Second Annual Report of the Distributed Generation Co-ordinating Group (2003)

A report to:

- **The Department of Trade and Industry;**
- **The Department for Environment, Food and Rural Affairs;**
- **The Scottish Executive; and**
- **The Gas and Electricity Markets Authority**

March 2004 67/04

Foreword

On 24 February 2003 the DTI published its Energy White Paper. It sets out the Government's goals for energy policy and states the aim of reducing the UK's CO_2 emissions by 60% by 2050. The White Paper gives further impetus to achieving a low-carbon economy. Maintaining the reliability of energy supplies was also a high priority. The White Paper envisaged an increased role for distributed generation. All this emphasises the importance of the work of the Distributed Generation Co-ordinating Group (DGCG) and of the Technical Steering Group (TSG) that reports to it. The White Paper provides a backdrop to our second annual report against which the significance of the year's achievements can be better, and more widely, appreciated.

It has been acknowledged that increased connection of distributed generation will mean an end to thinking in terms of 'business as usual' – both for the distribution network operators (DNOs) and for regulation. Ofgem has called it 'rewiring Britain'. This report records discussions that have a strong flavour of that process. It considers what the role of the DNOs should be in the long term. It addresses questions of risk-taking and incentives for DNOs to effect necessary change, but the DGCG has also emphasised the continuing need for reliability and continuity of supply and for sensible investment in networks, based on sound engineering judgement.

The DGCG has recognised the importance of communication and dialogue in creating a climate conducive to change. On 13 February 2003, for example, TSG Workstream 4 (Microgeneration Solutions), Ofgem and the Institution of Electrical Engineers (IEE) jointly sponsored a seminar on "Microgeneration and Electricity Networks: Delivering Necessary Change". Successful, and heavily over-subscribed, it provided an opportunity for more than 120 industry experts to discuss future work. It also secured endorsement for the Workstream's programme. Communication continues to be a priority.

This is our opportunity to thank all the members of the DGCG and TSG for their work during the year. We are also particularly appreciative of the good work being done by all those associated with the various TSG projects, details of which are set out in this report.

John Neilson
Joint Chairman

Neil Hirst
Joint Chairman

Summary

Formed on the recommendation of the Embedded Generation Working Group (EGWG) that reported in January 2001, the DGCG provides advice to the DTI, Ofgem, Defra, and the Scottish Executive on the development of generation connected to electricity distribution systems.

The DGCG has created the TSG, which draws on a wide range of expertise from the electricity industry and associated organisations. Its terms of reference are to steer and report on work programmes necessary to support the objectives set by the DGCG. Its six workstreams are addressing a considerable number of technical and technical/commercial issues likely to arise from increased connection of distributed generation.

The DGCG has set up a website (www.distributed-generation.gov.uk), which is kept regularly updated. Intended to make information on the DGCG's work available to a wide audience, the website contains information sheets, papers and summaries of meetings. Details of TSG projects are also to be found there.

The UK is facing a transition from self-sufficiency in energy, low prices in liberalised markets, and over-capacity in electricity generation to the need for challenging carbon reduction measures, increasing import dependency and the requirement to modernise energy infrastructures. All this will take place against a background in which European and global considerations will assume increasing importance

Ofgem is proposing to provide new incentives for distribution network operators (DNOs) to connect and use distributed generation. These will have an important part to play in meeting the aspirations of the Energy White Paper. The Government is currently interested in developing centres of excellence for distributed generation, in co-operation with the industry, universities and research facilities. There is a key role for the DGCG in facilitating the development of distributed generation.

The EGWG recognised that a major barrier to the development of distributed generation is the absence of any real incentive on DNOs to connect generation. The new distribution price controls, taking effect from 1 April 2005, are the opportunity to remedy this. The DGCG has taken a close interest in Ofgem's work on the new price controls and particularly on the question of developing appropriate incentives. Regular update reports and presentations have been received from Ofgem staff.

The focus of the DGCG has been the identification of unwarranted barriers to the development and connection of distributed generation. While some such barriers still remain, work over the last two years has done much to remove what once seemed a formidable array of obstacles. Appendix 3 provides an at-a-glance guide to the current status of the key barriers that the DGCG, TSG and others have identified and addressed.

Removing barriers to, and paving the way for, increased connection of distributed generation has necessitated an enormous amount of detailed work. The TSG has initiated a total of 46 projects, of which 16 were completed during the period covered by this report.

SOME KEY ACHIEVEMENTS OF 2003
During 2003, the DGCG and TSG:

- produced a revised connection process guide for distributed generation;
- published 'Solutions for the Connection and Operation of Distributed Generation';
- developed a new methodology for recognising the contribution of modern types of distributed generation to network security;
- completed a directory of the current, and projected, status of distributed generation connections;
- contributed to the first system cost estimate for 20% renewable generation by 2020 (compared with a conventional generation scenario);
- promoted a common, published methodology for handling multiple applications for connection of generation to the same piece of distribution network;
- developed a model for DNOs to analyse the impact of small-scale distributed generation on their low voltage networks;
- contributed to new engineering recommendations on the connection of domestic-scale generation to distribution networks; and
- completed an assessment of the skills and human resource required for DNOs to meet the challenge of increased volumes of distributed generation.

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1. Background, terms of reference and membership

Background

1.1. Formed on the recommendation of the Embedded Generation Working Group (EGWG), which reported in January 2001, the DGCG provides advice to the DTI, Ofgem, Defra, and the Scottish Executive on issues associated with the development of generation connected to electricity distribution systems. The DGCG has created the TSG to manage six workstreams consisting of a range of technical projects.

Structure of this report

1.2. This report covers the period from 1 January to 31 December 2003. The full DGCG meets quarterly.

1.3. Part 1 sets out introductory information about the DGCG and its work. Part 2 presents a resume of the key policy issues discussed at the quarterly meetings. Part 3 gives an overview of the work of the TSG, commenting on the status of its various projects. Appendix 1 contains a list of the DGCG's members. Appendix 2 is a high-level timetable, updating the one published in our first annual report. Appendix 3 gives an overview of the progress made to date on removal barriers to the connection of distributed generation. Appendix 4 is a glossary intended for those not familiar with the technical terms used in the report.

Membership

1.4. The DGCG has 18 members, who are mostly directors or senior employees of businesses or trade associations having a significant interest in distributed generation. Members were also selected from particular sectors of the industry (e.g. smaller generators, DNOs, suppliers, consumers etc.). Members contribute to discussion in an individual capacity rather than as representatives of their employing organisations, but they are expected to explain the views or their sector or constituency and to disseminate information within that community.

1.5. A full membership list is at Appendix 1.

Terms of reference

1.6. The following terms of reference have been approved for the DGCG:

- To recommend priorities for action arising from the recommendations of the joint government industry working group on embedded generation.
- To monitor and comment on action taken in respect of the recommendations of the report and to advise on progress.
- To provide advice to DTI, Defra, the Scottish Executive and Ofgem on any additional action that may be required as a result of the progress made or events encountered which hinder such progress.
- To establish a technical steering group, to review reports from it and to direct its work programme.
- To consider and make recommendations as to any complementary (e.g. research and development) action that may be helpful to achieving the objectives set out in the EGWG report.

1.7. To disseminate the results of its activities to the wider community.

Mission statement

1.8. The DGCG has adopted the following mission statement:

'The DGCG's primary objective is to facilitate the achievement of the Government's targets for renewable generation and CHP by addressing relevant technical, commercial and regulatory distribution network issues. It will do this in two ways. Firstly, it will identify and consider any network issues that are constraining the further development of distributed generation. Secondly, it will recommend to the DTI/Ofgem what actions it thinks might be necessary to remove unjustified constraints and if appropriate advise on priorities and incentives. The DGCG will operate openly in meeting these objectives, involving relevant sections of the industry and other interested parties.'

The Technical Steering Group (TSG)

1.9. The DGCG has created the TSG, which draws on a wide range of expertise from the electricity industry and associated organisations. Its terms of reference are to steer and report on work programmes necessary across the industry to support the objectives set by the DGCG. It is addressing a considerable number of technical and technical/commercial issues likely to arise from increased connection of distributed generation.

1.10. The TSG co-ordinates the work of six workstreams, each of which manages a number of projects. The workstreams and their overall tasks are summarised in the following table.

