

**March 2002**

**Distributed generation: price  
controls, incentives and connection  
charging.**

**Further discussion,  
recommendations and future  
action.**

## Executive summary

This document summarises responses to Ofgem's first consultation (September 2001) on distributed generation, of which there were 42. It proposes changes to the regulatory regime that would be of benefit to potential distributed generators and that can be effected before the implementation of the next distribution price control, in April 2005. Responses were overwhelmingly against the reopening or early termination of the existing price controls. The document identifies a number of workstreams that need to start before the next distribution price control review (2002/03), and explains which issues will have to await consideration in that review. Finally, this document points to some non-regulatory problems affecting distributed generation that may have to be addressed by other organisations.

The consultation focused on connection and use of system charging, with a view to establishing whether it would be possible to remove some barriers to distributed generation during the current price control period. However, the consultation also sought views on metering, information provision and other related issues.

Ofgem proposes that, as an interim arrangement, prospective distributed generators should have the choice of paying the costs of connection 'up-front' or paying only for the 'shallow' costs in this way, the balance being collected through an 'annualised connection charge' negotiated with the DNO.

DNOs should be prepared to negotiate charge variations on the basis of such costs and benefits as are reasonably identifiable. Avoided investment in distribution assets - including deferment of asset replacement - would on occasions be an appropriate topic for discussion, as would contributions to fault level. Ofgem would also look to DNOs to make genuine attempts to reduce the time and cost that is frequently associated with the preparation of network studies and connection quotations. Increased transparency in quoted charges would, in some cases, also be welcome. There is a strong case for the modification of deferred 'deep' connection charges in recognition of deferment of asset replacement. Ofgem will be seeking confirmation from DNOs that this will be their practice from now on.

The consultation explored the possibilities for increased negotiation of connection charges. It became clear, however, that the problem is not so much the lack of

negotiation but the various constraints that are placed on it. These arise from a number of causes, and it may be best to address them individually. They include:

- asymmetry of information;
- cost of preparing quotations;
- the difficulty of identifying a common basis for negotiation;
- lack of understanding of the network impact of distributed generation;
- lack of incentives on DNOs to make generation connections;
- the risk of apparent discrimination;
- lack of recognition of distributed generation in ER P2/5<sup>1</sup>; and
- 'Clusters' of applications bringing uncertainty and confidentiality concerns.

It is too soon to apply a 'with-without' test to establish the level of connection charges, particularly for smaller distributed generation schemes. Work has first to be done on developing a methodology that appropriately balances the requirements for increased use of modelling and the suitability of such an approach for large-scale application.

Subject to further consultation, and in recognition of the fact that the distinction between demand and generation connections may become less marked in the longer term, it should be possible for reimbursement of either generation or demand connections to arise from subsequent connections characterised by generation, demand or a combination of the two. The Electricity (Connection Charges) Regulations 2002 (like the 1990 Regulations that preceded them) currently apply only to initial contributions in respect of domestic premises. Ofgem will discuss with DTI the prospects for consultation on extending the regulations to permit reimbursement of initial contributors in respect of generation (and other) connections.

There remains the question of deeper reinforcement in anticipation of (or specifically to attract) clusters of major renewable connections. This cannot be addressed in a short-term adjustment to connection charging policy, but is becoming a pressing issue in some DNOs' areas. In the interim, Ofgem is prepared to consider how any specific and properly-justified reinforcement scheme might be financed.

Ofgem attaches importance to the establishment of workable and comprehensible standard arrangements for the installation of Domestic Combined Heat and Power (DCHP) and for the associated pricing and charging mechanisms. A separate workstream

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<sup>1</sup> Engineering Recommendation 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. Copies of the document may be ordered from: [www.electricity.org.uk/srch\\_fr.html](http://www.electricity.org.uk/srch_fr.html)

will take these issues forward<sup>2</sup>. Ofgem regards basic import/export active power metering as a minimum for all distributed generation, including DCHP. Such metering would support pricing likely accurately to reflect the varying behaviour of DCHP and micro-generation users as they connect to networks in increasing numbers and with higher-capacity generating units. Consistency with metering of the increasingly efficient photovoltaic units now being developed is another relevant consideration. Half-hourly and reactive power metering is not included as a necessary minimum.

The provision of information will be of key importance. Work done on Long-Term Development Statements (under distribution standard licence condition 25) has already made it significantly easier for prospective distributed generators to assess schemes. While DNOs may have something to learn from the NGC's Seven-Year Statement, transmission and distribution systems are different and may not always lend themselves to similar description. Ofgem welcomes the expressed willingness to publish comprehensible information targeted at micro-generation and DCHP users. Should helpful and innovative statements not develop, more specific regulatory action might be considered later.

Ofgem's revised recommendations for early implementation include:

- the option of 'annualised charging' under existing connection charge methodology;
- consultation on reimbursing non-domestic 'initial contributors' from proceeds of later connections;
- establishing agreed classification (banding) of distributed generation;
- separate and appropriate identification of import and export active power quantities as the general commercial best practice for distributed generation;
- protecting the commercial position of existing distributed generation; and
- full and comprehensible information for all prospective distributed generators.

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<sup>2</sup> The Technical Steering Group that reports to the joint DTI/Ofgem Distributed Generation co-ordinating Group has a workstream dedicated to solutions for micro-generation.

The paper also proposes that Ofgem should begin work immediately to:

- review the appropriateness of existing price controls for networks with distributed generation, deciding when and how changed circumstances will be identified (e.g. reduced power flows, more active system control, etc.);
- consider revision of ER P2/5 and comparable documents relating to Scottish networks (through the Technical Steering Group reporting to the Distributed Generation Co-ordinating Group<sup>3</sup>);
- clarify the benefits of distributed generation;
- standardise and simplify connection arrangements for DCHP;
- consider performance standards on 'network studies' and connection quotations;
- examine the options for 'premium power zones'; and to
- consider issues around Transmission Use-of-System (TUoS) charges for distributed generation.

The next distribution price control review will consider:

- distributed generation and the Regulatory Asset Base;
- the boundary between connection and use of system charging;
- options for entry and exit charging;
- distributed generation, operating and capital expenditure (OPEX and CAPEX);
- the scope for cost recovery over more than one price control period;
- network access arrangements; and
- commercial incentives on DNOs to connect distributed generation.

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<sup>3</sup> Enquiries relating to the work of the Distributed Generation Co-ordinating Group (DGCG) in the context of this paper should be directed to Arthur Cooke (Joint Secretary) on 020-7901 7297. E-mail: [arthur.cooke@ofgem.gov.uk](mailto:arthur.cooke@ofgem.gov.uk)

Note: To assist speed-reading, key text in this document has been highlighted in bold type.

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# 1. PART I – INTRODUCTION

## *Introduction*

### **Purpose of this document**

1.1 This document:

- summarises the responses to Ofgem’s preliminary consultation on distributed generation<sup>4</sup>;
- sets out revised proposals for interim measures to improve the position of potential distributed generators; and
- highlights certain issues for further action, either as part of one of Ofgem’s workstreams or by other organisations.

1.2 The September 2001 consultation built on the work of the Embedded Generation Working Group (EGWG), the findings of which were published by the DTI on 12 January 2001 ( [www.dti.gov.uk/energy/egwg/index.htm](http://www.dti.gov.uk/energy/egwg/index.htm) ). The focus of the consultation was to ask whether it might be appropriate to change the regulatory framework to remove perceived barriers to the connection of greater quantities of distributed<sup>5</sup> generating capacity. In particular, the consultation paper explored the possibility of making some interim changes from April 2002, rather than waiting until the implementation of the next distribution price control, in April 2005.

### **Responses to the consultation**

1.3 There were 42 responses to the consultation. The organisations that submitted responses are listed at Appendix 2 to this paper. Additionally, two organisations submitted comments on the basis that Ofgem would agree to treat them as confidential. It was clear that considerable work had gone into preparation of many of the responses. As a result, they have been particularly valuable in

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<sup>4</sup> ‘Embedded generation: price controls, incentives and connection charging – a preliminary consultation document’ September 2001 58/01 ([www.ofgem.gov.uk/docs2001/58\\_embedded.pdf](http://www.ofgem.gov.uk/docs2001/58_embedded.pdf))

<sup>5</sup> At the recommendation of the Distributed Generation Co-ordinating Group (DGCG), this document uses the term ‘distributed’ rather than ‘embedded’ generation. The former is more readily comprehensible to those outside the electricity industry and accords with wider international practice.

progressing thinking on distributed generation. Ofgem wishes to record its thanks to all those who have contributed to the debate.

### **Structure of the document**

- 1.4 Part II of this document deals with general issues arising in responses to the consultation. Part III covers connection, and Part IV is about use of system charges and the position of existing distributed generators. Comments on the existing price control regime are at Part V, while Part VI deals with metering and secondary issues. Ofgem's revised proposals are set out in Part VII. Part VIII covers further work for Ofgem. Part IX highlights issues outside the regulatory field, on which it might be appropriate for other organisations to lead. The appendix lists the organisations that responded to the consultation.
- 1.5 Key text in this document has been **highlighted, in bold type**, to assist speed-reading.

### **Responding to this document**

- 1.6 Ofgem would like to hear from those with an interest in the issues raised in this paper, including distribution businesses, distributed generators, suppliers, customers and their representatives.
- 1.7 It would be helpful to receive responses by Friday, 3 May 2002. They should be sent to:

Arthur Cooke  
Distributed Generation Co-ordinator  
Ofgem  
9 Millbank  
London SW1P 3GE

Tel: 020-7901-7297  
Fax: 020-7901-7197  
E-mail: [arthur.cooke@ofgem.gov.uk](mailto:arthur.cooke@ofgem.gov.uk)

- 1.8 If you have any queries regarding the issues raised in this document, Arthur Cooke or Steve McBurney on 020-7901-7371 (E-mail: ***steve.mcburney@ofgem.gov.uk***) would be pleased to assist you.

## ***Rationale***

- 1.9 Ofgem's principal statutory objective is to protect the interests of consumers, wherever appropriate by promoting effective competition. Increased distributed generation may bring benefits in terms of the reliability and security of supply, and, in the longer term, reduce the price of electricity. On the other hand, it is possible that it could reduce reliability and increase costs. Ofgem's principal objective suggests a thorough review of the implications of distributed generation for electricity consumers.
- 1.10 Ofgem also has a statutory duty to carry out its functions under the Electricity Act 1989 in a manner that it considers is best calculated to secure a diverse and viable long-term energy supply<sup>6</sup>. Requirements of diversity and viability suggest work on ensuring:
- that network investment does not create bias in the development of particular generating technologies;
  - non-discriminatory generator access to networks; and
  - the removal of monopolistic restrictions.
- 1.11 The Government's draft guidance on social and environmental matters in relation to electricity (made under section 14 of the Utilities Act 2000) specifically asks Ofgem, taking account of its duty to encourage competition in generation, to have regard to the desirability of:
- removing barriers to distributed generation;
  - access to the network on fair and transparent terms for distributed generation, including fair recompense for the benefits afforded to the network, through providing system security, deferring the need for system reinforcement, or otherwise;
  - distribution systems that are capable of accommodating the likely growth in distributed generation, having regard in particular to the Government's targets for renewable generation, and for CHP;

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<sup>6</sup> Electricity Act 1989, sub-section 3A(5)(c) as substituted by section 13 of the Utilities Act 2000.

- arranging charging regimes for the connection of distributed generation on fair and transparent terms; and
- easy availability, within the public domain, of information relevant to prospective generators' decisions, including clear and transparent rules governing the connection of generation to the distribution networks.

1.12 The main recommendations of the EGWG report were that:

- Ofgem should review the structure of regulatory incentives on Distribution Network Operators (DNOs) in the light of the new statutory duty on DNOs to facilitate competition<sup>7</sup>; and that
- a group should be established under Government leadership to co-ordinate and take forward the implementation of EGWG's recommendations for the longer term.

1.13 Ofgem's September 2001 consultation paper represented the beginning of a wider review of regulatory incentives on distribution network operators. This paper draws conclusions from the responses received and points the way forward. The DGCG has been established, under joint DTI/Ofgem chairmanship, and has appointed a Technical Steering Group (TSG) to manage the technical and technical/commercial workstreams necessary to prepare for the connection of greater distributed generation capacity. A comprehensive work programme is in place.

1.14 It is not yet clear what the ultimate degree of penetration of distributed generation will be. The EGWG report suggested that, while initial new connections might be accommodated with relatively little change to the existing configuration and operation of distribution networks, additional connections might, over time, necessitate the installation of significant amounts of new network infrastructure, together with a move to more active network management. The regulatory framework should be capable of allowing for a range of outcomes, and of responding to changes to the DNOs' cost structures. Advice from the DGCG, and particularly from a TSG workstream that is

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<sup>7</sup> Section 9 of the Electricity Act 1989, as modified by section 50 of the Utilities Act 2000.

monitoring the status of distributed generation and making projections about future developments, will be helpful in informing Ofgem's thinking.

