-50 MWe	Over 50 MWe
Efficiency savings	18-30%	7-21%	10-23%

163. It is the existence of a suitable heat demand which drives the economic viability of CHP, as heat cannot be transported over long distances. Users of heat have a choice: either they buy centrally-generated electricity from a supplier and use a boiler to generate heat, or they can use CHP. When choosing CHP, customers tend to size the plant for their heat demand and sell any excess electricity to a supplier through the electricity distribution infrastructure.

164. The more consistent the demand for heat throughout the day, the more economic CHP can be, so the best sites for CHP are industrial sites in continual operation. Community-scale projects are most effective where a range of different heat and cooling demands are aggregated (residential flats, office blocks, municipal buildings) within the system to ensure broadly constant overall demand.

165. The costs of generating electricity using CHP are generally higher than for standard centralised generation, even though there is a financial return for the heat that can be sold. So although CHP can offer carbon savings relative to conventional generation, it is not always taken up in potential sites. To reward the carbon saving Good Quality CHP offers, Government has taken a number of steps, including:

- fully rewarding its carbon saving in the EU Emissions Trading Scheme (ETS) Phase II;
- exemption from the Climate Change Levy
- business rates exemption;
- enhanced capital allowances for plant and equipment; and
- eligibility for Renewable Obligation Certificates for the biomass element of fuel used in energy from waste plants that use CHP.

166. However, in spite of these financial supports, there is evidence to suggest that the CHP development potential at many sites is not being pursued. There are a number of reasons for this, including unfavourable relative price movements between gas and electricity in recent years (the 'spark spread') and commercial uncertainties. CHP is a long-term investment and requires substantial management time, as well as confidence that the heat customer will remain in operation throughout the anticipated life of the plant.

61 Source: data from the CHPQA programme on a 'best available technology' basis. The range reflects the use of a range of technology types at the margins of the size boundaries and the use of alternative counterfactuals for the efficiency of a gas plant.

167. Businesses with large heat demands are more likely to be fully aware of the pros and cons of using CHP, taking into account all factors including the extent of current and anticipated future Government support.

168. There may be less understanding of the potential to invest in CHP at a smaller scale – for community schemes such as district heating and low carbon building developments. Here there may be a lack of take-up of potentially cost-effective CHP schemes due to ignorance of CHP's potential benefits. Government can help to tackle this through the provision of advice and information to those community generators who are interested in using CHP. The better information service proposed in Chapter 5 will help the increasing number of potential community generators looking for low-carbon solutions that will arise as a result of the Communities and Local Government drive for zero-carbon homes.

169. The proposals on market and licensing arrangements and easier connections for distributed generators will make it easier and less costly for community generators to connect to the distribution network and to supply to their customers.

170. Government has also taken steps to increase awareness of the opportunities for CHP amongst users of heat. Since the publication of the Energy Review Report, DTI has published the revised guidance for power station developers which includes industrial heat maps. We will continue to work to develop those heat maps with Regional Development Agencies and local authorities.

171. Defra will work with local authorities on guidance to ensure that anyone replacing a mid-sized furnace as part of a boiler plant (over 400 kW) is aware of the potential for CHP.

9. Conclusions

172. The current framework was established to meet the needs of large centralised generation and aspects of the system disadvantage smaller distributed generators. A number of Government policies and recent Ofgem changes to market arrangements will act to level the playing field for DG. To complement this work we have developed a package of additional measures that will go further to enable DG to compete freely and effectively with larger-scale, centralised generation.

173. In the context of the Government's overall energy policy goals, we believe that any action to address the market failures described above should:

- stimulate cost-effective low-carbon forms of DG;
- provide a means of enabling distributed generators to realise a reasonable economic value from their schemes;
- reduce the complexity involved in setting up as a distributed generator;
- ensure requirements on these smaller players are proportionate to their size and the use they make of the wider public network; and
- encourage, where possible, further development of DG within the licensed framework, rather than outside of it.

174. In the light of these principles, the Government and Ofgem propose a four-point package of measures, which have been discussed in this Review Report. These measures will help provide a basis on which DG can continue to grow alongside centralised generation.

175. The new **market and licensing arrangements** will open up the opportunities for individuals and community generation schemes to make more extensive use of DG. This will have carbon benefits through the use of low carbon generating technologies including CHP, reduced network losses and the potential to exploit local, renewable sources of energy.

176. Transparency of prices offered by each supplier to microgenerators for exported electricity in a simple and easy to understand format is an important first step to giving clearer **export reward**. The engagement of industry in technical changes to reduce their administration costs, should also make it more cost-effective to offer a tariff for exported electricity. We welcome the engagement of industry thus far on these changes, and will continue to work with them to progress this work.