No.	Workstream	Area of work
1	Distributed Generation Status and projections	• Current status of connected and planned distributed generation. • Likely future distributed generation mix.
2	Standardisation of Information and Solutions	• Relevant and accessible standards for the industry, reflecting current developments. • Appropriate categorising, or banding, of distributed generation types. • EGWG recommendations on information and guidance documents.
3	Short-term Network Solutions	• Technical, regulatory and commercial issues relevant to the development of basic active management of distribution networks. • Identification of short-term measures to allow fuller recognition of the contribution of distributed generation to network security and performance.
4	Micro-generation Solutions	• Removal of barriers to micro-generation. • Simple, standard solutions for connection of micro-generation. • To advise on micro-generation in the context of the next distribution price control review.
5	Long-term Network Concepts and Options	• Technical, regulatory and commercial issues pertaining to the longer-term transformation of distribution networks in order to facilitate distributed generation.
6	Industry Skills and Resources	• To help ensure that future skills and human resource requirements of DNOs and other organisations do not present barriers to the implementation of EGWG recommendations.

1.11. The TSG's work is discussed in greater detail in Part 3 of this report.

Communication

1.12. Communication is of key importance in ensuring a productive dialogue about the new ideas and technologies necessary for the development of distributed generation. This annual report is the formal channel of communication to Government departments and to those directly involved in the field.

1.13. The DGCG has set up a website (www.distributed-generation.gov.uk), which is kept regularly updated. Intended to make information on the DGCG's work available to a wide audience, the website contains information sheets, papers and summaries of meetings. Details of TSG projects are also to be found on the website. Approximately 240 individuals have registered with the website.

1.14. The TSG's work is heavily dependent on communication with organisations within the electricity supply industry as well as with interested external parties. The following paragraphs give some examples. In October, the TSG decided to set up a sub-group to review communication and dissemination. It will make recommendations early in 2004.

1.15. The projects detailed in this report have required extensive liaison with, for example, organisations such as the Health and Safety Executive, the Energy Networks Association, Elexon, and Future Energy Solutions (Harwell), the last particularly on managing the setting up of DTI-sponsored consultancy work.

1.16. The TSG's work on new arrangements for the governance of electrical standards has resulted in a dialogue with the Grid Code Review Panel for England and Wales, the Scottish Grid Code Review Panel and the GB Distribution Code Review Panel. The last of these has also been closely involved in work on the revised connection process guide. The TSG's Workstream 3 worked in close co-operation with EA Technology Ltd in preparation of 'Solutions for the Connection and Operation of Distributed Generation'.

1.17. Workstream 1 has consulted with both DNOs and generators in collating information on distributed generation connections, and on likely future trends. Its work on the systems costs of wind generation involved contributions from the University of Manchester Institute of Science and Technology, the British Wind Energy Association and ILEX Energy Consulting.

1.18. Workshops and seminars have also proved valuable in communicating with the wider community interested in distributed generation. Workstream 4, Ofgem and the Institution of Electrical Engineers (IEE) jointly sponsored a seminar on "Microgeneration and Electricity Networks: Delivering Necessary Change". Workstream 6 organised two workshops on the future skills and human resource requirements likely to be needed to meet increasing requests for the connection of distributed generation.

1.19. One fact revealed in dialogue with a wide range of interested parties is that perceptions of barriers to the development of distributed generation differ. For example, some developers have experienced the requirement for full-cost, site-specific connection charges paid 'up-front' as a serious disincentive. Others report that the certainty of the present requirements makes it easier to secure project finance than might otherwise be the case. The DGCG considers that solutions must be delivered with the appropriate scope for flexibility and choice.

2. Key policy issues discussed

The Energy White Paper

2.1. At their April meeting, members received a presentation on the DTI's Energy White Paper, "Our Energy Future – Creating a Low Carbon Economy". The main drivers for its production were the report of the Royal Commission on Environmental Pollution (2000), the widely publicised failure of the electricity networks in California and the report of the Prime Minister's Policy and Innovation Unit (2002). DTI had undertaken extensive consultation prior to publication of the White Paper.

2.2. The main policy goals in the White Paper are:

- putting the UK on the path to 60% cuts in CO_2 emissions by 2050;
- maintaining the reliability of energy supplies;
- promoting competitive markets in the UK and beyond; and
- ensuring that every home will be adequately and affordably heated.

2.3. The DGCG noted that the UK is facing a transition from self-sufficiency in energy, low prices in liberalised markets, and over-capacity in electricity generation to the need for challenging carbon reduction measures, increasing import dependency and the requirement to modernise energy infrastructures. All this will take place against a background in which European and global considerations will assume increasing importance.

2.4. Government is looking to Ofgem to provide incentives for DNOs to connect and use distributed generation, which will have an important part to play in meeting the aspirations of the White Paper. The Government is currently interested in developing centres of excellence for distributed generation, in co-operation with the industry, universities and research facilities. There is a key role for the DGCG in facilitating the development of distributed generation.

Incentives to connect distributed generation

2.5 The EGWG recognised that a major barrier to the development of distributed generation is the absence of any real incentive on DNOs to connect generation. The new distribution price controls, taking effect from 1 April 2005, are the

opportunity to remedy this. During the past year, the DGCG has taken a close interest in Ofgem's work on the new price controls and particularly on the question of developing appropriate incentives. Regular update reports and presentations have been received from Ofgem staff.

2.6 The DGCG considers there to be, broadly, four alternative regulatory approaches to the accommodation of distributed generation, of which the third appears to have the greatest merit:

- to maintain the existing framework;
- to 'level the playing field' between large and small generators;
- to incentivise the running of all distribution networks at minimum cost; or to
- 'tilt the playing field' in favour of small generators.

2.7 The interplay of generation and distribution businesses presents a complex environment with many shared costs. The monitoring and accurate attribution of these costs would be difficult and unreliable. The best course might be to create a general incentive for the DNOs to run the networks at minimum cost, while ensuring the security and reliability of the system. High level drivers to minimise cost would also deliver simplicity, which would be desirable in a business environment for small generators.

2.8 It might prove difficult to define 'minimum cost'. Over a five-year timescale, it would not be easy to ascertain whether what currently appeared to be a minimum cost solution would still look like that after the effect of subsequent connections had been taken into account. The pace of change in network businesses is likely to necessitate some additional flexibility in what the regulator would recognise as efficient expenditure. DNOs will face an increased level of investment risk, although this may not be problematic if potential rewards are matched.

2.9 The DGCG also considers it important to move to a position in which operating cost and capital expenditure are treated consistently. At present, the former is subject to a percentage reduction while the latter earns a guaranteed rate of return.

2.10 The DGCG has welcomed Ofgem's initiatives on incentives for distributed generation. The higher business risks associated with these developing technologies could sensibly be offset by potential for higher returns. In recent

years DNOs have operated with well-understood equipment and technologies. There has been little need for risk-taking or for investment with an experimental element. In a period of innovation and change, an acceptable risk that the promised benefits may not materialise should not discourage DNOs from sensible investment based on sound judgement.

Project finance

2.11 There is a degree of misunderstanding about the process of removing barriers to distributed generation. Some commentators point to the experience in other European states, suggesting that the process in those countries has been relatively straightforward and that it should be as simple in Great Britain.

2.12 Other Member States (notably Germany and Denmark) have successfully set up relatively simple mechanisms for financing distributed generation. It is, however, clear that energy markets are not yet as well developed in those countries as in Great Britain. Project risk is lower in Denmark, for example, where the majority of costs associated with connection of a major offshore windfarm would be 'smeared' across all electricity consumers.

2.13 Another example of the sensitivity of market-based mechanisms is valuation of Renewables Obligation Certificates (ROCs). Uncertainty as to their value, for example, tends to give the banks misgivings about lending money to potential renewable generators.

Wind power: its significance and what it might cost

2.14 Issues surrounding climate change, sustainability and energy security, as discussed in the Government's Energy White Paper, have constituted the main drivers for renewable generation. They have constituted a significant stimulus to the development of wind power in particular. To date wind farms have tended to locate on the west coast and on high ground although, in what is a developing and highly competitive market, more interest is being shown in less elevated sites.

2.15 Wind power is – at some 30% growth per annum - the fastest-growing energy source in the world. In 2002 there was global investment amounting to £4

billion. By that time, total global capacity had reached 31,128 MW, of which only 552 MW was located in the UK. This could be seen as a modest figure when compared to Germany's 12,001 MW, Spain's 4,830 MW and Denmark's 2,880 MW.