- 1.15 Together with the establishment of the DGCG and its work programme, this consultation completes the year's work on distributed generation envisaged in Ofgem's 2001/2 Plan and Budget (March 2001) ([www.ofgem.gov.uk](http://www.ofgem.gov.uk)) on responding to the main EGWG recommendations and in putting in place a programme of work to address its secondary recommendations. There is an undertaking in Ofgem's (December 2001) Proposed Corporate Strategy and Plan 2002-2005 ([www.ofgem.gov.uk](http://www.ofgem.gov.uk)) to remove unfair regulatory barriers that may prevent the development of distributed generation, and to consider the extent to which it will be in the interests of customers to alter the incentives on distribution companies at the time of the next price control (April 2005).
- 1.16 Apart from their direct relevance to other Ofgem projects (notably the distribution charge structure review and the next distribution price control review), the recommendations and further work identified in this document are consistent with, and should effectively complement, other organisations' initiatives. These include work already being undertaken by the Electricity Supply Industry and under the DTI's New and Renewable Energy Programme. Part IX of this paper suggests that other organisations, outside the energy and regulatory fields, may have a contribution to make.

## 2. PART II - GENERAL

### *Summary of responses: general matters*

#### **General approach and guiding principles**

- 2.1 The introduction to the September 2001 consultation document set out some guiding principles that Ofgem would generally attempt to follow in developing regulatory policy. The document acknowledged that not all of these principles could be applied to the early stages of the expansion of distributed generation but emphasised the desirability of achieving regulatory consistency – where possible. Few responses disagreed with this approach, a few expressed reservations.
- 2.2 While most responses concentrated on the specific arguments and proposals advanced in the consultation, some commented on the general approach and principles that might be appropriate.
- 2.3 One DNO suggested that it would be wrong to accord too much prominence specifically to connection charges and charging for use of system. This response drew attention to the wide consensus that difficulties in securing planning permission and arising from the introduction of the new electricity trading arrangements (NETA) were also significant factors in reducing the potential number of distributed generation connections. The response acknowledged that these were matters for Government.
- 2.4 While welcoming the anticipated growth in distributed generation, one major user of electricity expressed the strong view that demand customers should not be made worse off as a result of the installation of distributed generation, and that such generators should not receive more favourable treatment than unregulated EHV customers in terms of charging or network access. Other responses mentioned the desirability of equality of treatment of generation and demand.
- 2.5 One response suggested that the Embedded Generation Working Group (EGWG) had adopted a 'grid mentality' in its consideration of the prospects for distributed generation, failing to take account of the fact that, in terms of physics,

electricity will flow to the nearest load. This response pointed up the need to consider the scope for local trading systems, outside NETA, using private networks – or making only minimal use of DNO networks. It argued for further relaxation of the licensing regime to encourage local supplies competing with the wider, network-based arrangements.

- 2.6 Ofgem acknowledges that increased connection of distributed generation will raise a wide range of interconnected issues. That the first consultation concentrated on connection charging and use of system was not to imply that other considerations are of lesser importance. Indeed the Distributed Generation Co-ordinating Group (DGCG), chaired jointly by DTI and Ofgem, will help to ensure that relevant matters are not overlooked. The equitable treatment of demand customers will be just one important factor to keep in view.
- 2.7 Nor should there be anything to prevent forward-looking undertakings from developing local generation and distribution schemes that may hold out economic and social benefits to particular communities. Ofgem intends to develop its dialogue with such organisations. It may be appropriate for the regulator or Government to make further changes to accommodate them. Given, however, that the starting point is the pattern of generation, transmission and distribution that we currently have, regulation must presently focus on facilitating desirable change in existing arrangements.
- 2.8 Two generators' associations warned of the dangers of introducing interim arrangements that would change again in 2005, with the implementation of the next distribution price control. Ofgem recognises that distributed generators connecting between 2002 and 2005 will have made long term investments, and that they should not be exposed to any undue increase in risk. The proposals advanced in this document have been formulated to keep such increased risk to a minimum.
- 2.9 While generally welcoming the analysis set out in the September 2001 consultation, one DNO counselled that a high degree of cost-reflectivity in charging would be required if distributed generation were to be integrated into networks with any degree of economic efficiency. This is a principle to which Ofgem also attaches importance, although it agrees with the response in

question that many changes will have to wait until the next distribution price control review.

- 2.10 Although there were criticisms – which will be discussed later in this document – **Ofgem’s preliminary proposals were broadly welcomed in many responses, from both DNOs and generators. Merit was seen in moving quickly to workable interim arrangements aimed at reducing barriers to distributed generation.**

#### **Principles for connection charging**

- 2.11 **The consultation paper suggested that connection charges for distributed generators should be efficient, equitable and comprehensible.** Ofgem asked (paragraph 5.6) for comments as to the principles that should properly underlie such charges.
- 2.12 **Eight DNOs responded specifically to this question. None seemed to have difficulty with the proposed principles. Some simply endorsed them, while others set out how they might best be interpreted.**
- 2.13 One DNO concluded that charges should be cost reflective, taking account of local circumstances and giving appropriate locational signals. Potential cross-subsidy could take many forms, including load against generation or new connections against existing ones. This response regarded links to transmission pricing as the least significant. The company suggested, however, that splitting total network costs between demand and generation had the potential to increase charges to generators.
- 2.14 Another DNO also advocated effective locational cost signals. Without these, distributed generation would locate inappropriately, resulting in increased network reinforcement costs, operating costs, and adverse environmental impact. There should also be safeguards to ensure that an undue burden would not be placed on new generators, through the inflation of connection costs.
- 2.15 A further response emphasised that their application should allow DNOs to earn a reasonable return on, as well as fully to recover, relevant costs not recovered in the connection charge. There was also a call for full recovery of the advancement costs of any asset replacement.



- 2.16 One DNO suggested that the equitable treatment of distributed generation would be enhanced by the development of a 'fault current contribution rule'. This would limit the depth of connection charges for distributed generation in the same way as connection charges for demand are limited by the definition in sub-paragraph 5(c) of standard licence condition 4B in the new distribution licence<sup>8</sup> (i.e. the '25% Rule'<sup>9</sup> and the limit to one voltage level above the voltage of connection)<sup>10</sup>. This response also pointed out that 'supercustomer' billing methodology meant that any generator use of system (GDUoS) charge for connections less than 100kW would have to be standard. A 'shallowish' connection regime could be accompanied by standard GDUoS charges: a fully shallow regime could not. Such a mass billing process seems appropriate for the majority of customers, site-specific billing being reserved for the largest. Interim charging structures for distributed generation could accord with the existing billing arrangements.
- 2.17 Generator responses on charging principles tended to emphasise the desirability of transparency. A generator said that the principle of equity required connection charges, technical measures and timescales to be transparent, whether a 'deep' or 'shallow' charging regime were to be adopted.
- 2.18 A major generator emphasised that investors and developers require a stable, consistent charging regime, covering entry, exit and use of system, against which to plan any given scheme. Their response was clear in its view that a defined framework was needed for the resolution of charging issues, and that ad hoc solutions (such as removal or reduction of connection charges) would not constitute a workable answer. A generator's association also stressed the importance of considering the perspective of the investor. It regarded it as important that:
- there should be stability in that individual project returns, as predicted at the time of investment decisions, should not subsequently be undermined;

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<sup>8</sup> The distribution licence is available on [www.dti.gov.uk/energy/licences/elec.pdf](http://www.dti.gov.uk/energy/licences/elec.pdf)

<sup>9</sup> The '25% Rule' provides that no charge will normally be made for reinforcement of the existing distribution system if the new or increased load requirement does not exceed 25% of the existing effective capacity at the relevant points on the system.

<sup>10</sup> Ofgem comment: This response might be taken as suggesting that the '25% Rule' would not apply to distributed generation connections. Such an interpretation would be incorrect. See Ofgem's comment at the end of this section.

- it be recognised that the costs of negotiation have a disproportionate effect on smaller schemes, and that these administrative costs should be kept to a minimum; and that
- distributed generation should receive equality of treatment with demand.

2.19 Other responses drew attention to the need of developers to plan for connection costs and other network charges. Transparency would reduce financial unknowns and allow for the more effective screening of projects. They also maintained that efficient charges are those that give appropriate cost signals, equitable charges are those that do not create cross-subsidy and that comprehensible charges are those that are calculated according to transparent policy and methodology.

2.20 The response from a large distributed generator underlined the need to ensure that the chosen charging regime should encourage optimal levels of network investment. In particular, it should discourage over-investment in networks.

2.21 A major generator's response suggested that it might be preferable to concentrate on achieving consistency in charging between generation and demand rather than attempting to define a broader concept of equitable treatment.

2.22 Ofgem has been encouraged by the degree of consensus about charging principles. It has been helpful in formulating the interim proposals set out in this paper, and, while further discussion will inevitably reveal differences over interpretation, it forms a useful basis for further work on distribution charging.

### **Distinguishing generation and demand**

2.23 **The consultation paper sought views (paragraph 5.13) on the degree to which the characteristics of generation and load connections would remain truly distinct as regards the majority of network services. It asked how and when the present situation might change.**

2.24 Eight DNOs responded to this question. There were four other responses, of which three were from generators. **There appears to be general agreement that demand and generation connections will require separate treatment for some**

**considerable number of years yet, but that the advent of micro-generation and DCHP may cause some earlier blurring of the distinction at low voltages. The timescales for these changes is currently unclear, but they will affect technical aspects of network management as well as connection and UoS charging.**

- 2.25 A DNO pointed out that an important difference between demand and generation connections is the latter's fault level contribution and its impact on upstream switchgear. The need for enhanced capabilities necessitates detailed investigations, which can prove time consuming. Switchgear manufacturers do not always respond quickly to enquiries.
- 2.26 As the majority of generator connections require top-up supplies, one response concluded that generation and demand charges for connection and use of system should be mutually consistent in terms of structure and scope of cost recovery.
- 2.27 Another DNO agreed with the suggestion in the consultation paper that an increase in the amount of distributed generation would tend to change the role of the network with the impact of demand and generation connections becoming less distinct. The change would be gradual, taking place over a number of years. In particular, the spread of micro-generation would have a significant impact on LV networks. This company considered that, to secure a better understanding of these changes, analytical work needed to be done. This response also highlighted:
- the higher reinforcement costs of generation connection as compared with demand connections of similar size (arising from voltage and fault level considerations in addition to power flow); and
  - what the company considered to be the absence of a generation equivalent of the '25% Rule' (in sub-paragraph 5(c) of standard licence condition 4B in the new distribution licence).
- 2.28 One response suggested that the distinction between demand and generation connections would endure for a long time, but considered maintaining that distinction to be important in the process of developing an understanding of the different balances of risks and rewards presented by each. It also pointed to the

task facing DNOs of developing systems and processes to accommodate increased distributed generation, and in acquiring the new skills needed to operate them. The outcome in terms of charging would very probably be a shift to fixed or capacity-related charges, so as to limit volume risk.

- 2.29 A vertically-integrated energy company also believed that micro-generation and DCHP would start to blur the distinction at lower voltages. However, it was the company's view that the debate should centre on the small to medium-sized discrete generating plant in respect of which there was the greatest urgency for clarification. Here, the fundamental distinctions between load and generation remained, and separate treatment was required under the Balancing and Settlement Code (BSC), Connection and Use of System code (CUSC), and under the Distribution and Grid Codes.
- 2.30 A DNO said that, **if distribution networks were to become primarily a way of linking local load and generation, instead of a delivery mechanism for grid-connected generation, charging methodologies would have to be reviewed. This response stressed, however, that such a review could not be restricted to the single element of generation connection charges.**
- 2.31 In another DNO's submission, **an important distinction lay in the conversion of underlying costs to tariffs. Where there was a large customer base (as with domestic consumers) it was appropriate to apportion fixed/capacity costs into unit rates, using known class characteristics. Generation connections were not yet sufficiently numerous for such treatment. A site-specific approach would be appropriate. Again, micro-generation and DCHP were identified as the most likely to be connected in sufficient numbers to permit treatment similar to demand. Several DNOs expressed the view that charges might shift from a unit-based proxy for capacity costs to a fixed or capacity-based methodology – perhaps in the form of entry and exit charges.** Another added that any quantifiable network benefit deriving from generation connections should be kept separate from connection or use of system charging.
- 2.32 One DNO anticipated the relatively early need for separate treatment of DCHP and photovoltaic (PV) installations. Their response suggested that this would require type-approval of packaged domestic-scale installations, accreditation of

registered installers, and a rapid mechanism for the resolution of any technical problems arising from individual connections.

- 2.33 A former Public Electricity Supplier (PES) maintained that, in describing 'shallow' connection charging for demand customers (paragraphs 5.7 and 5.8), the consultation paper did not acknowledge the effect of the '25% Rule'. As regards generation connections, this response suggested that distributed generators were not charged the full cost of asset replacement, but rather the 'advancement costs' from the expected retirement date of the asset. This respondent only rarely encounters the need to undertake reinforcement at the next level up for generation connections, and so regard their treatment of load and generation connections as based on a similar 'shallowish' approach. Their response suggests that this approach might be formally and universally adopted.
- 2.34 A large distributed generator observed that passive demand requires network services while active generation, in contrast, provides those services. 'Embedded benefits', as understood before the introduction of NETA, could have been regarded as compensating distributed generators for the provision of those services. The company pointed out that they had argued elsewhere that there has been a dilution of 'embedded benefits' consequent upon the introduction of NETA with the result that there is insufficient reward for generation locating close to demand, and no incentive on DNOs to contract with distributed generation for network services. This response therefore looks forward to review of the interaction between distribution and transmission operators so that DNOs are incentivised to optimal procurement of network services.
- 2.35 Another large distributed generator considered that the way in which distribution networks have evolved would make it difficult to be entirely consistent in the treatment of generation and load. However, the company urged moves towards the valuation of generator output on the same basis as customer demand, and particularly emphasised the desirability of according appropriate commercial rewards to those distributed generators able to deliver secure and high-quality output. Increased distributed generation connections would mean more opportunity for distributed generators to provide network services.