177. We are working to improve **information** to potential users of DG to encourage take-up and help meet our climate change targets going forward. We want to ensure that the DG information service is a holistic part of broader Government advice on energy efficiency and microgeneration, given the clear synergies.

178. This increased competition between decentralised energy and traditional, centrally-generated electricity will be beneficial for cost-effectiveness and for carbon emissions.

179. The provision of **DG connection services** has been developing for a number of years now. The further proposals described here demonstrate Ofgem's continuing commitment to eliminate unnecessary barriers and make the DNOs' connection practices as user-friendly as possible.

180. We are establishing a **new Distributed Energy Unit** within the DTI to monitor the development of markets for these technologies, and to drive the implementation of these measures to ensure that any further barriers to DE that may be identified are addressed.

Annex: DG Information Needs Gap Analysis

DG INFORMATION REQUIREMENT	WHAT IS CURRENTLY AVAILABLE/PLANNED
Awareness raising on the Climate Change/role of DG	**Defra Climate Change Communications Campaign** 'Act on CO_2' – aimed at getting people to reduce their emissions. **CO_2 Calculator** **Greener Living Guide (Defra)** provides information primarily on how to improve your energy efficiency, engage in recycling.
Basic information about DG technologies, how they work in a household and community situation, effectiveness in different scenarios	**Energy Saving Trust** gives very general information on microgeneration and other options. But it is not easy to find and consumers may not see EST as the only obvious place to look for advice of this type. The **Sustainable Energy Network** set up by **EST** aims to provide local advice on low carbon activities.
Information about companies and products and their relative merits	There is a list of 'accredited suppliers' and 'accredited products' on the Low Carbon Buildings Programme capital grant website. Renewable Energy Association accreditation scheme – **REAL Assurance Scheme** – for consumers wishing to buy or lease small generation units for their home, community building or small business. The new Government-sponsored **microgeneration certification scheme** opened for the transition phase in May 2007. **Home Information Packs** and **Energy Performance Certificates** would give different ratings to different solutions, revealing the carbon value of the different products.
Grant funding	**Low Carbon Buildings Programme** source of funding for microgeneration particularly. Some local authorities offer grants. Some energy supply companies have tie-ups with microgeneration companies to offer grants. **Climate Change Communications Initiative** is a fund, which can help local authorities, communities, and schools take action on reducing emissions. **Partnership for Renewables** innovative scheme to boost renewable energy £10 million available for public/private renewable schemes. **Salix** independent company funded by CT to reduce carbon in public sector through investment in energy efficiency measures and technologies.

DG INFORMATION REQUIREMENT	WHAT IS CURRENTLY AVAILABLE/PLANNED
Real-life case studies which act as 'how to' guides	Range of case studies held by Government and other related organisations, but no central store available. Most don't describe the detailed arrangement of the projects.
List of Q&As for consumer to ask prospective installer to help ensure they get an appropriate installation at a sensible cost	We could not identify any source of advice on this subject.
Clear pointers to key information – Government accreditation scheme	**CHP QA scheme** already exists – www.chpqa.com **Microgeneration certification scheme** see above. The REA has developed a Code of Conduct which has its own website.
Market funding e.g. access to ROCs how to get a supplier to offer export reward, what the entitlements	**Ofgem's website** provides guidance on rewards for ROCs, getting a connection and licensing. **Energy Networks Association** provides information on connections. **DTI website** provides some discussion of Renewables Obligation Certificates. But nothing is tailored to directly address the practical needs and concerns of Distributed Generators. Not aware of any site offering guidance on reward for export As regulator **Ofgem** cannot comment on or suggest solutions that arise out of licensing exemptions regime i.e. operate outside of the regulatory framework.
Getting connected to the distribution grid, dealing with the DNOs.	
Licensing – what is required, how to get licensed, where exemptions might apply	
Basic information about how local authorities can use DG to help achieve their targets related to climate change and which technologies might be appropriate in which situations The role ESCOs can play and how they work – worked examples would probably be useful – Other financing options	This information could be included in the 'energy measures report' required under the **Climate Change and Sustainable Energy Act**. Guidance is being produced as part of the new **Performance Framework for Local Authorities** on how to achieve carbon emissions reductions.
The role of planning policy (this would link to the planning portal) Permitted development regime Use of planning policy statements – Help in assessing planning applications to ensure developers are meeting relevant targets	**CLG** are currently creating some **practice guidance** for part III of the PPS on Climate Change, and some technical guidance aimed at developers as part of the Code for Sustainable Homes. Its important to have guidance and help that meets the needs of planning officers so they have the means to challenge those developers who argue it is not possible to get 10% energy needs from onsite renewables.

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