2.16 During the reporting period, the DGCG has devoted some time to understanding and discussing a landmark paper on the likely system costs of major wind generation schemes in comparison with the conventional generating option. The analysis was conducted jointly by ILEX Energy Consulting, the University of Manchester Institute of Science and Technology (UMIST), the British Wind Energy Association (BWEA) and National Grid Transco (NGT), under the aegis of TSG Workstream 1. Originally published in 'Power UK' (Issue 109 of March 2003), 'Total Cost Estimates for large-Scale Wind Scenarios in UK' (Dale, Milborrow, Slark & Strbac) presented a cost comparison between conventional plant and 20% wind generation for the year 2020. The paper suggested that the total additional cost of wind generation would be approximately £1.3 billion a year on an annualised basis. Fuel burn would reduce by 20%. Intermittency would cause a 66% increase in balancing costs amounting to £2.85/MWh of wind generation produced. This assumed a total consumption of 400TWh. Significant capital investment would be required (£14bn on wind turbines and £3.7bn on network reinforcement). These figures constitute only a cost estimate and they do not take account of market developments, dynamic effects or demand elasticities. However, DGCG members considered it important to understand the assumptions underlying the paper.

2.17 Some members suggested that carbon trading, from 2005, would increase fuel costs by 2p/kWh to 3p/kWh and would become a dominant influence on this sort of analysis. They thought that wind generation might become a more economic option compared to current generating technologies. Other generation technologies might be expected to emerge.

2.18 The methodology and assumptions set out in the article appear robust. Its importance is that this is the first time that the large-scale wind option has been costed out. The article will constitute a useful analytical basis for testing against other ways of saving given quantities of carbon.

Domestic Combined Heat and Power (DCHP)

2.19 At its October meeting, the DGCG focussed on the prospects for DCHP or MicroCHP, which is likely to become commercially available over the next two years. The export capacity of individual units is expected to be insignificant initially. However, concentrations of such equipments in housing estates, for example, could have an appreciable impact on the operation of electricity networks at lower voltages. Depending on local network conditions, such concentrations of DCHP might reduce network costs by slowing growth in peak load. On the other hand, they might increase costs by causing difficulties for the DNO in maintaining voltage within statutory limits.

2.20 Two DCHP products in the later stages of development incorporate Stirling engine technology. Stirling engines work by the expansion of gas when heated and by its compression when cooled. In the DCHP units soon to come onto the market, heating is by means of a gas burner. Cooling is effected by the water used for domestic space and water heating. Although operating on the same basic principle, DCHP systems under development have adopted some different engineering solutions - for example, in some cases converting the linear motion of the piston/cylinder assembly into rotary motion to drive the generator[1].

2.21 Indications are that the first DCHP units will cost between £400 and £700 more than a conventional condensing boiler. However, these additional costs will, manufacturers claim, be offset against savings of up to £150 per year for a typical three-bedroom house.

2.22 It is anticipated that two DCHP systems will shortly become commercially available in Great Britain. BG's 'Microgen' equipment will be available in a range of outputs from 5kWt to 36 kWt, but producing 1.1 kWe. Powergen and Whisper Tech will be marketing a DCHP unit known as 'WhisperGen' producing 6kWt and 1.2kWe.

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[1] Other DCHP technologies are also being developed, including an Organic Rankine Cycle unit, which work on principles quite different from that of the Stirling engine.

2.23 DCHP could make a significant contribution to the achievement of public policy goals set out in the Energy White Paper of 2002. If DCHP were installed in 25% of boiler replacements over the 17 years to 2020 there could be some five million units connected.

2.24 Members debated the likely impact of DCHP on distribution use of system (DUoS) charges. The driver for DUoS charges are network capacity costs incurred in meeting peak demand on the 11kV system. Network capacity would still be required for backup, even if significant amounts of electricity were generated on site. DCHP would reduce growth of peak load on networks - in time affecting the DNO's ability to recover costs. However, networks perform the dual functions of providing security of supply and of bulk power distribution. Energy efficiency (including DCHP) will tend reduce the need for the latter. The next distribution price control review, looking forward to the period from 2010, should include consideration of charge structures to reflect this. Ofgem will need to develop its thinking in this area, in the context of a more general debate on the future role of DNOs. The DGCG's consideration of the changing role of DNOs is considered later in this report.

2.25 The DGCG considers that, in rural areas having access to the gas network or given an LPG-fired DCHP unit, per capita investment in DCHP might be more cost effective than the investment of an equal sum in the electricity network.

2.26 For these small-scale units, the functionality and cost of metering will be an important consideration. Although the installation cost of new metering would be in the order of £35, there are benefits associated with meter change on the installation of DCHP. Current trials are using a basic import/export meter having a capital cost of only £12 per instrument - making a total metering cost of some £47 per installation. Use of such an instrument would obviate concerns about the suitability of the wide variety of meters currently in circuit for the measurement of export. Moreover, meter change would give an opportunity to install a remote display to provide customers with real-time information about the on-site generation of electricity.

Future direction for DNOs

2.27 The DGCG's July meeting featured a presentation and wide-ranging discussion on the future role of DNOs and on what the appropriate regulatory incentives might be. The fundamental question is what the wider industry and its customers will want DNOs to do and what sort of organisations they will expect them to become. Because of its impact on power flows, service delivery and system control, distributed generation is central to this debate.

2.28 The aims of providing network services safely, efficiently and sustainably might suggest critical success factors such as safety, environmental and legal compliance, availability, reliability, security, price, consistency and transparency. It was suggested that these might focus management attention on four key capabilities:

- asset development;
- asset stewardship;
- business integrity (operating more transparently than in the past); and
- trading effectively (providing a service for payment, including awareness of where the current environment might facilitate this and where change might be required).

2.29 In accordance with current best practice, asset development might encompass alternatives to a straightforward focus on the construction and operation of assets. It would include policy development, investment appraisal, long-range asset planning and life-cycle cost management. Asset stewardship would suggest network risk management, cost-effective maintenance, efficient asset renewal and active network operation.

2.30 Business integrity would imply flexible charging frameworks, effective economic signalling, and the realisation of commercial opportunities. It might also include brokering of 'user-to-user' deals, by which users with different generation and demand profiles might each take advantage of opportunities created by the other. Trading operations would be managed to achieve transparency, consistency and probity.

2.31 The management of capex should, it was suggested, focus managers on discharging the DNO's responsibilities while ensuring sustainability, increasing efficiency and remaining credible in terms of clear planning and regular reporting on performance. Sustainability required the avoidance of 'short-termism' and the setting of long-range targets underpinned by an adequate incentive to invest.

2.32 Against such a background, the industry might experience four phases in the connection of distributed generation. The DGCG considers it attractive to map incentives to them, where possible. However, it is too early to be specific about the two final phases. The four phases seem to be:

- effective connection, with incentives perhaps focussing on lead times for design and construction and on volumes of MW connected;
- efficient connection, with incentives perhaps shifting to allowed revenue determined by reference to average unit cost of connection;
- utilisation, with incentives possibly taking some early account of supplementary services (e.g. for loss reduction); and
- increased exploitation, at which stage incentives might take account of plans for distribution network services.

2.33 Key considerations for incentives and distributed generation seemed to be:

- incentives needed to address a balanced set of behaviours (connection performance, availability, loss-reduction, etc.);
- enhanced rates of return on distributed generation capex;
- establishing effective charging arrangements;
- retention of effective locational signals; and, most importantly,
- rewarding low-cost, low-constraint connection at short lead times.

2.34 Looking rather beyond the present distribution price control review, Ofgem might begin to think about:

- whether there might be an economic imperative to incentivise synergy between connection and asset replacement;
- incentives for innovation; and
- the DNO as market participant (e.g. as market maker or balancing services provider), and the consequences, if any, that this might have for the 'supplier hub' principle.

2.35 It was too soon to know whether it might be appropriate to create a TO/SO divide at distribution level. Such a separation could lead to inefficiencies and contractual barriers in practice. The resulting price signals might be too complex for small generators. Difficulty had been encountered in formulating GBSO incentives for transmission. It might be preferable to keep the two functions together at distribution voltages. It might be sensible, from the commercial viewpoint, to concentrate on regulating the DNOs effectively.