2.36 A major generating company observed that, in general, flexible generation connected to an integrated part of a distribution network would be capable of contributing many more system benefits than would flexible demand. However, inflexible generation connected to a radial part of the system would probably make no contribution beyond avoiding the distribution of energy, when it was generating. In this connection, the relevant factors would seem to be the:

- design and operation of the relevant circuits;
- capability of any given generating set to bring benefits to the system (e.g. reactive power, avoidance of reinforcement, and energising the network);
- flexibility of the generating set in question; and
- degree of price elasticity of the generating set.

2.37 Apart from the general recognition of the need for separate treatment of generation and demand for at least the medium term, and of the likely early impact of micro-generation and DCHP in blurring the generation/demand distinction at LV, conclusions can be drawn about the interim charging arrangements at which the consultation was aimed. **It seems clear that there will be insufficient medium-sized distributed generation to constitute a class to which overall capacity costs could be apportioned into unit rates. Ofgem therefore agrees that site-specific charging (probably for all except DCHP) should remain for the present.** It would seem sensible to reward any quantifiable network benefits on the same basis – probably through tailor-made contractual arrangements between the generator and the DNO.

2.38 **Responses highlighted some apparent confusion as to the application of the '25% Rule' in standard licence condition 4B(5)(c) of the Electricity Distribution Licence. The rule applies equally to demand and generation connections.** In this context, it is worth noting that section 16 of the Electricity Act refers to 'any premises', and that nothing in condition 4B suggests inconsistent application to demand and generation connections. Moreover, condition 4B(3)(c) refers to 'electricity being accepted into the licensee's distribution system at the specified entry point'.

## *Summary of responses: options for 'banding' of distributed generation*

### Introduction

- 2.39 Distributed generation covers a wide spectrum from large power stations down to small, domestic-scale installations. Clearly, there will be a need to treat specific groups differently, in accordance with their various characteristics. The consultation paper (paragraph 5.30) asked for views on the bands or classes into which distributed generation might justifiably be divided.
- 2.40 21 responses offered suggestions about banding. **The great majority was of the view that such an approach would be helpful. There was also a general recognition that the largest connections (as with EHV demand connections) would need site-specific treatment.** Of the 21 responses, nine were from generators and eight from DNOs.
- 2.41 Some supported banding on the grounds that a fixed connection charge together with banded GDUoS charges for small and medium sized distributed generators would allow rapid project evaluation and would facilitate accounting for connection costs in overall project costs.

### Criteria for banding

- 2.42 Responses suggested a number of possible criteria for banding. In summary these were:
- voltage of connection;
  - generating capacity;
  - network design (i.e. interconnected or radial); and
  - cost of developing technology.
- 2.43 A large generator suggested that, until a fuller understanding of the effects of distributed generation develops, it may be appropriate to group generators by the voltage level at which they are connected. An alternative would be by electrical capacity. As the interaction of generation and demand develops it may be preferable to rely on other criteria (e.g. export profile characteristics, reliability or predictability indices, of generation population).

- 2.44 A major generating company suggested that the costs and benefits that distributed generation brings to the system should drive appropriate banding of such generation. Appropriate distinctions might be drawn between generation connected to integrated and radial parts of the system.
- 2.45 One response favoured a system of banding that would take account of the costs of developing renewable technology. The idea here is that wind turbine technology, the costs of which had decreased, might merit different treatment from photovoltaics (PV) or biomass conversion, which were still at an early stage of development. Any technology in its early stages tends to be relatively expensive, declining in price as it matures. This response proposed that allowance be made for this fact.
- 2.46 One generators' association advocated a 'small generation band' attracting a standard connection and GDUoS charge. The response suggested that such a band should cover only those generators that could connect to LV networks, probably including small wind turbines as well as PV and DCHP.
- 2.47 One DNO cautioned that generators should only be classified in bands where there were sufficient numbers and commonality of operation to justify it. Charges for EHV connections should always be site-specific.

### Proposals for banding

- 2.48 A number of specific options for banding were advanced, based on size or voltage criteria. They are summarised for comparison in the following table:

Option	Band 1	Band 2	Band 3	Band 4	Band 5
1	ER Gcc-007	To 10kW	To 100kW	To 1MW	To 10MW
2	DCHP < 2kW	Other LV connected	HV connected	EHV connected	
3	Up to 2kW exported	2kW to 100kW exported	0.1MW to 10MW exported	> 10MW exported	
4	LV connected – up to 1.5kW exported	LV connected - > 1.5kW exported	HV connected	EHV connected	
5	Up to 2kW exported	Up to 5kW, single phase	Up to 15kW, single phase		
6	0 to 3.6kW	3.6kW to 10kW	100kW (?)		
7	< 100kW	100kW to 10MW	> 10MW		
8	ER Gcc-007				



- 2.49 Option 1 suggests a first band using the definition in the Engineering Recommendation (Gcc-007) currently being developed at the Electricity Association, which was “embedded generators up to 16 amps per phase connected to the public low-voltage distribution network”.
- 2.50 Option 2 suggests banding by voltage level, with a special category for DCHP installations.
- 2.51 Option 3 is based on the size of generating plant, expressed in terms of export capacity. The four bands would broadly capture:
- Band 1 – Micro CHP or PV installations;
  - Band 2 – Mini CHP;
  - Band 3 – Typically something about the size of a small windfarm; and
  - Band 4 – Larger distributed generation.
- 2.52 Option 4’s first suggested band (exports up to 1.5kW) has been sized to match the design ADMD<sup>11</sup> of a domestic property, recognising that, in most circumstances, such installations could be accommodated on the existing LV network. It is also in line with the currently proposed capacities of DCHP units. The second and third bands were chosen to align with the regulated price-controlled tariff baskets.
- 2.53 Option 5 envisages a number of bands for smaller distributed generators. For the lowest band (up to 2kW exported) the existing LV system would be likely to accommodate the generation.
- 2.54 Option 6 bands by size, and creates two bands for small-scale generation up to and including 10kW. These sizes seem to accord with developing thinking on small generating equipment. A further banding boundary at 100kW might prove workable and beneficial.

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<sup>11</sup> After-Diversity Maximum Demand

- 2.55 Option 7 incorporates three bands, to match demand charging. The lowest band would be sized to accommodate a charging structure that could be billed via the 'supercustomer' billing methodology. Standard charges could apply between 100kW and 10MW. Connections over 10MW could be subject to site-specific charging.
- 2.56 Option 8 (like Option 1) suggests that the lowest band should reflect the definition used in Engineering Recommendation (Gcc-007).

### **Banding and DCHP**

- 2.57 Most responses recognised a **need for simple, standard connection procedures for DCHP installations. As a result, proposals for banding tended to include a specific band to accommodate small DCHP and micro-CHP equipments, many of which would be subject to type approval. Such a band would lend itself to simple, standard connection procedures. Ofgem would need to be satisfied that any connection charge levied for this band reflected genuine costs borne by the DNO.**
- 2.58 Many agreed that simple, standard connection procedures could be put in place for micro-generation and DCHP. One DNO saw the need to maintain a clear distinction between charging methodologies for domestic and non-domestic connections. This was already an important feature of demand connections, and should be mirrored in generation connections. The distinction would be helpful in achieving a balance between standard and negotiated charging.
- 2.59 Although opposing the concept of banding, a generator's response acknowledged that standard charging for DCHP (probably defined as being connected at 230V, single-phase, and having demand as well as generation) would be preferable to the complexity of deriving a cost-reflective charging regime for this type of unit.
- 2.60 An organisation representing generators applauded moves towards simplicity and transparency, and considered that the level and structure of charges should operate in a non-discriminatory manner for all connections, regardless of connection voltage or output.

- 2.61 One response suggested that complex, site-specific charges for individual DCHP installations would not be commensurate with the benefits that these small generators could bring to networks. This response advocated a zero connection charge policy for DCHP. This would be a simple and non-bureaucratic solution involving no need to negotiate with the DNO. Domestic customers should not receive complex legal documents. This response regarded as unacceptable any requirement of prior notification for the installation of an appliance providing heat as well as electricity.
- 2.62 A meter manufacturer saw no general need for connection charges in terms of adapting the power network, as some small reversals of active power in the local network could be tolerated.
- 2.63 One DNO response rejected the idea of standard charges for micro-generation and DCHP schemes. This response suggested that standard connection charges could not be cost reflective, and would not give the appropriate locational signals. The company pointed out that the "25% Rule" and the voltage level restriction in standard licence condition 4B.5(c) would probably afford sufficient protection to micro and DCHP connections.
- 2.64 Another DNO proposed a simple micro-generation and DCHP connection procedure (that could be set out in a straightforward guide) including:
- a connection request from the customer, providing basic, standard details of the installation;
  - assessment of the connection by the DNO – for a standard fee;
  - installation of export metering; and
  - revision of registration and DUoS charges (e.g. for top-up and standby) to permit trading of export energy.
- 2.65 Ofgem is not presently convinced that the connection of DCHP would require pre-notification to the DNO, nor would site inspection prior to installation seem necessary<sup>12</sup>. Such procedures probably would be appropriate for some of the

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<sup>12</sup> Ofgem understands that provisions covering these installations will be included in The Electricity Safety, Quality and Continuity Regulations 2002, on which the DTI is presently consulting.

larger micro-generation installations. An appropriate choice of banding should determine where the boundary should fall.

### **The case against banding**

- 2.66 One generator's response opposed banding and the different charging arrangements for differently sized generators (and demand connections) that it connotes. The company argued that banding would lead to perverse incentives for those connectees who could organise their affairs so as to fit into more than one band. Such a situation would run counter to the policy of aligning transmission and distribution charging principles. The response acknowledged, however, that domestic scale micro-generation should be an exception.

### **Ofgem comment**

- 2.67 Ofgem considers that the potentially large range of sizes and types of distributed generation, different groups probably requiring different treatment, makes a clear case for banding. **While the case for a DCHP and micro-generation band at one end and EHV band at the other seems to have been made, there is further work to do in deciding where the other boundaries should fall and how the bands relate to the timescale for the development of distributed generation. It will be helpful for the Distributed Generation Co-ordinating Group (DGCG) to advise on this – particularly as its Technical Steering Group has identified banding as a workstream for early delivery.** These responses, together with DGCG advice, will be helpful in informing a final decision.
- 2.68 As an initial reaction, it seems too early to link banding to network design (interconnected or radial), although this may be of interest later – when the impacts of distributed generation are better understood. Nor does it seem appropriate to use banding as a vehicle for recognising the shifting costs of developing technologies. It would be difficult to do so without creating a cross-subsidy. Financial support for developing technologies would be a matter for government.
- 2.69 Provided that the lowest band is not too broadly defined, there may be no need for site-specific connection charging for DCHP installations. Ofgem would need to be satisfied that any connection charge reflected genuine costs borne by the

DNO. The suggestion that anything connected to LV networks should be included in this band may be too wide for this purpose.

### 3. PART III - CONNECTION

#### *Summary of responses: broad options for connection charging*

##### **Introduction**

- 3.1 Annex 4 to the EGWG Report identified five broad policy options for connection charging. The September 2001 consultation paper (paragraph 5.66) sought views as to their respective advantages and disadvantages as either interim or final solutions.
- 3.2 Although the responses to this consultation as a whole make it clear that the EGWG options have value primarily as the policy options that might underpin the next distribution price control, it seems helpful to record the responses here.
- 3.3 There was a total of 16 responses, of which eight were from generators, seven from DNOs and one from a supplier. Not all these responses expressed a clear preference.

##### **The EGWG policy options**

- 3.4 Under Option 1: the status quo would be preserved with:
- generators' paying 'deep' connection charges;
  - demand customers' paying 'shallowish' charges; and
  - demand customers' paying the balance of reinforcement cost, via DUoS.
- 3.5 Option 2 would see:
- shallow charging for generator and demand connections; while
  - load customers continue to pay reinforcement costs via DUoS.
- 3.6 Option 3 envisaged:
- demand continues to pay 'shallowish' connection charges;
  - generation pays 'shallow' connection with some level of UoS (entry)charge, perhaps as excluded service revenue; and

- reinforcement is financed from DUoS in the form of demand (exit) and entry charges.

### 3.7 Under Option 4 :

- demand would continue to pay 'shallowish' connection charges;
- generation would pay 'shallowish' charges, and some level of entry/UoS charges (perhaps as excluded service revenue); and
- reinforcement costs would be financed from exit and entry (UoS) charges paid by both demand and generation.

### 3.8 Option 5 envisaged that:

- Small and medium-sized generators would, like comparable demand connections, pay 'shallowish' connection charges and some combination of UoS charges; and
- Larger generator connections would be treated on a site-specific basis.