2.36 The DGCG recognises that not all of these can be fully addressed in the present distribution price control review, and that the detailed work on them will not be straightforward. The incentivisation of distributed generation has to be considered as part of a global vision – over the longer term. The ideas emerging from the presentation and discussion appear consistent with the DGCG's previously-suggested high-level aim for DNOs, which was *"to provide the systems at lowest cost to allow buyers and sellers to trade electricity."*

International R&D

2.37 The DGCG has considered the Tyndall Centre's report on research and development on distributed generation – principally in North America, Europe and Japan[2]. There is presently no mechanism for being kept informed of EU R&D

[2] Tyndall Centre for Climate Change Research, "Network Integration of Distributed Generation: International Research and Development", 2003. Produced under contract for the DTI's Sustainable Energy Programme. Report No: K/EL/00307/REP URN 03/837

projects. UK DNOs are not sufficiently engaged in these projects to have any influence on outcomes. Management teams tend to focus on cost reduction rather than on R&D. They originate noticeably few good R&D proposals in the field of distributed generation. Unlike UK companies, utilities such as EdF and RWE are typically able to commit teams of five to ten people to a project. There appears to be a mismatch between the aspirations of the White Paper and R&D activities, which DTI might usefully consider further. (Members noted that the DTI's Renewable Energy Programme offers part funding for DNO R&D initiatives, but that few such proposals have been received)

2.38 That the UK operates a liberalised electricity market does not make technical work conducted by other Member States any less relevant. Rather there are additional, commercial factors and complex ownership arrangements to consider in the UK. (e.g. the trading implications of inter-tripping). In the longer term, the unbundling resulting from the UK's market based approach might tend to make innovation efficient. The Innovation Funding Initiative, on which Ofgem was consulting at the end of the reporting period, might constitute a useful catalyst in this area.

3 The work of the TSG: Removing the barriers to distributed generation

Introduction

3.1 The TSG meets every six weeks. It co-ordinates the six workstreams listed in the table at paragraph 1.10, above. The following chart sets out the current membership of the TSG.

Dr Phil Jones (Chairman)	System Investment Director, CE Electric UK
Mr Stephen Andrews	Director, ILEX Energy Consulting
Mr Phil Baker	Director, Electricity Technology, DTI
Mr Mike Barlow	System Manager, Scottish and Southern Energy
Mr Phil Bowley	Head of Electrical Engineering, Innogy
Dr Lewis Dale	Regulatory Strategy Manager, NGC
Prof. Nick Jenkins	Electrical Energy and Power Systems Group, UMIST
Mr Mike Kay	Head of Network Transformation, United Utilities
Mr Alan Laird	Maintenance Manager, Scottish Power
Mr Guy Nicholson	Managing Director, Econnect
Mr John Scott	Technical Director, Ofgem
Mr Dave Sowden	Head of Regulation and Public Affairs, BG Microgen
Mr Mike Doble (DGCG Programme Manager)	Principal Consultant, Future Energy Solutions
Mr Steve McBurney (Secretary – to 31 Aug) Ms Ronke Adenuga (Secretary – from 8 Dec)	Ofgem staff

3.2 An important consideration for the DGCG and TSG is the identification of unwarranted barriers to the development and connection of distributed generation. While some such barriers still remain, work over the last two years has done much to remove what once seemed a formidable array of obstacles. Appendix 3 provides an at-a-glance guide to the current status of the key barriers that the TSG, and others, have identified and sought to remove.

3.3 Removing these barriers is very much a shared responsibility. The various projects within the TSG have made a significant contribution, but companies and working groups within the industry also continue to respond positively. Trade associations and interested individuals have played their part. Ofgem has been able to address regulatory barriers, while the DTI has provided funding for the necessary consultancy and research.

3.4 Because responsibilities are shared, effective communication continues to be essential. The TSG's WS1 Project 9 continues, at the time of drafting, to review our understanding of barriers in the light of the perceptions of those whose businesses are feeling the effects of them. The project is continuing to collect data on the perceptions of these interested parties.

3.5 The following sections of this part of the report summarise the TSG's work, to date, by reference to the projects that each workstream was managing at the end of the reporting period.

3.6 Each workstream has a Director (a TSG member) who is accountable to the TSG for projects within the workstream and particularly for:

- defining and directing projects;
- establishing objectives, deliverables and their timing;
- establishing, as appropriate, ad-hoc groups of interested parties to advise on and support the workstream; and
- co-ordination of activities with other workstreams.

3.4 Each workstream also has a Sponsor (a DGCG member) who is accountable to the DGCG for projects within the workstream, and also for:

- supporting the Workstream Director;
- ensuring that the timetable of work, as envisaged by the DGCG, is maintained;
- ensuring co-ordination of activities across the various workstreams; and
- providing a high level check on project content and priorities.

Workstream 1 (Distributed generation: status and projections)

Sponsor : Mr Mike Hughes	Director: Dr Lewis Dale

3.5 Workstream 1 undertook to create and develop a directory of the status and projections for distributed generation. This involved the definition of distributed generation, comparison of projection studies, and the identification and study of key scenarios of the impact of distributed generation on distribution networks.

The project also undertook to contribute to work on the likely network cost of 20% penetration of renewables by 2020.

3.6 As a number of Workstream 1's projects are complete or nearing completion, consideration is being given to how effective periodic reporting might be taken forward as an established process rather than a project.

3.7 WS1 – Project 1 (Preliminary directory of existing status and projections sources) This project achieved its objectives during the reporting period. **Project completed.**

3.8 WS1 – Project 2 (Expanded directory of status and projections) Connection information has been gathered from DNOs and from National Grid Transco (NGT). It has been summarised and circulated. Discussion continues with the DNOs on data relating to distributed generation under construction. The Energy Networks Association has assumed responsibility for the maintenance of this information in the long term.

3.9 WS1 – Project 3 (Definition of classes of distributed generation for definitive status reporting) Definitions of the classes of distributed generation are not mutually exclusive and do not provide information on certain aspects (e.g. connection voltage). The project has sought to develop a set of consistent and comprehensive definitions, together with a database suitable to handle those definitions. A database underpinning this project has been produced by ILEX Energy Consulting. **Project completed.**

3.10 WS1 – Project 4 (Comparison of projection studies). This project has been finalised by the updating of CHP projections. **Preliminary aims achieved, but the project to be kept open for occasional review of developments.**

3.11 WS1 – Project 5 (Identification of key scenario features required in client workstreams) Tabulation of issues and associated scenario features have been prepared, submitted to the full TSG, and circulated. **Project completed.**

3.12 WS1 – Project 6 (Issue and updating of projection scenarios) This work was undertaken largely for Workstream 5. It builds on the work of WS1 P05. Draft scenarios, including new data on microgeneration have been published on the DGCG website (www.distributed-generation.gov.uk). Comments have been

invited. **Project aims achieved, but the project to be kept open for periodic review of developments.**

3.13 WS1 – Project 7 (Specification for research on international distributed generation practice). This project is being conducted jointly with Workstream 2. A consultancy contract has finalised preliminary research. The project team is currently looking at specific issues.

3.14 WS1 – Project 8 (Liaison with DTI contractor on a project to estimate costs of 20% renewables in 2020). This project was the catalyst for the paper 'Total Cost Estimates for Large-Scale Wind Scenarios in UK' (Dale, Milborrow, Slark & Strbac) discussed in paragraph 2.18. Further discussion of the findings set out in the paper is likely to continue, but the project has achieved its aim. **Project completed.**

3.15 WS1 – Project 9 (Priority list of perceived barriers) Comments received in response to a draft questionnaire circulated to developers are being collated. Further data collection is being undertaken.

Workstream 2 (Standardisation of information and solutions)

Sponsor: Mr Kevin Morton	Director: Mr Mike Kay

3.16 Workstream 2 has the task of planning and overseeing the translation of technical solutions into industry standards, codes and engineering recommendations – as appropriate. Its work is largely driven by that of other workstreams.

3.17 WS2 – Project 1 (Banding of distributed generation) The purpose of this project has been to classify the wide variety of types of distributed generator into commonly-accepted 'bands' for standard reporting. Full details were set out in last year's annual report (paragraphs 2.10 to 2.17). An initial proposal is complete, but it remains to review this in the light of developing technology and the findings of other TSG workstreams.

3.18 WS2 – Project 2 (Project-specific information standards) In co-operation with the Distribution Code Review Panel (DCRP), the project team reviewed data

interchange requirements. Publication of a best practice guide, in May 2003, completed the work of this project. **Project completed.**

3.19 WS2 – Project 3 (Connection process guide). The aim of this project was to update a connection guide originally produced by Econnect Ltd and Ilex Associates in 1999. The revised guide was published on the DGCG website in December 2003. It is anticipated that it will be adopted by the DCRP as a DCRP-governed document.

3.20 WS2 – Project 4 (Review of management and governance of electrical standards) This project grew out of Ofgem's proposals on the governance of electrical standards (published on 10 October 2002, and available on www.ofgem.gov.uk). The work involves close liaison with the Grid Code Review Panel for England & Wales, the Scottish Grid Code Review Panel and the GB Distribution Code Review Panel. The panels are currently considering detailed changes to their constitutions and rules, in anticipation of being in a position to seek Ofgem's formal approval - early in 2004.

3.21 WS2 – Project 5 (Revision of Table 2 in Engineering Recommendation P2/5[3]) The aim of this project is to implement a methodology (following its development in WS3) for amending Table 2 of ER P2/5 to make it applicable to modern generation types. Table 2 summarises the contribution that generation can make to distribution network security.

3.22 WS2 – Project 6 (Review of Licence Condition 25) The Distribution Code Review Panel has recommended that further review of DNOs' Long-Term Development Statements (prepared in accordance with standard licence condition 25 in the distribution licence) be delayed until there is greater evidence of user experience of their use. The review is likely to take place during the first half of 2004.

3.23 WS2 – Project 7 (Standardisation of interactive connection offers). The objective of this project was to agree a standard approach to be adopted by DNOs where more than one potential generator is seeking connection to the same section of the distribution network. As well as problems of confidentiality, the order in

[3] ER P2/5. In order to meet consumer demand, DNOs are obliged to develop their networks in accordance with the security requirements of ER P2/5.

which the various connections are made can affect their respective characteristics and cost. Agreement has been reached, and the new methodology adopted. Details of how DNOs will handle interactive connection offers are to be found in the charging statements that they publish, in accordance with standard licence condition 4. **Project completed.**

Workstream 3 (Short-term network solutions)

Sponsor: Professor Robin MacLaren	Director: Mr Mike Barlow

3.24 Workstream 3 has taken responsibility for projects delivering solutions to the immediate challenges that distributed generation presents to DNOs.

3.25 WS3 – Project 1 (Security contribution) This project related to the updating of Engineering Recommendation P2/5 to take account of modern generating technologies. Following consultation (including a highly successful and well-attended seminar), an appropriate methodology was recommended, and is currently being finalised. Action for implementation will become the responsibility of Workstream 2 (P05).

3.26 WS3 – Project 2 (Basic active network management).This project resulted in the publication (in July) of the landmark document 'Solutions for the Connection and Operation of Distributed Generation' (Collinson, Dai, Beddoes and Crabtree), which should quickly be established as a standard work of reference for DNO planning engineers. As a follow-up task, further guidance is being prepared on intertripping and voltage control. **Main project completed.**

3.27 WS3 – Project 3 (Impact of Small-Scale Embedded Generators (SSEGs) on LV networks) This project developed a detailed model, in the form of an Excel spreadsheet, representing a generic distribution network. DNOs can use the model to analyse their own particular network designs. The spreadsheet has the flexibility to accept a wide range of network parameters. It calculates voltages, voltage unbalance, power flows and fault levels for different penetration levels of SSEG. The final report is available on the website (www.distributed-generation.gov.uk) **Project completed.**

3.28 WS3 – Project 4 (Is limiter safety case). A contract has been awarded to PB Power to review the safety issues associated with the use of these current

limiting devices. A detailed safety case will be prepared. The next stage of the project would be to consider detailed technical, safety and regulatory issues.

3.29 WS3 – Project 5 (Network splitting). Terms of reference are out to tender in respect of this project to consider network splitting configurations aimed at reducing network short circuit levels through increased network impedance. The overall aim of the project is to recommend how to achieve a balance between fault level reduction, impact on customers and costs.

3.30 WS3 – Project 6 (Sequential switching). This project is in its early stages. Terms of reference will be put out to tender early in 2004.

Workstream 4 (Microgeneration solutions)

Sponsor: Mr Andrew Horsler	Director: Mr Dave Sowden

3.31 Workstream 4 is taking forward work on the connection of microgeneration (i.e. up to 16 amps per phase). This involves both technical and commercial considerations. In conjunction with Ofgem and the Institution of Electrical Engineers, the workstream jointly sponsored a seminar on "Micro-generation and Electricity Networks: Delivering Necessary Change", held on 13 February. The workstream is also participating in a study on System Impact of Microgeneration (SIAM).

3.32 WS4 – Project 1 (Connection terms). This project is addressing revised connection terms to take account of microgeneration. Work is now being done on detailed drafting. Progress with this project has been slower than first envisaged. This is partly because discussion between DNOs and suppliers (following the legal split of these activities by the Utilities Act 2000) has not been completed. This process has to be completed before the - relatively minor - changes to accommodate microgeneration can be effected. Another consideration is that there is little commercial pressure on DNOs and suppliers to take these discussions forward quickly.

3.33 WS4 – Project 2a (Metering – Basic metering and export reward criteria). During the last reporting period (2002), this project made a significant input to Elexon's work on removing the requirement for half-hourly metering in domestic premises. That change was implemented in September 2003. Export profiles for

microgeneration are now in place, though these are relatively crude and are likely to need refining in the future. Work on the economics of microgeneration, and on the associated reward mechanisms, is well advanced, and possible ways forward have been identified. Work continues on arrangements for monitoring the performance of microgeneration. P02a expects to make specific recommendations, in due course, on how to reflect the economic value of microgeneration.

3.34 WS4 – Project 2b (Metering – Legal, regulatory and commercial framework). Ofgem's paper of March 2002[4] called for workable and comprehensible standard arrangements for the installation of microgeneration. This project is assessing what changes may be required to various legal documents to facilitate the installation of microgeneration. An important aspect is the changes that will be necessary to allow installers of microgeneration legally to perform the necessary metering work. An options paper is currently under discussion.

3.35 WS4 – Project 3 (Lease financing through energy bills). The higher capital cost of DCHP units may make lease financing an attractive option for some consumers. Consideration is being given to whether, and how, existing licence conditions may need to be modified. The Energy White Paper had also identified barriers in this area, and the project conclusions were fed into the work of the DTI Energy Services Working Group, which reported to Ministers at the end of 2003. **Project completed.**

3.36 WS4 – Project 4 (Accrual of Renewables Obligation Certificates (ROCs) and Levy Exemption Certificates (LECs)). The project team is considering how output from microgeneration might qualify for ROCs and LECs. Detailed discussions with Ofgem will take place early in 2004.

3.37 WS4 – Project 5 (Engineering Recommendation G83). Engineering Recommendation G83/1, governing the connection of SSEG, including DCHP, was promulgated during the reporting period. G83 is now mentioned in the Distribution Code, effectively making it mandatory. **Project completed.**

[4] 'Distributed generation: price controls, incentives and connection charging. Further discussion, recommendations and future action', Ofgem, March 2002.

3.38 WS4 – Project 6 (CEN workshop agreement). All Member States are now agreed on the 'fit and inform' principle, under which there would be no requirement for the DNO's prior permission to install a microgenerator. A working draft standard was circulated in September. This is a long-term project, which is unlikely to come to fruition before 2006.

3.39 WS4 – Project 7 (Wiring Regulations). The project team has achieved its main objective of ensuring that there is no conflict between Engineering Recommendation G83/1 and the BS 7671 (formerly the IEE Wiring Regulations). At the time of drafting the team was considering the additional issue of ring main connection of microgenerators. A new, related area of work has been opened - on the connection of microgenerators into ring mains. **Original project aims achieved.**

3.40 WS4 – Project 8 (new Electricity Safety, Quality and Continuity Regulations). The Regulations came into force during the reporting period. **Project completed.**

3.41 WS4 – Project 9 (Microgeneration accreditation issues). The project team is led by the Energy Savings Trust (EST), and is following the development of accreditation systems for micro CHP in the context of the Government's energy efficiency initiatives. The Buildings Research Establishment, on behalf of Defra, has produced first drafts of Seasonal Performance Index algorithm for microCHP, and has proposed changes to the system for rating boilers in the UK to make the two compatible. In addition, the EST-sponsored laboratory test procedure is undergoing trial tests with a number of manufacturers.

3.42 WS4 – Project 10 (Mini-generation issues). DTI requested this project to consider the position of small generators with a capacity exceeding that specified as microgeneration. There has been a disappointing level of response to a questionnaire sent to potential developers. The future of this project is currently under discussion.