### **Preferences expressed in responses**

3.9 **Of the 16 responses, 13 (seven generators, five DNOs and one supplier) expressed some sort of preference from amongst these options. Four generators, four DNOs and the supplier all favoured Option 5, although one of these DNOs said that Option 4 might be as acceptable. To the extent that it is possible to understand why Option 5 emerged as the clear favourite, it would seem to be that it appealed as the fairest, most equitable option.** One response added that it would, over time, allow re-balancing of DUoS charges to reflect the overall benefits that distributed generation could bring to networks.

3.10 Two responses – both from organisations representing renewable generators – favoured Option 3. Another generator organisation favoured Option 2, but

acknowledged that it constituted a subsidy to distributed generation. One DNO favoured Option 1, on the grounds that it did not consider the existing connection charging regime to constitute a barrier to the connection of distributed generation.

- 3.11 Several responses, from both DNOs and generators, stressed the importance of consistency. They suggested that it would be inappropriate to adopt an interim solution that might prove incompatible with the outcome of the distribution price control review. A DNO, for example, pointed out that the timescale for generation projects was such that the company would soon be making connection quotations for connections planned for after the price control review. An inappropriate interim solution would clearly be unhelpful.

#### **Ofgem comment**

- 3.12 **Ofgem notes the majority view that Option 5 has attractions as the policy basis to underlie the next distribution price control and will keep it in view during the review process.** Ofgem also notes the views expressed about consistency.

#### ***Summary of responses: 'deep' versus 'shallow' connection charging***

##### **'Deep' connection charging as a barrier to entry**

- 3.13 **The consultation paper asked (paragraph 5.16) whether there was any foundation in the perception that 'deep' connection charges constitute a barrier to entry to the distributed generation market. Nine DNO and ten generator responses, plus three from other organisations, made for an interesting range of comments. It was noticeable that all the DNOs denied that deep connection charging policies constituted a barrier. The view of the majority of generators was that they constitute a significant barrier. It is also clear that there can be other, major factors at work in determining whether distributed generation projects go forward.**
- 3.14 One DNO reported that they had reviewed 85 Non-Fossil Fuel Obligation (NFFO) schemes quoted for connection to their system over the previous six years. Of these, 33 were landfill gas schemes, 34 were windfarms, and 18 others were mainly hydro and biomass proposals. NFFO contracts had been awarded



to 17 landfill, 28 windfarms and 14 others. As at the date of its response, this DNO suggested that:

- 15 of the 17 landfill sites had proceeded to completion - apparently irrespective of connection costs;
- only eight of the 28 windfarms had been constructed, with lack of planning permission being quoted to the DNO as the most significant obstacle; and
- five of the remaining 14 had reached the construction stage, although the reasons for failure in this category were not known.

3.15 The same response concluded that, while connection charges were a major variable and while other costs tended to be more predictable at early stages in the project, connection charges did not appear to have been a major influence on the ultimate success of projects. If it were the case that some generation projects could not justify economic connection charges, there might be a case for public subsidy to support government environmental objectives, but not for a distorted approach to connection charging policy.

3.16 Another DNO suggested that, in their experience, connection charges were often only a 'small fraction' of the total cost involved. The company expressed concern that the market might be tilted in favour of distributed generation, regardless of the economics that might imply that such entry might be inefficient.

3.17 Another DNO response suggested that non-distribution issues appeared to constitute more immediate barriers. These included refusal of planning permission, high gas prices, and variations in the prices paid to generators under NETA. As connection and DUoS charges were DNOs' primary income streams, it was essential that the impact of any interim proposal be fully understood before a licence modification was effected.

3.18 A former PES observed that 'deep' connection charges were rarely levied in respect of connections to its network. Accordingly there was no problem of deterrent effect. This response explained that the company treated demand and generation connections very much alike – apart from the fact that demand customers currently receive tariff support allowance.

- 3.19 Another DNO currently designed distributed generation charges to be cost-reflective. They considered it incorrect to regard cost-reflective connection charges as an undesirable barrier to entry – even if they were relatively high. It could be that the particular scheme was uneconomic in the absence of some form of cross-subsidy. Spreading the ‘deep’ asset proportion of connection costs over time would not materially alter the financial viability of distributed generation schemes, since the net present value (NPV) of such costs would, subject to discount rate differences, be the same as an ‘up-front’ charge. The introduction of this form of annualised charges would represent a source of project financing to distributed generators, provided on regulated terms. Such terms might be more attractive than other sources, such as the banks.
- 3.20 A further DNO also referred to financing, in the sense that regarding ‘deep’ charges as a barrier to entry effectively implied that distributors were a cheaper source of finance for distributed generators than were the normal financial markets. ‘Shallow’ charging could, on this view, imply DNOs’ bearing risks at levels that financial institutions would not. The company considered that such risks should be accounted for in the rate of return used in calculating any interim GDUoS charge – and in setting future price controls.
- 3.21 A vertically integrated energy company said that the issue of ‘second comers’ should be resolved, and that options for annuitising charges should be made available. However, the existing arrangements had the advantage of commercial certainty (and the absence of DUoS charges). An interim solution might best preserve the benefits of the existing arrangements, but give some increased incentive to DNOs to achieve connection at minimum cost.
- 3.22 One DNO considered that connection and use of system charging had been given too much prominence in the consultation, and that the potential of economic instruments, such as the Renewables Obligation and Climate Change Levy, to promote renewable generation had not been recognised. Nevertheless, this DNO saw no compelling reason for the separate treatment of demand and generation. The company proposed offering larger (HH metered) customers the option of funding non-contestable connection costs through higher UoS charges. A common capacity charge for both demand and generation seemed

appropriate, particularly as customers having their own generation were likely to increase in number.

- 3.23 **Some disagreed with the suggestion in the consultation paper that different treatment of generator connections to the transmission and distribution networks might create perverse incentives to connect at one voltage level rather than another. It was suggested that the choice of whether a generator connects to the transmission or distribution network is dominated by the relative economics of connection, arising primarily from the generator's size.**
- 3.24 **Generator responses said that 'deep' charges 'can be a critical factor in preventing a new project from moving forward', having a significant negative impact on the economics and financing of new distributed generation. The effect was particularly marked in the case of lower cost or smaller projects, where a 'deep' connection charge might have a relatively large percentage impact on overall project costs. The deterrent effect can be exacerbated by the difficulties of establishing costs for 'deep' connections, and especially:**
- **the cost of obtaining quotations for deep connection, and particularly the cost of studies carried out by DNOs;**
  - **the time taken to receive offers, particularly when there are implications for transmission networks; and**
  - **general lack of transparency and justification of costs.**
- 3.25 Generators and the organisations representing them were able to give specific instances in which 'deep' connection charges had prevented distributed generation schemes from going forward. Connection charges were 'regularly cited as contributory factors in undermining the commercial viability of CHP developments'. One response mentioned a city-centre CHP proposal that had been undermined by connection charges amounting to approximately 20% of the overall investment cost.
- 3.26 An organisation representing generators considered DNOs' charges for associated system studies to be an additional unwelcome cost. Another response considered that the timetable envisaged in the consultation paper was too long, and that much faster action should be taken to remove barriers to entry.

- 3.27 **As with DNO responses, there were some generators who saw merit in offering potential distributed generators the same sort of financing options that would be available for transmission connections. This would include a choice between 'up-front' payment and mortgage-type finance arrangements.**
- 3.28 It was pointed out that that 'deep' connection charging is only a barrier to entry in that it is more expensive than an alternative arrangement. If 'shallow' charging were introduced, with the balance being collected from distributed generators over a period of years, there might be no overall difference in the longer term financing of a scheme. Ofgem regards these as important arguments, which, taken together with wider concerns in relation to discrimination and cross-subsidies suggest a need seriously to consider offering potential generators a choice of payment method as an interim step, and a move to more 'shallow' connection charging at the next distribution price control.
- 3.29 One generator commented:
- "It appears that giving newly connecting generators the option of either paying this cost up front via a deep connection charge as now, or paying a lower charge (shallow connection) and a continuing Use of System charge to recover the balance of the costs is workable in the short term and would not prejudice a longer term review of charging structure. The ongoing Use of System charge could be set to recover the additional charges but perhaps with a higher rate of return for the DNO (subject to regulatory scrutiny) to reflect the position that the DNO is taking the risk of the Generator failing before all the costs had been paid up front. In return the new generator has the option to minimise the initial capital expenditure and only pay the remainder via Use of System if he is successful and remains on the system".*
- 3.30 **A supplier's response also drew attention to the payment options currently possible for transmission connections, and suggested that distributors might also offer potential generators the facility to pay part of the reinforcement costs 'up-front' and the balance through a UoS charge.**
- 3.31 One response reported that research data, derived from in-depth interviews with UK consumers (September 2001), indicated that 'deep' connection charging would be a barrier to the entry of DCHP. Charges for connection or network

reinforcement would remove customer savings from DCHP, creating a major barrier to market entry. This deterrent effect would be most marked in the case of the fuel-poor and disadvantaged households where DCHP held out the prospect of the greatest social and economic benefits.

- 3.32 **It seems reasonable to conclude that ‘deep’ connection charging, though there are arguments in its favour, can constitute a barrier to the successful completion of at least some schemes. Much will depend on the circumstances. It seems sensible to increase the choice available to potential distributed generators. As an interim step achievable before the price control review, choice as to the method of payment of non-contestable generation connection costs would complement moves to extend competition in connection work.**
- 3.33 **The time and expense involved in the process of network studies and formulating quotations can make a difficult situation worse – especially for distributed generation schemes with relatively low overall costs. Ofgem considers there to be a good case for setting specific standards to ensure improved service levels in this area, and will be consulting separately on them.**
- 3.34 An organisation that is currently considering the prospects for CHP at a large number of sites said that they would support a move to ‘shallow’ connection charges on the grounds that its members would welcome the move from capital to revenue charges when appraising projects. Moreover, DNOs, being low-risk, monopoly businesses, would attract a lower cost of capital than entrants into the distributed generation market. Another response stressed that a significant number of businesses that find it difficult to raise front-end funds would welcome a move to ‘shallower’ charging.
- 3.35 **It is clear that customers’ savings from DCHP could be eroded by inappropriate connection charges. As most DCHP units will be connected to existing supply cables, a connection charge may not be appropriate (i.e. installation of a DCHP unit where there is an existing single-phase electricity supply). Ofgem would need to be satisfied that any connection charge levied for this type of installation reflected genuine costs borne by the DNO. The building or upgrading of estates or groups of houses might require network reinforcement in respect of which a connection charge would be appropriate. It**

may be appropriate to create a recognised 'band' covering DCHP, and other small installations, allowing proper account to be taken of these considerations.

- 3.36 Ofgem attaches importance to the establishment of workable and comprehensible standard arrangements for the installation of DCHP and for the associated pricing and charging mechanisms. A separate workstream will take these issues forward, in consultation with other interested organisations.**

#### **Advantages and disadvantages of 'deep' and 'shallow' connection charging**

- 3.37** The Consultation paper asked for views on the respective advantages and disadvantages of 'deep' and 'shallow' connection charging regimes for prospective distributed generators. Eleven DNOs and 17 generators responded to this question. A transmission operator also commented. The issues raised are complex and will mostly have to await detailed consideration in the distribution price control review. This has, however, been a valuable start to the dialogue, and conclusions can be drawn from the responses that have been helpful in informing decisions on Ofgem's proposed interim solution.
- 3.38** Both DNO and generator responses highlighted the need for a clear, workable definition of 'shallow' charging.
- 3.39** Two DNOs listed what they considered to be the advantages of 'deep' connection charges. In summary, these were:
- **low commercial risk to DNOs;**
  - **minimal financial impact of stranded assets;**
  - **clear locational signals;**
  - **avoidance of the need to negotiate interruptible connections;**
  - **comprehensibility and ease of administration;**
  - **the issue of 'lost' depreciation charges that would have been charged to the generator under the existing connection charge policy;**

- a mechanism of termination payments, to cover the risk of stranded assets; and
- locational signals – perhaps through the development of a ‘fault current contribution rule’.

3.40 A DNO’s response said that the case for moving to ‘shallow’ connection charging had not been made. This response inclined to the view that the economics of transmission and distribution were different, and that ‘deep’ charging might be more appropriate for the latter. More thorough assessment was required before major change could reasonably be made. It was this company’s view that refinements to the existing ‘deep’ charging policy (e.g. reimbursement of ‘initial contributors’) would be preferable. This response also pointed to the likely high volatility of GDUoS charges. **DUoS charges for EHV demand connections were calculated on a site-specific basis and often had the appearance of ‘annualised deep connection’.** Mapping this across to generation, it seemed sensible to continue to assess HV and EHV connections as site-specific, even though some of the charges could be ‘annualised’. This would:

- preserve locational signals;
- offer the prospect of lower charges in the future, should more remote assets come to be shared; and
- maintain parity with existing distributed generators who had paid connection charges on similar principles.

3.41 For some DNOs, however, the desirability of simplicity and transparency suggested a move to ‘shallowish’ connection charging. Such a move would, however, require satisfactory security against early termination and some mechanism for allowing higher returns on investments entailing risks greater than those normally associated with network businesses.