Workstream 5 (Long-term network concepts and options)

Sponsor: Dr Malcolm Kennedy	Director: Mr Alan Laird

3.43 Workstream 5 is working on the long-term impact of distributed generation, including the possibilities for new technologies and more active management to solve technical problems. An important aspect is the extent to which DNOs could use distributed generation to help maintain the quality and reliability of supply (for example through contracting for network services or for reconfiguring parts of the network to have the capability of operating in island mode). Questions of system security beyond ER P2/5 also fall within the remit of this workstream. As it has been dependent on inputs from other workstreams, and as it deals with the longer term, a number of Workstream 5's projects have been obliged to wait for the completion of other tasks before going forward.

3.44 DGCG has supported initiatives aimed at securing funding for Workstream 5 projects. DTI's New & Renewable Energy Programme, which has been the means of funding TSG projects, has been over-subscribed by some 60%. It was therefore important to develop defensible projects that avoided duplication. There has been no guarantee that all the proposed projects could be carried through, but good progress is now being made in respect of the majority.

3.45 Workstream 5 is the best placed to identify best practice in deciding how to innovate and what to innovate. The workstream has therefore been involved in an Innovation Group, which first met at the IEE in June.

3.46 WS5 – Project 1 (Fault level). Depending on network conditions, distributed generation can increase the current that would feed into a fault. This may mean that the ratings of installed equipment are exceeded. The project will seek an improved understanding of fault level contributions from distributed generators of differing sizes and designs, and how these can be accommodated within the distribution infrastructure. Following a tender process, a consultant has been selected to carry out the work.

3.47 WS5 – Project 2 (Voltage control). The purpose of this project is to model the interaction of distributed generation, in-line voltage regulators and transformer voltage control schemes. It is also intended to assess the application of static compensation devices. Terms of reference were put out to tender in October. The successful bidder will be selected by early 2004.

3.48 WS5 – Project 3 (Active management). Following on from Workstream 3's work on basic active management, this project will identify, research and development needs associated with full active network management. It will identify cost implications and provide guidance on the trade off between active management and network reinforcement. Terms of reference were put out to tender, at the end of the reporting period.

3.49 WS5 – Project 4 (Security). Again building on the work of Workstream 3, the project will consider the options for more fundamental change to, or replacement of, ER P2/5. This project has been deferred.

3.50 WS5 – Project 5 (Islanding). The objective of this project is to identify the potential changes to policies, procedures, connection arrangements, operating practices and equipment that might facilitate the island operation of distributed generation. The tender process is closed and a contractor has been selected.

3.51 WS5 – Project 6 (Supplementary services). DNOs do not at present generally contract for supplementary (or 'ancillary' or 'network') services from generation. With the spread of distributed generation, it may become appropriate for them to do so. The project will evaluate the potential for an ancillary services market to operate at the distribution network level. Terms of reference have been put out to tender.

3.52 WS5 – Project 7 (Power quality). The project will consider the contribution that distributed generation could make to power quality. In particular it will identify the impact on the quality of supply as received by load customers that a significant penetration of distributed generators would have. It will also identify what changes may be required to both generator and network design standards and codes in order to ensure that load customers retain and if possible improve their quality of supply. This project has been deferred.

3.53 WS5 – Project 8 (Network design). Significant increases in distributed generation will fundamentally affect the design of distribution networks. The project will identify changes to DNO design standards that are appropriate to accommodate increased levels of distributed generation. It will also look at the cost implications of networks design changes. This will be a key longer-term project. Following the appointment of a project manager, funding proposals will be put forward.

3.54 WS5 – Project 9 (Safety). The DGCG and TSG regard network safety as a priority. This project will consider how the changes attendant on the connection and operation of distributed generation can be effected in a robust and safe manner. Following the appointment of a project manager, funding proposals will be put forward.

3.55 WS5 – Project 10 (New technology). The project team will consider how new technological developments might be harnessed to facilitate the operation of distributed generation. New generating technologies may develop. It is expected that electricity storage may become a significant factor within the timescales in which the team will be interested. Following the appointment of a project manager, funding proposals will be put forward.

3.56 WS5 – Project 11 (Network losses). This project will be aimed at assessing the impact of distributed generation on system losses. The work will be put out to tender early in 2004.

Workstream 6 (Industry skills and resource)

Sponsor: Mr Eddie Hyams	Director: Professor Nick Jenkins

3.57 Workstream 6 is assessing the skill requirements and human resource requirements for meeting the challenge that distributed generation presents to DNOs. It is relating these to current initiatives in relevant education and training. This is leading to an understanding of the stimuli likely to deliver the necessary competencies.

3.58 WS6 – Project 1 (Current initiatives: assessment and summary). Project 1 completed its work during the last reporting period (2002). Its report set out the current situation with regard to skills in the Electricity Supply Industry. **Project complete**

3.59 WS6 – Project 2 (Skills and human resource requirements). The project took the form of a series of workshops designed to define the skills and human resource needed for satisfactory completion of the DGCG's overall programme. The key conclusion was that, at the present rates of deployment of renewables and CHP, skills and human resources are not the main factors limiting the connection of distributed generation. There was, however, a concern at the loss of ability to innovate. Should the rate of connection of distributed generation increase significantly, skills and human resource constraints would be likely to emerge as a severe limiting factor. **Project completed.**

3.60 WS6 – Project 3 (Identification and stimulus of actions for education and training). The objective of this project is to develop a map of skills against supply and to identify and stimulate actions to ensure that the requirements are satisfied.

Use of resource

3.61 The TSG has initiated a total of 46 projects, of which 16 were completed during the period covered by this report. The bulk of this work has been carried out by representatives of the DNOs, NGT, generators, academics and consumers giving freely of their time and expertise. The best assessment is that, over the two years of the TSG's existence, to date, something in the region of nine person/years have been devoted to this work.

3.62 It would not have been possible to take forward such a wide range of projects, nor to create and maintain the DGCG's website, without financial support from the DTI's Renewable Energy Programme. To date, funding provided or committed from this source has been in the region of £900,000.

3.63 The DGCG is particularly appreciative of the resource that individuals and organisations have been prepared to devote to the TSG's various projects. That they have been prepared to do so speaks of a general recognition of the importance of this work.

Appendix 1 : DGCG Membership

Mr Neil Hirst	(Joint Chairman)	Head, Energy Markets Unit, DTI
Mr John Neilson	(Joint Chairman)	Managing Director, Customers and Supply, Ofgem
Mr Peter Bennell (to July 2003)		Senior Vice President, TXU
Mr Mike Clancy		National Officer, Prospect
Mr Charles Davies		Commercial Director, NGT
Mr David Green		Director, Combined Heat And Power Association
Mr Andrew Horsler		Member, energywatch
Mr Mike Hughes		Formerly CEO of Midlands Electricity
Mr Eddie Hyams (to January 2004)		Advisor to Micropower Ltd
Dr Malcolm Kennedy		Former Chairman, PB Power
Mr John Lanagan (from October 2003)		Head of Business Development, Powergen Retail
Prof Robin MacLaren		Managing Director, Scottish Power Transmission and Distribution
Mr Stephen Mancey		Director of Electricity Supply, Centrica
Mr Alan Moore		Managing Director, National Wind Power
Mr Kevin Morton		Managing Director, EdF Energy Networks
Mr Tony White		Independent Member
Mr David Williams		Director, ECO2
Mr John Scott		Technical Director, Ofgem
Dr Phil Jones	(TSG Chairman)	System Investment Director, CE Electric UK
Mr Jeremy Eppel		Divisional Manager, Sustainable Energy Policy Division, Defra
Mr Robin Naysmith		Head of ELL, Energy Division, Scottish Executive
Mr Mike Doble	(Programme Manager)	Principal Consultant, Future Energy Solutions
Mr Phil Baker	(Joint Secretary)	Director, Electricity Technologies, DTI
Mr Arthur Cooke	(Joint Secretary)	Distributed Generation Co-ordinator, Ofgem

Appendix 2 : High-level timetable (as at 31 December 2003)