3.42 Another DNO suggested that the comparison with the ‘shallow’ charging regime operated by NGC missed the point that NGC cannot always attribute deep marginal network costs to a particular connection. DNOs could make such

attributions. The focus of discussion should not be the relative advantages and disadvantages of 'deep' or 'shallow' connection, but rather addressing the concern of generators to commute part of 'up-front' connection costs to ongoing charges. Existing charging principles for load connections should apply to generation. As the costs would occur whether or not the generator was operating, a fixed capacity charge would be preferable to a unit-based charge.

3.43 Another DNO response emphasised the need for equitable sharing of costs between demand and generation connections. Any enduring cost-reflective charging regime would have to take account of the effect of distributed generation on maximum demands at various voltage levels. Certain costs (e.g. accommodating reverse power flows, fault levels and harmonics) could only be attributed to the distributed generation that occasioned them. There would be a need for clarity about the boundary between connection and UoS charging. 'Shallow' charging would seem to be for the next price control period, rather than for interim arrangements.

3.44 **It was clear from DNOs' responses that they do not all experience or understand distributed generation in the same way. In the South and East, there is, at present, little distributed generation being connected. In the North and West of Great Britain, in contrast, the Scottish distribution networks and at least the United Utilities and Manweb areas in England and Wales see considerable potential for connection of renewable generation. In these areas it also frequently seems to be the case either that the local network is relatively weak (there being few demand connections) or that network at higher voltages has reached its designed capacity and is in need of significant and costly reinforcement. Sometimes both circumstances obtain. Both resulting DNO viewpoints are valid and merit recognition in any regulatory solution. Moreover, the issue goes beyond connection charging. Even 'deep' connection charges would not, for example, extend to reinforcement of 132kV networks in anticipation of clusters of major renewable connections.**

3.45 **Because of the different situations that tend to confront them, the Scottish and North Western DNOs expressed considerable concern about the weakness of locational signals in 'shallow' charging. A change in charging practice could be significantly more onerous to these DNOs than to those further South and**



**East. One response suggested that, as the increased connection of renewable generation resulted from a national target, there might be a good case for meeting some of the costs on a national basis, rather than exclusively regionally.**

- 3.46 DNOs are under a legal obligation to develop and maintain an efficient, co-ordinated and economical network. A revised charging regime that might encourage the proliferation of generating plant in areas of sparse network and requiring considerable investment in deep reinforcement might not be in keeping with those duties. Expensive 'deep' reinforcement costs, moreover, would have to be met by others. To institute such a change now would increase DNOs' business risk, complicate charging and dilute locational signals. The interim stage of 'shallow' charging up-front with annualised 'deep' site-specific connection charges would avoid many of these drawbacks. A thorough re-evaluation could then be conducted at the time of the next distribution price control review.
- 3.47 One response suggested that the information required to construct 'shallow' charges would be more modest than was the case for a 'deep' regime. However, the common treatment of distribution and transmission connections did not appear to the company to be a significant issue. More important would be the complexity that could arise from the sharing of shallower assets and the question that this suggested about the desirability of moving from an asset to a tariff basis for charging.
- 3.48 **Generators and those representing their interests mostly – but not universally - supported 'shallow' connection charging.** One organisation representing generators was of the view that there should be no connection charge at all for the smallest category of distributed generation. These were installations that would lend themselves to type approval and to standard connection and system-protection regimes.
- 3.49 **A generators' association pointed out that all transmission users pay for the transmission infrastructure development required to meet the needs of new generating capacity. That is to say that TNUoS charges are made both on 'entry' (i.e. generation) and on 'exit' (i.e. demand) from the transmission**

networks, the greatest contribution coming from the demand side. In contrast, distributed generators provide all the necessary finance for their connection. This, it was suggested, makes the networks less accessible to new entrants. This response therefore favoured the entry and exit charges proposed in the EGWG report. Entry charges should cover all entry users, including interconnections from the transmission network.

- 3.50 One response also argued for a fund for strategic investments (possibly raised from distribution system exit charges) as a way of ensuring that 'initial contributor' generators would not be faced with paying the full, deep costs of connection.
- 3.51 A generator made the point that larger distributed generators often pay transmission charges, as well as having paid 'deep' connection charges to their host DNO.
- 3.52 Another response said that 'deep' charging gives DNOs no incentive to plan and operate their networks so as to make capacity available to distributed generation. Although GDUoS charges could be set to enable DNOs to recover their costs, this response suggested that 'shallow' charging would create an incentive for DNOs to find the most cost-effective ways of making capacity available.
- 3.53 **Others also supported a move to 'shallow' charging, which would:**
- **provide a more equitable allocation of costs between connected customers, in the long term;**
  - **be more consistent with the situation facing transmission-connected generators;**
  - **remove the risk of discrimination against the first-comer;**
  - **limit the scope for abuse of monopoly power by the DNOs in setting connection charges; and would**
  - **mirror the treatment of CHP connections by Transco.**

- 3.54 One response suggested that **some form of zonal DUoS charging might preserve locational signals. Zonal charging is considered elsewhere in this document.**
- 3.55 A large distributed generator questioned the appropriateness of the locational signal in 'deep' charging. CHP and renewables were frequently not able to choose the location of their generating sets. In these cases the only responses to a locational signal would be to build or not to build.
- 3.56 Other generators supported 'shallow' charging, on the grounds that 'deep' charging is not compatible with the purchase of rights to use the network. 'Deep' charging would reflect the degree of slack in the system and the investment needed to make the connection. This approach created the problem of first and second comers. The company believed the merit of 'shallow' connection charging to be that it would separate the costs of specific assets needed to connect a party from the charging methodology for use of system. The latter should reflect more general economic principles as well as providing appropriate price signals. The question of initial contributors and second-comers is considered in more detail later in this paper.
- 3.57 Another generator's response suggested that, in assessing the connection costs of distributed generation, proper account should be taken of the contribution to fault level of transmission-connected generation. In many cases, new distributed generators are expected to meet the full, and often high, costs of replacing switchgear to accommodate increased fault levels. These costs should be shared more equitably amongst those contributing to excess system fault level.
- 3.58 **Not all generators, however, were enthusiastic about the prospect of a move to 'shallow' connection charging. One was sceptical about the benefit that 'shallow' connection charging would bring in circumstances in which generators would pay the difference between 'shallow' and 'deep' costs in DUoS charges. The company also suggested that 'shallow' charging could result in reinforcement, necessary for the new generation, not being carried out.**
- 3.59 Another major generator suggested that a GDUoS charge that did not create cross-subsidies between generators – or between generators and demand

customers – would have to be site-specific, complex and no better than the existing system.

- 3.60 **Ofgem favours a move to a ‘shallower’ connection-charging regime, but recognises that it will not be possible to create a fully-fledged set of arrangements in advance of the distribution price control review. To the extent that some DNOs (possibly those on whom there is presently the least pressure to make distributed generation connections) already have what is effectively a ‘shallow’ or ‘shallowish’ connection charging regime, Ofgem welcomes the fact. In the period to the next price control review, other DNOs should give serious consideration to offering choice between up-front charges and spreading the payment of ‘deeper’ reinforcement costs over an appropriate period of years (‘annualised charging’). It would be sensible for DNOs to take reasonable steps to manage the additional risk that this would entail. Termination payments would be one way of doing so.**
- 3.61 **Moving to a less site-specific method of recovering deep costs would raise much wider questions of risk and reward in DNO businesses. These can only be addressed as part of the more thoroughgoing and comprehensive understanding that will develop from workstreams associated with price controls and charge structures.**
- 3.62 **Another reason for retaining site-specific charging for the present is Ofgem’s recognition of the importance that many responses attached to the locational signals in ‘deep’ charging. There may be possibilities for replacing locational signals with elements in variously structured GDUoS options, but these also require careful consideration and consultation. The potential volatility of GDUoS charges applying to what is currently a relatively small distributed generator population is yet another such factor.**

#### **Interruptible generation connections and ‘shallow’ charging**

- 3.63 **The consultation paper (paragraph 5.27) sought views as to the extent to which interruptible generation connections might, under a ‘shallow’ connection-charging regime, be an issue at distribution voltages. Twenty responses touched on this question, of which eight were from DNOs and 11 from generators.**

- 3.64 A generators' association pointed out that large-scale and transmission-connected generators benefit from firm access rights to the network and compensation for lack of delivery. They considered that such rights should accrue to distributed generation and consider it wrong that, having paid deep connection charges, distributed generators receive no compensation when the network is down.
- 3.65 A major distributed generator disagreed with the suggestion that 'deep' connection charges secure firm access rights for distributed generators. Their response pointed out that, when a distributed generator which is not a Balancing Mechanism participant suffers from a transmission constraint or failure, its contract quantities are not honoured<sup>13</sup>, and the parties involved are both deemed to be out of balance. They maintain that this is not 'firm access' in the sense that transmission-connected generators enjoy it.
- 3.66 NETA also influenced a number of respondents' views. One response argued that interruptible connection, under a 'shallow' charging policy, would probably run contrary to the requirements of a unit operating commercially under NETA. Such a generator would have concerns about honouring long-term contracts and about exposure to the balancing market. An interruptible connection would not be desirable. Similarly, another considered that "interruptible generation connections would further exaggerate the discriminatory treatment of distribution-connected generation under NETA". This response also expressed the view that specifically interruptible generation connections would risk delivery of reliable supplies of heat and power from CHP plant to host. In both senses, interruptible connections would undermine the case for investment in the major proportion of distributed CHP plants. Explicit interruptible connections could not be introduced until appropriate arrangements had been adopted to address asymmetry of treatment and to transfer the burden of imbalance risk from the distributed generator to the DNO.
- 3.67 A major generator argued that the concept of users' having a choice of interruptible or firm connections was flawed. Connections of differing levels of security would threaten overall network security, placing security of supply at

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<sup>13</sup> Ofgem comment: It should be noted, however, that both transmission and distribution connected generators are exposed to imbalance charges when transmission failures occur.

risk. The company maintained that a minimum standard of connection for distributed generation should be developed as part of any review of Engineering Recommendation P2/5.

3.68 Some maintained that firm export rights should accompany the introduction of any form of DUoS charge for new distributed generation. The lack of such rights could create significant difficulties when arranging the financing of new projects. The investment decisions of existing distributed generators would have been made on the presumption of unhindered access to market for the sale of power. Any reduction in access would further reduce the output of distributed generation.

3.69 Not all generators, however, favoured totally firm connection. One indicated that the majority of wind generation projects did not require 100% firm export conditions, and that reinforcing networks to that standard would be economically inefficient and would lead to unnecessarily high network charges. This response therefore favoured giving generators the choice of non-firm connection – provided that they would not be exposed to unknown and uncontrollable risk as a result. This response suggested that associated issues to consider would include:

- provision by DNOs of sufficient information to allow prospective generators to assess the likely frequency and extent of interruptions or constraints;
- mechanisms for sharing of constraining down between generators; and
- defining DNO responsibilities or incentives to upgrade parts of the network subject to routine constraints.

3.70 In the submission of one large distributed generator, there should be a commercial framework enabling both generators and demand customers freely to enter into contracts to provide clearly defined services under commercially negotiated market conditions. This might, or might not, include interruptible connection terms. One supplier took substantially the same view, suggesting that interruptible connection arrangements should be considered as part of the commercial and negotiable arrangements between a generator and distributor.

Agreement to take non-firm access arrangements would be reflected in reduced charges.

- 3.71 As one DNO observed, a move to 'shallower' connection charging would tend significantly to dilute the existing incentive on potential distributed generators to choose non-firm connection. The drawback here would seem to be the possibility of network investment over and above what was really required.
- 3.72 It had been the experience of another DNO that most generators had chosen to have unfirm distribution network connections, to reduce their capital costs. In most cases, this company's response suggested, relatively shallow assets would provide the security, and a shift to 'shallow' connection charging might make little practical difference. Security of access to the transmission network was generally governed by the capacity of the upstream network and by the requirements of P2/5. In a shallow connection regime, there would be little incentive for a generator to accept a connection with any significant degree of operational constraints – particularly as DNOs do not make constraint payments.
- 3.73 A vertically-integrated energy company pointed out that the management of constraints was a critical element of interruptible connections under a 'shallow' connection charging policy. The situation could prevail for the short or long term, depending on progress with planning, consents and construction phases of reinforcement. The policy and mechanisms for constraint management would, the response suggested, need to be thoroughly thought through before a 'shallow' connection policy could be adopted.
- 3.74 One DNO questioned whether the issue of interruptibility was really a matter of 'deep' or 'shallow' connection charging, but rather one of commercial response to the costs of providing a connection. Their response suggests that generators should be free to contract for constrained connections. Another DNO was of a similar view, suggesting that the cost of resolving constraints should fall on the generator, to whom the DNO could offer a range of connection options. The company considered that a standard GDUoS tariff could provide a basic level of security. Any additional security would be for the generator to negotiate with the DNO. Irrespective of whether the assets in question were 'deep' or 'shallow', any payment for additional security could be recovered in the connection

charge. It would not be appropriate to create a cross-subsidy by smearing these costs across the generality of connected parties. In terms of firmness, the main options suggested were:

- a simple tee off a passing circuit (low security - vulnerable to faults, maintenance constraints, upstream asset outage etc.);
- a double circuit tee (medium security, being less vulnerable to local cable outages); or
- separate connections to two electrically independent main substations (very secure).

3.75 Other DNOs also declared themselves ready to provide low security connections – provided that the generator was aware of the possibility of interruption, and prepared to accept that risk. Generators tended to accept network connections without additional security. This contrasted with the practice of large demand customers who frequently paid for security additional to the requirements of P2/5. This difference in preference might reflect differences in perceived trading risks.

3.76 Another DNO agreed with Ofgem's assessment that the issues of interruptibility would not be resolved before the price control review. The company suggested that considerations of firmness of connection should not be allowed to delay sensible interim measures that would facilitate the majority of distributed generation schemes. For many of these, firmness of connection was unlikely to be an issue. Others considered that special cases, involving large generators and major constraints, could be resolved by specific agreement. There was no need to allow such special cases to drive a general policy.

3.77 Responses addressing interruptibility have been helpful. **Ofgem concludes that a move to shallow charging would not necessarily result in problems over network access. Generators seem to ascribe a greater or lesser value to a firm connection depending on the type of prime mover<sup>14</sup> that they operate. This suggests that a degree of choice as to the firmness of connection is desirable.**

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<sup>14</sup> The component of a power plant that transforms energy from the thermal or the pressure form to the mechanical form, operating the generating set (e.g. the steam turbine in a thermal power station, the blades of a wind generator or the water turbine of a hydro-electric plant).



In practice, such choice seems already to be available. There are locations – perhaps mostly in the Northwestern part of England and in Wales – where some thought will have to be given to constraint management. In Scotland, some valuable work has already been done on agreed methods for managing constraints.

- 3.78 There seems to be merit in the suggestion that any GDUoS charge should cover only the basic level of security of connection, any reinforcement work for an enhanced level of security being recovered in the connection charge. If, however, basic charges covered 'firm' connection, consideration should be given to building in sufficient flexibility to reward generators that are adversely affected by system constraints.
- 3.79 **There remains the question of deeper reinforcement in anticipation of (or in order to attract) clusters of major renewable connections. If the price control regime were to permit 'deeper' reinforcement in anticipation of requests for connections, the question of the individual generator's paying for firm access might arise less frequently. This cannot be addressed in a short-term adjustment to connection charging policy, but must wait for the price control review. In some parts of Great Britain it will, by then, be a pressing issue. In the interim, Ofgem would be prepared to consider how any specific and properly-justified reinforcement scheme might be financed.**

Ofgem recognises that firmness of connection is one of the distributed generation issues on which Engineering Recommendation P2/5 has a direct bearing. Ofgem will be seeking separate discussions about the possibilities for amendment of P2/5. As regards Scottish networks, proper account would, concurrently, have to be taken of NSP 366, which parallels NGC's planning standards and which, because 132kV is a transmission voltage in Scotland, applies to smaller generation connections there.

### *Summary of responses: scope for negotiation and charge disclosure*

#### **Transparent negotiation as an interim mechanism**

- 3.80 The consultation paper (paragraph 5.42) asked for views on the potential scope for more structured and more transparent negotiation of charges as an interim mechanism for the connection of distributed generation. 17 responses dealt with this question, of which nine were from DNOs and five from organisations with generating interests.
- 3.81 **About half the DNO responses claimed that negotiation already takes place. If DNOs could see the prospect of reward for connecting new generation, they might be more inclined to share benefits with developers.**
- 3.82 **A particular difficulty, however, concerned clusters of distributed generation proposals in respect of the same area of network. The DNO is faced with different combinations of such schemes that might go forward – on varying timescales. Each potential outturn can alter the costs that would be quoted to each individual scheme. This dilemma is further complicated by confidentiality requirements between the various parties.**
- 3.83 Another DNO suggested that, initially, they would want to treat all distributed generation connections, including micro-generation and DCHP installations, as one-off schemes (and therefore, apparently, offering scope for some negotiation). This response considered that these small schemes would presently offer little to the network in terms of improved security and reduced losses. The company acknowledged, however, that a large micro-generation population might bring some network support through diversity. Such a development might be helpful in formulating GDUoS charges.
- 3.84 Another DNO response pointed out that it was difficult to quantify the benefits to be derived from distributed generation. As a consequence, it was difficult to bring such information into a negotiation process aimed at equitable sharing of benefits.
- 3.85 One DNO response suggested that, for larger projects at least, an interim charge likely to bring the greatest benefit at least cost would be the complete and

transparent sharing of DNO connection project workfiles with the prospective generators.

- 3.86 **The generator responses were generally strongly in favour of negotiation. Those that expressed reservations seemed to be doing so because of doubts as to whether a genuine negotiation was a practicable possibility.** One company emphasised that no generator – proposed or existing – should face any net increase in total charges as a result of the introduction of interim or enduring charging framework.
- 3.87 A generators' association suggested that the basis on which negotiation took place should be clearly understood, and that there should be "a reasonable degree of standardisation of approach". Conditions of connection should be clearly defined, and in the public domain. This would allow an outline assessment of the cost and risks of a connection without resorting to detailed negotiations. Negotiations with DNOs could impose considerable costs on prospective developers.
- 3.88 One generator suggested that, as DNOs are monopolies, negotiation could only take place in a framework laid down by regulatory rules. Negotiation should, for example, extend to firmness of connection and whether payment might be spread over time. Whether the potential distributed generator should pay for a particular asset would best be set out in the regulatory framework.
- 3.89 Another organisation representing generators, on the other hand, declared itself strongly opposed to negotiation in setting network charges for generator connections. It considered site-specific charging to be inconsistent with the need for transparency. Small developers, moreover, did not have the information or resources to engage in negotiation with DNOs on anything approaching an equal footing. Instead, the response advocated a straightforward and transparent methodology for calculation of connection and GDUoS charges.
- 3.90 **The response from energywatch echoed this in suggesting that the DNOs and their associated connections businesses retained too much market dominance and control over information for negotiation to be a basis for fixing charges. This being so, it was essential that recourse to investigation of disputes by**

energywatch, with ultimate right of referral for determination by Ofgem, should remain.

3.91 The impression gained from all these responses is that it is not so much the lack of negotiation that is the problem, but rather the various constraints that are placed on it. These constraints arise from a number of causes, and it may be that the best way of ameliorating the position of prospective distributed generators, in the short to medium term, would be to address them individually. Some will be easier than others, but they seem to include:

- asymmetry of information;
- cost of quotations;
- the difficulty of identifying a common basis for negotiation;
- lack of understanding of the network impact of distributed generation;
- lack of incentives on DNOs to make generation connections;
- the risk of apparent discrimination;
- lack of recognition of distributed generation in ER P2/5<sup>15</sup>; and
- 'Clusters' of applications bringing uncertainty and confidentiality concerns.

3.92 Ofgem considers that work already done on Long-Term Development Statements (under distribution standard licence condition 25) has already made it significantly easier for prospective distributed generators to assess schemes – without having to make an immediate request for an expensive system study. The Distributed Generation Co-ordinating Group will be asked to make recommendations on P2/5.

3.93 The suggestion on the sharing of connection workfiles with prospective generators has considerable merit. Ofgem would urge all DNOs to adopt it as a workable and cost-effective interim contribution to transparency in charging.

3.94 Standard charging may be easier to achieve as the population of distributed generators increases. Increasing numbers are also certain to improve understanding of the technical impact of generators on distribution networks.

3.95 For the avoidance of doubt, there is no suggestion that any increase in or change of approach to negotiation of connection and/or GDUoS charges would affect the existing rights of complaint to energywatch or determination by Ofgem.

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<sup>15</sup> Engineering Recommendation 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. Copies of the recommendation may be ordered from [www.ea-eng.org.uk/eadocs](http://www.ea-eng.org.uk/eadocs)

### The scope for disclosure of specific charges

- 3.96 **The consultation paper suggested that it might be possible to agree disclosure of prices charged to distributed generators. While, on the one hand, this might tend to improve transparency, there is clearly a serious confidentiality issue here.** In an effort to discover what might be possible, the consultation paper (paragraph 5.40) asked for views. The fact that relatively few responses addressed this question implies that it did not arouse any great enthusiasm. Of the 11 responses to comment, six were from DNOs and four from generators.
- 3.97 The response from energywatch suggested that a “significant step forward in extending transparency in what constitutes reasonable charges and charging methodology” would be for Ofgem to publish in greater detail the specific charges and the associated relevant technical detail in its connection charge determinations. Energywatch reports instances of DNOs’ treating determinations of demand connections as isolated cases with nothing to say about future connection charges. Ofgem considers this to be a constructive suggestion and will endeavour to give more detail in future, although it would seem necessary to seek the permission of the parties to reveal the detailed costings.
- 3.98 Some had no concerns about the disclosure of charges and technical details. The development of competition in connections was making connection costs increasingly discoverable for potential developers.
- 3.99 Others were sceptical about the publication of non-contestable charges, which, it maintained, were affected by too many diverse factors (including proximity of connection, network capacity, loadings, machine designs and operating duty) for details of individual charges to be helpful. One DNO stressed that there was adequate protection under the Competition Act 1998 and through the right to determination of disputes.
- 3.100 Another DNO considered that the development of a marginal cost approach (based on the disclosure of detailed commercial and technical benefits) would require considerable work. The necessary technical models would have to be developed. Variation of costs and benefits over time would require regular reassessment and charge adjustment. This company doubted the workability of such a system.

- 3.101 One generator considered transparency to be an important element in facilitating the delivery of trading benefits to distributed generators. A major generating company suggested that it should be possible to construct a transparent GDUoS tariff, thereby restricting negotiation to shallow connection assets. Such a solution would be in line with the EU preference for regulated access arrangements.
- 3.102 **Ofgem recognises the concerns of DNOs to avoid administratively burdensome mechanisms, and to respect the confidentiality of information that they receive from developers. Work on Long-Term Development Statements constitutes a significant step towards improving transparency. Possible improvements to Condition 4 Statements are considered later in this paper.**
- 3.103 **Although some responses from organisations representing generators said that they would welcome improved transparency, they advanced no practical proposal as to how it might be achieved. Ofgem will continue to bear in mind the importance of the degree of detail in formal determinations, and will consider the extent to which there may be scope to standardise on best practice. Perhaps generators' organisations could ascertain whether their members have information about individual connections that might be of assistance to prospective distributed generators, and that they would be prepared to share.**

**A 'with-without test'**

- 3.104 **Ofgem wanted to explore the possibility of increasing the scope of connection charge negotiations to recognise the benefits (or disadvantages) that distributed generation might bring to any given part of the network. The concept of 'with-without' test might be of particular interest to those planning medium to large generator connections, and could help to improve transparency.** Such a test could be helpful in formulating a GDUoS tariff.
- 3.105 The consultation paper asked (paragraph 5.44) for views on the availability of, and prospects for, methodology for modelling power flows and losses in a 'with-without' test. It is not surprising that nine of the 15 responses dealing with this question were from DNOs.

3.106 One DNO agreed that a 'with-without' test would be possible, but said that it would be complex and would require extensive development. Such a test might best be phased in as part of an ancillary services framework. This response contained a good summary of current practice:

*"All DNOs have modelling packages that can be used to model power flows. Modelling of network losses is also carried out, but there is likely to be different methodologies applied. The substitution method is currently used to establish loss adjustment factors. Marginal loss calculations have been applied in academic analysis. In order to assess the full impact of generation it may be necessary to assess the technical and commercial upsides (and downsides) of embedded generation (and demand) in terms of a range of technical areas including security of generators and existing demand connections, reliability, voltage control, protection, stability, quality of supply in addition to power flows and losses. The impact on operational procedures and constraints would also have to be considered as networks become more actively managed."*

3.107 Another DNO pointed out that network losses might be reduced or increased when the generator was running, and should be reflected in a unit-related GDUoS charge. Stage 2 trading rules of the Balancing and Settlement Code would enable account to be taken of those situations in which generation increased losses. Network support from distributed generation would only produce a realisable benefit where costs could be avoided or deferred. Recognition of network support should be negotiated agreements between DNOs and generators.

3.108 **Other DNOs considered that the cost of modelling was such that it would be unlikely to be worthwhile for any but the largest schemes. One, however, indicated that, while the methodology might be similar to that currently used to determine line loss factors, the greater complexity of modelling power flows and losses would require further research work.** One response suggested that Ofgem should instigate such research. Another DNO was of the opinion that, for wide-scale application, a relatively simple, generic methodology would be required to effect studies of system power flows, fault levels, voltage levels, and losses - on a 'with-without' basis.

- 3.109 A further DNO response said that the company currently modelled losses only for EHV-connected generators. **Although a ‘with-without’ test for smaller distributed generation schemes would add significantly to the costs of system modelling, it was, theoretically, the approach that DNOs would wish to take. The response looked forward to a time when modification of the security requirements in ER P2/5 had been amended to allow DNOs to treat generation support for the network on the same footing as reinforcement proposals. Where a ‘with-without’ test confirmed that a generation proposal could result in deferment of reinforcement, there would be a benefit to share with the generator. There were, however, wider issues of sharing the benefit of savings. DNO investment patterns would change. One of the most challenging aspects would be to understand how and at what times numerous, small, distributed generators might displace load (i.e. reduce maximum demand on parts of the system).**
- 3.110 It was the view of some that such a test would be complex to apply, and that it would inevitably reduce transparency. The possibility had also to be faced that load customers might be prompted to request a similar test for their connections.
- 3.111 A further DNO’s response also recognised that the results of power-flow modelling would be dependent upon the interaction between the assumed time pattern of generation with the time pattern of local network demands and power flows. The company pointed out, however, that distributed generation would be unlikely to be constrained-on to meet the DNO’s needs. That fact would make robust power-flow modelling difficult.
- 3.112 Others’ reservations about the ‘with-without’ test were mainly founded on non-technical issues. Such a test, as part of a process of negotiation, might run counter to the EU preference for regulated network access arrangements. Moreover it would not work easily with increasing competition for connection work. There was the practical difficulty of applying the test in circumstances where there were concurrent developments on the same part of the network.
- 3.113 An organisation representing generators applauded the principle of a ‘with-without’ test, but suggested that it would prove difficult to agree a transparent methodology to achieve valuation. Key issues to resolve appeared to be:



- definition of a materiality limit;
- transparency in structure and application;
- applicability to different connection voltages; and
- agreeing DNO service standards, together with appropriate redress for breach.