Recommendation[5]	Actions	Timescale for completion	Current status
Facilitation of competition			
Review of incentives on DNOs	Interim arrangements as in Ofgem's consultations on 'Distributed generation: price controls, incentives and connection charging' (March 2002)	Mid 2002	**Achieved**
	Ofgem's conclusions on the framework for monopoly network price controls	June 2003	**Achieved**
The DGCG reviewed progress on DNO incentives for distributed generation at its meetings in January and July 2003.	Ofgem's initial consultation on the Distribution Price Control Review (DPCR)	July 2003	**Achieved**
	Outcome of Ofgem's preliminary DPCR consultation	October 2003	**Achieved**
	Ofgem's interim DPCR proposals	Summer 2004	Work in progress
	Ofgem's final DPCR proposals	November 2004	Work in progress
	Ofgem's review of distribution charge structures – initial conclusions	June 2003	**Achieved**

[5] See the report of the Embedded Generation Working Group (EGWG), published by DTI on 12 January 2001

	Ofgem's review of distribution charge structures – conclusions	October 2003 (as part of the DPCR document)	**Achieved**
	Ofgem's review of distribution losses – initial proposals	June 2003	**Achieved**
	Ofgem's review of distribution losses – conclusions	October 2003 (as part of the DPCR update document)	**Achieved** (although further development work will follow over the medium term)
Connection process guide	Action with Technical Steering Group (TSG) Workstream 2 (WS2)	Publication April 2003. Published, after some delay, in December 2003.	**Achieved**
Establish commercial forum	DGCG appointed	November 2001	**Achieved**
	TSG appointed	January 2002	**Achieved**
	Commercial forum on electrical standards for connection of distributed generation	First quarter of 2004	Preliminary meeting planned for early 2004
Assessment of contribution from distributed generation			
Review of Engineering Recommendation P2/5	Revision of Table 2	Completion re-scheduled from September 2003 to July 2004	Work in progress in TSG WS3
	Short-term changes to P2/5	Date to be fixed	Methodology agreed. Implementation action with TSG WS2.
	Decision on governance of P2/5	Completion re-scheduled for 2004	. Work in progress on Ofgem's role in approving changes to technical codes.
Security services study	Longer-term review of security contributions from distributed generation.	Date to be fixed	TSG WS5 is awaiting appointment of a project manager and DTI funding.

Power quality, voltage and ancillary services study	Power quality work is with TSG WS5 (Project 7)	Date to be fixed	On hold
	Ancillary services work is with TSG WS5 (Project 6)	Date to be fixed	Project planned and funding agreed. Consultancy tenders are being evaluated.
Islanded operation	Action with TSG WS5 (Project 5)	Date to be fixed	Project planned and funding agreed. Consultants will be appointed early in 2004.
Network design and practice analysis	Action with TSG WS5 (Project 8)	Date to be fixed	Awaiting appointment of Project Manager and agreement on funding.
Basic active management assessment *The DGCG formally received WS3's July 2003 paper at its meeting held in that month.*	Guidance on best practice in basic active management (TSG WS3 – Project 2)	'Solutions for the Connection and Operation of Distributed Generation' published July 2003	**Achieved**
	Longer term concepts and options (TSG WS5 – Project3)	Date to be fixed	Terms of reference are out to tender.
Establish ancillary services market forum	DGCG to advise later on timing for this action	To be decided	On hold
Charging principles			
Identify short-term changes	Interim arrangements as in Ofgem's consultations on 'Distributed generation: price controls, incentives and connection charging' (March 2002)	Mid 2002	**Achieved**
Statement of intent by Ofgem	Ofgem's conclusions on the framework for monopoly network price controls	June 2003	**Achieved**
	Outcome of Ofgem's preliminary	October 2003	**Achieved**

	DPCR consultation		
	Ofgem's interim DPCR proposals	Summer 2004	Work in progress
Development of charging options	Ofgem's review of distribution charge structures – initial conclusions	June 2003	**Achieved**
	Ofgem's review of distribution charge structures – conclusions	October 2003 (as part of the DPCR update document)	**Achieved**
Regulatory arrangements for next DPCR	Ofgem's conclusions on the framework for monopoly network price controls	June 2003	**Achieved**
	Ofgem's initial consultation on the DPCR	July 2003	**Achieved**
	Outcome of Ofgem's preliminary DPCR consultation	October 2003	**Achieved**
	Ofgem's interim DPCR proposals	Summer 2004	Work in progress
	Ofgem's final DPCR proposals	November 2004	Work in progress
Provision of information			
Scoping for DNO network long-term development statements	Formal slc 25 direction	Issued Summer 2002	**Achieved**
	TSG WS2 (Project 6) to co-ordinate industry review	Re-scheduled from May 2003 to later in 2004 – to allow for collection of information on user experience	On hold.
Value balance assessment as part of scoping study	Integral to the scoping study for long-term development statements	Summer 2002	**Achieved**

Information and connection process standard information	TSG WS2 (Project 2) to publish guidance on exchange of information between generators and DNOs.	'A Guide to Data Interchange for Distributed Generation Projects', published April 2003. Accepted by the DCRP for incorporation in the 'Connection Guide for Small Generators' (originally drafted by Econnect)	**Achieved**
	TSG WS2 (Project 7) to recommend guidance on interactive connection applications	Suggested text for slc 4 statements finalised and posted to the DGCG website. DNOs to implement at next revision of slc 4 statements	**Achieved**
Micro-generation issues			
Connection standards for micro-scale generation	Action by TSG WS4 (Project 5) on ER G83/1	Final publication by September 2003	**Achieved**
	Action by TSG WS4 (Project 6) on CEN Workshop Agreement on 'Electrical interface for domestic cogeneration'.	No formalisation expected before September 2004	Work in progress in CENELEC committee. Final publication expected in 18 months to 2 years.
Connection charging principles	Interim arrangements as in Ofgem's consultations on 'Distributed generation: price controls, incentives and connection charging' (March 2002)	Mid 2002	**Achieved**
	Ofgem's review of distribution charge structures – initial conclusions	June 2003	**Achieved**
	Ofgem's review of distribution charge structures – conclusions	October 2003 (as part of the DPCR update document)	**Achieved**

Metering and charging options analysis	Ofgem's policy set out in the distributed generation paper of March 2002.	March 2002	**Achieved**
	Action by TSG WS4 (Project 2a) metering requirements and export reward.	Re-scheduled from May to September 2003 to April 2004	Delayed. Paper on the economics of microgeneration submitted to DGCG/Ofgem (December 2003). It will be finalised shortly. A cost/benefit analysis is due for completion in the spring.
	Action by TSG WS4 (Project 2b) metering requirements: legal, regulatory and commercial framework	Recommendations by end 2002.	Not achieved. Work in progress
Impact on the BSC	General impacts included in the TSG WS4 workstreams detailed above	See above	See above
	BSC Modification P81 to remove the half-hourly metering requirement for domestic-scale generation.	September 2003	**Achieved**
Future network issues			
Establish working group to consider future possibilities	TSG WS5 covers long-term network concepts and options	Initial conclusions re-scheduled from February to October 2003, to inform Ofgem's DPCR.	Following resource problems, projects have been scoped and re-prioritised. Project managers and consultants are being appointed as funding is agreed.
Connection charging	Ofgem's review of distribution charge structures – initial conclusions	June 2003	**Achieved**

	Ofgem's review of distribution charge structures – conclusions	October 2003 (as part of the DPCR update document)	**Achieved**
Regulation and incentives on DNOs	Ofgem's conclusions on the framework for monopoly network price controls	June 2003	**Achieved**
	Ofgem's initial consultation on the DPCR	July 2003	**Achieved**
	Outcome of Ofgem's preliminary DPCR consultation	October 2003	**Achieved**
	Ofgem's interim DPCR proposals	Summer 2004	Work in progress
	Ofgem's final DPCR proposals	November 2004	Work in progress
	Ofgem's review of distribution charge structures – initial conclusions	June 2003	**Achieved**
	Ofgem's review of distribution charge structures – conclusions	October 2003 (as part of the DPCR update document)	**Achieved**
	Ofgem's review of distribution losses – initial proposals	June 2003	**Achieved**
	Ofgem's review of distribution losses – conclusions	October 2003 (as part of the DPCR update document)	**Achieved**
Ancillary services market	Action with TSG WS5 (Project 6), to consider technical aspects	Initial conclusions re-scheduled from February to October 2003, to inform Ofgem's DPCR.	Project planned and funding agreed. Terms of reference out to tender.
	Ofgem to consider wider commercial and regulatory implications	Initial views re-scheduled from March 2003, pending WS5 recommendations	On hold

Commercial mechanisms for active management	Action with TSG WS5 (Project 3), to consider technical aspects	Date to be fixed	Terms of reference out to tender.
	Ofgem to consider wider commercial and regulatory implications	Initial views re-scheduled from March 2003, pending WS5 recommendations	On hold
Co-ordinated R&D	Ofgem to consider incentives for innovation.	Ofgem's preliminary consultation on Innovation Funding Initiative (IFI) and Registered Power Zones (RPZs) published July 2003.	Ofgem's consultations continue in parallel with the DPCR.