3.114 Another response pointed out that, while a ‘with-without’ test would identify the reinforcements required, it would not identify who else would benefit from them and how that would change over time. This response concluded that other charging approaches merited consideration.

3.115 **Ofgem concludes, on balance, that it is too soon to apply a ‘with-without’ test for smaller distributed generation schemes. Work has first to be done on developing a methodology that appropriately balances the requirements for increased complexity in modelling and suitability for large-scale (and perhaps relatively low cost) application.** Ofgem also recognises the force of the point about changing network conditions. Over the coming years, distribution networks are likely to be subject to considerable change. The question of ‘with-without’ modelling is however, one that the DGCG’s Technical Steering Group might usefully consider.

3.116 **A commercial issue requiring further thought is highlighted in a DNO’s response. It may be that, diversity apart, the contribution of distributed generators to network performance can only be fully acknowledged and rewarded through contracts with DNOs that ensure generators export when they can provide the network benefits. For some generators, at least, this will have to be balanced with prevailing conditions in the NETA generating market. There would seem to be an issue here of trade-off between imbalance charges and penalty payments under ancillary service or load-management contracts.**

## *Summary of responses: initial contributors and second-comers*

### Introduction

- 3.117 As more distributed generation is connected, the situation will increasingly arise in which, under a 'deep' connection charging regime, a subsequent generation connection might 'free-ride' in the use of expensive network assets paid for by an earlier generation connection (the 'initial contributor') to the same part of the network. This suggests some mechanism for reimbursement of the initial contributor from the proceeds of the subsequent connection. Acknowledging that this issue could not be fully resolved as part of an interim arrangement to remove barriers to the entry of distributed generation, Ofgem's consultation paper (paragraph 5.49) asked for preliminary views on the issue.
- 3.118 The Electricity (Connection Charges) Regulations 2002<sup>16</sup> permit reimbursement of the initial contributor from connection charges levied on second-comers. However, they extend only to domestic premises. DNOs have the option of charging the initial contributor a lower amount in the first instance, in the expectation that there would be subsequent connections from which the balance of costs could be recovered. This latter option is, however, hardly a workable solution. There may be a case for amending the Regulations.
- 3.119 Of the 19 responses covering this issue, nine were from generating interests and nine from DNOs. The other was from energywatch. **There was considerable consensus as to the need for equitable treatment of initial contributors, although responses highlighted different views on practicability and on how any reimbursement mechanism should operate.**
- 3.120 Paragraph 5.50 asked DNOs to indicate whether their existing record systems might be sufficient to support reimbursement of generator initial contributors. Seven DNOs responded to this question.

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<sup>16</sup> The Electricity (Connection Charges) Regulations 2002 came into force on 11 February 2002. They replace the Electricity (Connection charges) Regulations 1990, but make only consequential changes, resulting from the Utilities Act 2000. The Regulations may be ordered from: [www.clicktso.com/bookstore.asp?AF=A10034&FO=32180&Action=Book&ProductID=0110393384](http://www.clicktso.com/bookstore.asp?AF=A10034&FO=32180&Action=Book&ProductID=0110393384)

## Generators' views

- 3.121 Four generator responses said that DNOs should be required to keep asset registers specifically to facilitate reimbursement of generator initial contributors. One suggested that the system of reimbursement should be simple, and on the same basis as that currently operating for demand connections. Another said that, given the duration of planned asset lives, there should be an obligation to keep registers for an extended period.
- 3.122 Three generator responses commented on reimbursement in the context of the debate about 'deep' and 'shallow' connection charge options. One regarded inequities in the treatment of first and second comers as yet another example of the drawbacks of 'deep' charging methodology. A move to 'shallow' charging and GDUoS would provide a more equitable basis for charging.
- 3.123 One response suggested that registers of connection assets would have to be generally available to current and prospective generators.
- 3.124 A further generator response suggested that, under a 'deep' charging regime, it would be appropriate to extend the reimbursement mechanism to encompass future network reinforcement by the DNO as well as common systems and equipment utilised for future demand connections.
- 3.125 Yet another recognised that a shift to 'shallow' charging would diminish the significance of this issue. Under a 'deep' charging regime, however, explicit introduction of reimbursement for initial contributions would provide for a more equitable allocation of costs. Nevertheless, this response noted that there were practical limitations to be recognised. Those considering investment in distributed generation would be unlikely to take the expectation of future reimbursement of connection costs into account. It would not be sufficiently predictable. As it would not impact on the investment decision, the question of reimbursement could not be a factor in incentivising new distributed generating plant.
- 3.126 One response highlighted potential difficulties in the definition of connection assets under a 'shallow' charging regime. A generator located remotely from the established network might require long connecting lines which, though probably

regarded as connection assets rather than infrastructure, could bear subsequent connections.

### **Views of energywatch**

- 3.127 The response from energywatch shared the view of generators that it should be possible for DNOs to maintain adequate records to support the reimbursement of initial generation contributors. This response also advocated a robust system of audit and enforcement without which, it maintained, DNOs would be unlikely to comply with the requirement to reimburse. To energywatch, this potential difficulty of ensuring compliance also suggested that a 'shallow' charging regime would be appropriate.

### **DNOs' views**

- 3.128 Two DNOs supported the principle of reimbursement, although one of these stressed that such payments could not be made retrospectively to existing distributed generators. Similarly, another DNO supported the idea in principle, while stressing that current systems and processes would not accommodate it.
- 3.129 Another referred to the complexity and cost of making reimbursements to domestic premises, under the 1990 Regulations (The same would be true of the 2002 Regulations). The company suggested that a similar process for generation would be invoked more frequently, resulting in significant administrative cost. Such costs could be reduced by time limitation, but that would have the effect of discouraging applications for connection until after the expiry of the time limit. Such an effect would run counter to the Government's policy of encouraging distributed generation. One DNO favoured a limitation to five years, as a way of ensuring parity of treatment between classes of customers and of avoiding unwieldy administrative arrangements.
- 3.130 In contrast, another DNO commented that it:
- "...already operates a similar scheme for compliance with the Electricity Connection Charges Regulations 1990. Extending our approach to cover generators and reinforcement costs would obviously involve some additional expense, but need not be excessive if the requirement was known in advance."*

- 3.131 Not all DNOs anticipated that a reimbursement scheme would be invoked frequently. It was the experience of one that spare capacity – in terms of voltage or power flow – was rarely available to second comers on plant and cables connecting generators to the network. This was because generators often insisted on the absolute minimum design for their new connections. As such, the principles applicable to reimbursement of demand connections might not generally be applicable to generation connections.
- 3.132 Two DNO responses said that the company's present record system would be sufficient to support reimbursement in accordance with the principles underlying the Connection Charges Regulations. Another's records extended back for only five years, but would otherwise be sufficient. Similarly, while one DNO's existing records did not lend themselves to this purpose, the company regarded it as feasible to maintain a register of existing assets going forward. Generally, DNOs seemed to consider that reliable registers could, from now on, be kept – albeit at some cost.

#### **Ofgem Comment**

- 3.133 There is some force in the point that investment appraisals would be unlikely to factor in the possibility of unspecified future reimbursement, and that facilitating reimbursement would not directly incentivise distributed generation connections. Ofgem is not, however, concerned here with creating a direct incentive, but rather with ensuring equitable treatment of connected parties. Removing the possibility of 'free-riding' by second comers would appear to be helpful in creating a generally more benign environment for distributed generation. Given the radial nature of distribution networks and the likelihood of 'generation only spurs' being treated as connection assets, even under a 'shallow' connection charging policy, the need for reimbursement may well be a continuing issue.
- 3.134 **Ofgem does not accept that maintaining adequate records to support reimbursement of initial contributor distributed generators would be disproportionately onerous or expensive. Indeed, reimbursement would appear to be an important adjunct to cost-reflective connection charging.**

- 3.135 DNOs would have to carry out varying amounts of work to render their records suitable to allow reimbursement of generator initial contributors. However, the consensus appears to be that such changes would be feasible. Ofgem is not persuaded that a five-year time limit would be helpful – particularly given the relatively long life of distribution assets.
- 3.136 There appears to be some variation in the extent to which DNOs (and formerly PESs) have organised themselves to comply with the Electricity (Connection Charges) Regulations 1990. The comments from energywatch indicate that the consumer council has also noticed this. Perhaps some PESs only rarely encountered instances in which a domestic connection would have attracted a reimbursement. In such circumstances, the requisite record-keeping may have seemed relatively burdensome. If reimbursement of generator initial contributors were likely to be more commonplace, the administrative framework to support it will appear proportionately less costly.
- 3.137 It was recognised, at the time that the Utilities Act 2000 received Royal Assent, that distributed generation would necessitate modification of the Electricity (Connection Charges) Regulations 1990. The result was the Electricity (Connection Charges) Regulations 2002. However, the regulations currently apply only to initial contributions in respect of domestic premises. Section 19 of the Electricity Act 1989, (as amended by section 46 of the Utilities Act 2000) enables the Secretary of State, after consultation with the Gas and Electricity Markets Authority, to make amended regulations. Ofgem will therefore discuss with DTI the prospects for consultation on extending the regulations to permit reimbursement of initial contributors in respect of generation (and other) connections.
- 3.138 Subject to further consultation, and in recognition of the fact that the distinction between demand and generation connections may become less distinct in the longer term, Ofgem's initial view is that it should be possible for reimbursement of either generation or demand connections to arise from subsequent connections characterised by generation, demand or a combination of the two.

## 4. PART IV – USE OF SYSTEM CHARGING AND THE POSITION OF EXISTING GENERATORS

### *Summary of responses: interim generator distribution use of system charges (GDUoS)*

#### Introduction

- 4.1 The prospect of moving to shallower connection charging raises the question of some sort of GDUoS charge. This is a complex question, which it will be proper to address in the distribution charge structure review. The consultation paper (paragraph 5.71) looked to interim arrangements, and sought to explore the possibility of a GDUoS charge that might do more than recover the balance of connection charges. Could such a charge at present reflect the costs or benefits that distributed generation might bring to the network?
- 4.2 There was inevitably some overlap here with respondents' consideration of the idea of 'with-without' test. Identification of costs and benefits is one issue, while the split of cost recovery (or recognition of benefit) between connection charges and UoS charges is another. In the section of this paper dealing with the prospects for a 'with-without' test, Ofgem concluded that it would not be feasible to introduce such a test before more work has been done on modelling the impact of generation on distribution networks. Similar conclusions seem to emerge here.
- 4.3 Of the 24 responses covering this issue, ten were from DNOs and 12 were from those representing generator interests.

#### Generators' views

- 4.4 The consensus amongst generator responses seemed to be that, for an interim GDUoS that went beyond recovering 'deep' connection costs over time, a simple and straightforward mechanism would have to be found. One suggested that any interim solution might be based on a simplified 'with-without' model, incorporating locational signals.

- 4.5 Another considered that, where DNO and generator agreed on the identification of material benefits (or costs) arising from the connection of distributed generation, it would be appropriate to recognise them in charging. Any enduring solution, the company suggested, would have to be more sophisticated than merely changing the payment stream associated with 'deep' connection costs.
- 4.6 An organisation representing renewable generators considered that, as an accompaniment to a 'shallow' connection charging policy, GDUoS charges should:
- enable recovery of the DNO's 'deep' costs in making export capacity available; and
  - provide appropriate cost signals to prospective generators, reflecting the long-run costs of providing this network capacity.
- 4.7 The same organisation suggested that GDUoS charges, apart from being linked to locational factors, should recover costs created in terms of such factors as fault level contribution and that they should recognise any reduction in demand loading. One organisation said that they would support introduction of GDUoS, provided that the principles of efficiency, equity and comprehensibility could be met. Specifically:
- efficiency suggested cost-reflectiveness in terms of technical characteristics and locational factors;
  - equity implied avoidance of cross-subsidy; and
  - comprehensibility meant transparent methodology and straightforward calculation.
- 4.8 Another organisation representing generators took a somewhat different view, suggesting that GDUoS charges should be distinct from any remuneration for network support, balancing services or ancillary services. Realisation of these services would only be achieved through the development of a functioning market at distribution voltage levels – a development that is not implicit in the introduction of GDUoS charges.