Appendix 3 : Removal of barriers to distributed generation (overview as at 31 December 2003)

Ser.	Barrier	Status	Comment
1	Lack of information about the current status of distributed generation – and about its likely development.	**Removed**	See WS1 report in Section 3.
2	Lack of incentive on DNOs to connect distributed generation.	Work in progress	Consideration of appropriate incentive mechanisms are a main element of Ofgem's work on the new distribution price control. Certain elements of this work are expected to roll over into the next distribution price control (from 2010?) – particularly where microgeneration is concerned.
3	Insufficient scope for DNOs to pre-invest in networks actively managed to accommodate distributed generation.	Work in progress	Being considered in parallel with the distribution price control review.
4	Lack of information on distribution network development (comparable to the NGT Seven Year Statement)	**Removed**	Long-Term Network Development Statements published under standard licence condition 25. Ofgem initiative completed during the 2002 reporting period. Will be subject to review by WS2 P06.
5	Lack of a transparent, common connection-charging methodology.	Work in progress	This is a main element of Ofgem's work on the new distribution price control and associated distribution charge structures.
6	Lack of non-DNO involvement in the management and governance of relevant electrical standards	Work in Progress	Code changes anticipated for early 2004. (See WS2 P04)
7	Difficulty of access to embedded benefits. Licence-exempt distributed generators formerly had to negotiate with suppliers to secure benefits of avoided TNUoS charges.	**Removed**	A modification to the Balancing and Settlement Code (BSC), from 1 Apr 03, permitted licence-exempt distributed generators to receive embedded benefits directly.

8	Under the electricity trading arrangements, 'Gate Closure' at 3.5 hours before delivery tended to disadvantage wind-generation, which could not always forecast output over such a period.	**Removed**	The Gate Closure period is now reduced to one hour, allowing such generators to give more reliable forecasts to the System Operator responsible for balancing and settlement in the generation market.
9	Lack of standard approach by DNOs where more than one potential generator is seeking connection to the same section of the distribution network.	**Removed**	Standard approach now set out in DNO's charging statements under standard licence condition 4. (See WS2 P07)
10	Lack of standard technical guidance on the connection of distributed generation.	**Removed**	Publication (Jul 03) of 'Solutions for the Connection and Operation of Distributed Generation'. (See WS3 P02) and (in Dec 03) of the 'Technical Guide to the Connection of Generation to the Distribution Network' (revised by WS2)
11	Engineering Recommendation P2/5 does not cover more recent generation technologies.	Work in progress	See WS2 P05, WS3 P01 and WS5 P04
12	Microgeneration was not covered by The Electricity Supply Regulations 1988.	**Removed**	The Electricity Safety, Quality and Continuity Regulations 2002 ('The ESQC Regulations') provide for microgeneration. (See WS4 P08)
13	Lack of appropriate connection guidance for microgeneration.	**Removed**	Promulgation of Engineering Recommendation G83/1 (See WS4 P05) and of Wiring Regulations Guidance Note 7.
14	Lack of guidance to electrical contractors on private electrical installations to which microgeneration is connected.	**Removed**	IEE Guidance Note 7 now provides guidance.
15	Concern about possible conflict between ER G83 and BS7671 (formerly the IEE Wiring Regulations) on microgeneration.	**Removed**	See WS4 P07.
16	Requirement for half-hourly metering was disproportionately expensive for micro-generation	**Removed**	BSC Modification P81 (effective Sep 03) removed the requirement for half-hourly metering for equipment covered by ER G83.
17	No microgeneration equipment has accreditation for purposes of the Energy Efficiency Commitment.	Work in progress.	See WS4 P09. First drafts of both testing procedures and the Seasonal Performance Index have been produced and are under discussion.

18	Standard terms of connection currently do not match the 'fit and inform' obligation envisaged in the ESQC Regulations and in ER G83/1	In process of removal.	Discussion of standard terms of connection continues between DNOs and suppliers. (See also WS4 P01)
19	Lack of trading mechanisms for microgeneration output.	Barrier remains	Electricity trading arrangements were not designed with microgeneration in mind. Further work needs to be done on the valuation of output from these smallest generators. WS4 P02a has produced an initial paper on 'The Economic Value of Microgeneration'.
20	Insufficient understanding of the likely impact of small-scale embedded generation on LV networks	**Removed**	Model developed by WS3 P03.
21	Lack of mechanism for investment in transmission networks to accommodate anticipated renewable and distributed generation.	In process of removal.	The DGCG welcomed work involving the two Scottish transmission operators, DTI and Ofgem to identify investment required for the export of increased renewable generation from Scotland.
22	Insufficient UK involvement in EU R&D projects associated with distributed generation.	Barrier remains	The DGCG has identified a mismatch between the aspirations of the Energy White Paper and UK involvement in relevant EU research initiatives. This is a matter that DTI might consider further.
23	Potential shortage of skills and qualified personnel in the power engineering profession.	Barrier remains	See WS6 report in Section 3.
24	Distributed generation cannot easily contract to provide supplementary services at distribution voltages.	Barrier remains	This issue is to be addressed by WS5 P06.

Appendix 4 : Glossary

Active Network Management – the provision of network control facilities to enable real-time management of voltage levels and real and reactive power flows.

Ancillary Services – voltage support, frequency response, reserve and black start.

Balancing and Settlement Code (BSC) – The code forming part of the electricity trading arrangements and governing the process of maintaining the balance of supply and demand and the mechanism for charging parties for the correction of imbalances caused by them.

DNO – Distribution Network Operator – as defined in the DNO's licence.

Domestic Combined Heat and Power (DCHP) – combined heat and power applied at domestic scale, to provide hot water and electricity to an individual, or to multiple, dwellings.

Energy storage – A generic term for a range of technologies designed to provide storage facilities in an electricity grid system. They could avoid the need to design power systems with sufficient capacity to satisfy maximum demand. These technologies include pumped storage (that converts electrical energy into potential energy by pumping water from a lower to an upper reservoir), electro-chemical storage (in charged electrolytes), compressed air, super-conductors and flywheels.

Embedded benefits – Benefits accruing to distributed generators as a result of their not using the transmission network. Principally the avoidance of transmission use of system (TNUoS) charges.

Fault level – a measure of the potential energy infeeds at a specified point on a power system.

Intertripping – implementation of post-fault constraint whereby a generator's circuit breaker is tripped by the operation of upstream breakers in response to a line fault or the loss of a transformer. Communication between breakers is usually effected by telephone line.

Islanding - A situation in which a portion of the network that becomes disconnected from the main grid system but continues to be supplied by generation connected to it. Faults on power networks are normally cleared by circuit breakers located close to the fault. The 'island' can be created when such circuit breakers open. 'Islanding' is conventionally regarded as problematic, but networks can be re-configured to use islanding as a means of maintaining supplies.

Is Limiter – a fault current limiting device capable of temporarily increasing network impedance, as required. Is limiters operate within 10ms, in response to the rapid rise in network current associated with a fault. Such devices can avoid the problems of security risk, losses and voltage control associated with permanently increased network impedance.

LV – Low voltage (415V three-phase or 230V single phase)

Microgeneration – small-scale generation (up to 16 amps per phase) connected to an electricity distribution network (Engineering Recommendation G83/1 refers).

Network splitting – reducing fault levels by reducing the number of parallel paths in networks comprising radial transformer feeding arrangements - by the opening of circuit breakers, rather than by physical network change.

Power quality – a coverall term referring to voltage stability, harmonic distortion and continuity of supply.

Registered Power Zone (RPZ) – The RPZ concept is currently under development in Ofgem's consultations associated with the distribution price control review. An RPZ would be a defined piece of distribution network in which a DNO would be able to manage and develop innovative solutions to the connection of additional distributed generation – earning a higher return on well-managed projects, in recognition of the additional risk that they entail.

Sequential switching – a method by which the multiple sources contributing to a fault are separated prior to the clearance of the faulted section of network. Sequential switching arrangements can permit generation connection without the need to uprate circuit breakers.

TNUoS – Transmission Use of System Charges. The charges levied for transporting electricity across the transmission system.