- 4.9 A further response suggested that new generators should have a choice of charging methodology. Their choice would depend on the discount rate inherent in any 'shallow plus GDUoS' approach. As an interim measure, GDUoS charges might be calculated similarly to those currently applying to demand connections. However, there was merit in considering calculations taking account of the operational benefits of distributed generation.
- 4.10 One generators' association supported the EGWG suggested system of entry and exit charges, and claimed that, to achieve equitable treatment with transmission connections, all entry users to distribution systems (including interconnectors from transmission systems) should pay entry charges.
- 4.11 An organisation representing small generators considered GDUoS to be important in giving the right signals to DNOs and others. It related possible GDUoS charging options to a banding system advocated elsewhere in the response, and starting with a nominal, non-metered option for the smallest generators.
- 4.12 From the viewpoint of small generators located close to contracted loads – and possibly making little use of DNO networks – one response argued that regional GDUoS charges could be inequitable.

#### **Views of DNOs**

- 4.13 **One DNO pointed out that the design sufficiency of existing networks allowed little opportunity for material benefits from distributed generation: they had been designed to operate without it. While agreeing in principle that costs and benefits should be recognised, it could see no short-term mechanism to allocate benefits to networks from the aggregated effects of generators. Two responses mentioned that ER P2/5 would have to be changed to allow DNOs to take advantage of the potential contribution of distributed generation to network security. Another considered that there would need to be contractual arrangements between DNOs and generators, and that the latter would have to face the full cost implications of failure to generate at times of system stress. There would be an obvious interaction with the generator's exposure to NETA. Yet another DNO considered that further work was needed before the effects of distributed generation could be properly understood.**

- 4.14 Other DNOs considered that network benefits from distributed generation should be recognised contractually – outside the scope of GDUoS. Although one DNO favoured such site-specific contractual arrangements, the company explained that it currently saw little opportunity for generators to develop additional income streams through local network support. Few installations had the capacity either to operate in islanded mode or to commit in practice (and by contract) to operate on demand. Locational drivers such as availability of fuel, land costs, planning consents and (for CHP) heat demand meant that it was frequently impossible or infeasible to optimise the point of network connection.
- 4.15 **One DNO response stressed the need to gain a greater understanding of relative advantages and disadvantages. During the interim period to April 2005, the company suggested, the reinforcement element should be covered through a ‘deferred connection charge’. Another agreed that more sophisticated GDUoS charging was something for the future rather than for the interim period. This response also favoured contractual arrangements with generators, and mentioned the possible conflicts arising through exposure to NETA.**
- 4.16 One response recognised that there were benefits associated with the connection of distributed generation. **Although the current price control formula gave DNOs no specific benefit for loss reduction (and distributed generation could, in certain circumstances, increase them) and although the impact on security was unclear, it was possible to identify benefits from deferred funding of asset replacement**<sup>17</sup>. The company therefore proposed, as an interim arrangement, that non-contestable costs recovered through an excluded service GDUoS charge include a credit recognising such benefits. This response suggested that this could be the difference in present values between replacing an asset in 15 years’ time (in the absence of the new connection) and in 40 years’ time (on the life-cycle of the proposed plant).

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<sup>17</sup> The company explained that some assets would be subject of early replacement to resolve fault level issues. If such costs were attributed to the generator, then the costs that other customers would otherwise have faced for replacement would be deferred by the life-cycle of the newly-commissioned plant.

- 4.17 A vertically-integrated energy company expressed concerns at the possible effect of an excluded service GDUoS charge. Many generation projects had relatively short design lifetimes of between 10 and 15 years. The company asked who would pay for the balance of the expected asset life (circa 40 to 50 years). There should be no UoS charge for EHV and HV as this could lead either to cross-subsidy from demand customers or to adjustment and volatility in GDUoS charges applied to a small generator population. For LV connections, the company thought that an interim solution might be found in commuting a domestic UoS charge into a DCHP capacity charge. The case for shallow charging and GDUoS had not, in the company's submission, been made.
- 4.18 Some also suggested that the level of future GDUoS charges might be uncertain and that this might deter investment. Reallocation of the costs of deep reinforcement to generators could be problematic.
- 4.19 It was the view of one DNO that excluded revenue GDUoS charges should not be introduced until the next price control review. From that time, a GDUoS charge might be in two parts: a fixed service capacity charge, and a unit-related charge to capture the costs and benefits of the generator's operation.

#### **Other responses**

- 4.20 A supplier's response, like those of several of the DNOs, suggested that further analysis was required to assess the benefits and risks of distributed generation to the networks.

#### **Ofgem comment**

- 4.21 **While distributed generation has the potential to bring considerable benefits to networks, Ofgem recognises that the techniques for measuring those benefits require further development. Moreover, DNOs are constrained, not least by the present content of ER P2/5, from taking full advantage of them. Ofgem will be consulting separately on the future of P2/5, and considering parallel rules applying in Scotland.**
- 4.22 The quoted analysis of the requirements of efficiency, equity and comprehensibility has merit, but nevertheless constitutes a considerable challenge – particularly for formulating any interim arrangement. Nor is it clear

that a simplified version of any 'with-without' test would be workable. It is difficult to see how a simplified version could be derived before a clear picture of the full version had been visualised. Even if that difficulty were to be overcome, the result might be too blunt an instrument to have the desired effect.

4.23 In Ofgem's considered view, this is not an area that lends itself to simple solutions. The costs presently recovered in 'deep' connection charging, together with properly-quantified benefits to the distribution system should optimally be recovered via a combination of:

- shallow connection charges;
- GDUoS charges; and
- market-based solutions and contractual arrangements outlined in several DNO responses.

4.24 **Ofgem considers that these issues do not lend themselves to a short-term, interim, GDUoS solution. There would, however, seem to be a strong case for the modification of deferred 'deep' connection charges in recognition of deferment of asset replacement. Ofgem will be seeking confirmation from DNOs that this will be their practice from now on.**

### ***Summary of responses: site-specific and zonal charging***

#### **Introduction**

4.25 **The consultation paper sought views (paragraph 5.82) on the appropriate level at which site-specific charging would be appropriate, and also (from paragraph 5.80) to initiate a debate about the possible options for zonal charging mechanisms. The analysis of responses set out in this paper makes it clear that, with one important exception and until at least April 2005, all generator connections should effectively be dealt with on a site-specific basis. That exception is DCHP – probably on the definition being developed in ER Gcc-007.**

4.26 **The consultation paper recognised that it would not be realistic to expect DNOs to develop cost-reflective zonal charging mechanisms in the interim**

**period to April 2005. It seemed important, however, to attempt a preliminary identification of the main issues before deciding how to approach the distribution price control review.**

- 4.27 Of the 11 responses to discuss site-specific charging, six were from DNOs and three from generators. Perhaps unsurprisingly, at this stage, only three DNOs and one generator representative discussed zonal charging. It is also unsurprising, given the more immediate impact of renewable generation in Scotland, that two of those DNO responses were from the Scottish companies.

#### **Site-specific charging**

- 4.28 **It was clear from the DNO responses that the difficulty in constructing site-specific charging was not so much negotiation as identification of the costs and benefits involved.**
- 4.29 One DNO considered that it would be feasible to recognise the benefits of constrained-on generation, where network reinforcement expenditure had been avoided. This sort of situation would be more likely to arise in rural areas than on their own network. As DNOs were not exposed to costs associated with energy losses and reactive power, it would not be possible to reward services provided in respect of them.
- 4.30 In principle, one DNO response specifically supported negotiated site-specific charges for EHV-connected generators. Such charges would be made up of three elements: connection charges, DUoS (finance) and contracts for services. It argued that DNOs should be able to secure the higher charges commensurate with the risks of DUoS. The current price control regime does not support the payment of generators for the services that they provided.
- 4.31 Although involving too many uncertainties to offer an interim solution, one DNO response suggested study of innovative arrangements worked up in the State of Victoria, Australia. The Australian experience led the DNO to conclude that there was potential for the use of distributed generation in lieu of network reinforcement, provided that liabilities for security and quality of supply could be adequately backed-off through suitable contract arrangements between DNOs and generators. Although there is insufficient space for analysis of the

Victorian approach in this paper, it seems to merit further study. Relevant issues highlighted included:

- relative levels of security with and without the generator;
- adequate justification of the reinforcement option;
- reliable estimating of avoided costs;
- the link between avoided costs and charges;
- equitable sharing of the benefits of avoided costs;
- the terms of the network support contract; and
- issues of transparency.

4.32 **A generator's response shared the view that the difficulty here was evaluating the benefits that distributed generation could bring to a network, and then rewarding them consistently. This was made more difficult by the lack of charging arrangements between NGC and the DNOs for system support services. The company also thought that DNOs might have to resolve conflicts between the objectives of facilitating competition and managing their networks economically.**

4.33 Another generator considered that appropriate changes to ER P2/5 would allow scope for DNOs to meet their obligations on quality in new ways. Providing for islanded operation of parts of the network would be an example.

4.34 Some saw merit in rewarding material and quantifiable benefits in up-front connection charges. However, one response cautioned against creating a complex and costly 'pseudo-GDUoS' framework as an interim way of accommodating such rewards. Any GDUoS regime would require full and proper consultation.

4.35 **Ofgem is alive to the dangers of trying to create a relatively complex GDUoS mechanism, on the basis of an insufficient understanding of the benefits that individual generating sets can bring to a distribution network. It is clear from responses to this consultation that neither DNOs nor the generator community**

has sufficient confidence in presently-available information for such an attempt to attract support. That said, there are clearly instances where some benefit can be identified and recognised through contractual arrangements negotiated for individual sites. There is no reason why this should not be done, as part of interim arrangements, where it is seen to be feasible. As noted earlier, payment of some of the resulting connection charges could be spread over time.

- 4.36 Ofgem also acknowledges that early consideration needs to be given to the value of system support services currently provided by NGC.

#### **Zonal charging**

- 4.37 The consultation paper mentioned some of the difficulty attendant upon creating a system of zonal DUoS charging. This includes the problem of adapting NGC's zonal charging practice to what are predominantly radial distribution networks, and the potential problems of price disturbance, volatility and perverse price signals, due to small initial populations of distributed generators. Closer examination seems to make the issue yet wider and more complex.
- 4.38 One DNO considered zonal charging to be a simplified manifestation of the bespoke 'with-without' test discussed elsewhere in this paper. The company believed that considerable analysis would need to be performed before such a mechanism could be established – not least because the principles applicable to transmission systems do not automatically transfer to distribution networks.
- 4.39 Another response was clear that, in the longer term, any regulatory model for distributed generation would have to be capable of coping with its localised characteristics, in terms of degree and pace of development. Examples quoted were the expected 'lumpiness' of the development of DCHP in urban areas and the initial wave of wind generation schemes in the northern and western parts of Great Britain. CAPEX requirements in these areas would be higher than elsewhere.
- 4.40 A generators' association made a similar point, suggesting that GDUoS charges should be designed to recognise long-run network costs and benefits as well as

**having a zonal component, reflecting the value of transfer capacity between geographical areas. Where generators could reduce circuit loading, the zonal component could be negative.**

- 4.41 Ofgem recognises that the existing price control regime was developed to promote the efficient operation of networks predominantly delivering power from the transmission system to the end user, while occasionally connecting a generator. The prospects for distributed generation, and particularly of large renewable schemes will mean that the regulatory framework will have to be reviewed and restructured.
- 4.42 'Deep' connection charges are unlikely to reflect the long-run costs and benefits of distributed generation, and may have severe practical difficulties associated with network constraints. This suggests a system of 'shallow' connection charges with zonal UoS charges.
- 4.43 If avoidance of reinforcement is to be taken into account, it would seem to require some recognised way for the regulator to secure assurance that the deeper reinforcement was reasonably required in anticipation of increased distributed generation, and that the avoided scheme had been properly costed. Of possible assistance would be the identification of favoured areas for development in which forecasts of increased renewable generation would be accepted as reasonable. The development of 'premium power zones', in combination with appropriate investment incentives for DNOs, might be one such initiative. Such an approach would have obvious links to the planning process, which has been highlighted as a significant obstacle to the development of distributed generation projects.
- 4.44 **The foregoing reinforces Ofgem's previously-stated view that it would be premature to attempt to develop an interim system of zonal DNO charging. That the issues merit consideration in the distribution price control and distribution charge structure reviews, however, seems clear.**



## *Summary of responses: existing distributed generators*

### **Introduction**

- 4.45 The consultation paper sought views (paragraph 5.91) on the treatment, under any interim arrangements, of existing distributed generators. 13 generators or organisations representing generators responded to this question. Of the remaining eight responses, seven were from DNOs.
- 4.46 Paragraph 5.92 of the consultation paper asked for proposals as to how any capacity increases and decreases of existing distributed generators might most equitably be handled. Of the 14 responses dealing with this point, eight were from DNOs and six from generators.

### **The position of existing distributed generation**

- 4.47 **There was considerable consensus across DNO and generator responses. Broadly they agreed with Ofgem's proposal that existing distributed generators should not be affected by any interim regulatory arrangements. Responses often stressed the need to retain stability.**
- 4.48 **Generator responses pointed to the difficulty of determining GDUoS charges for existing distributed generators in such a way as to balance what had been paid in up-front charges with on-going UoS costs. Generators were generally adamant that existing distributed generation should not be disadvantaged by any interim regulatory arrangement.** The development and operation of long-term generation assets required a stable regulatory environment. Investment decisions made in the past should not be undermined.
- 4.49 Some generators emphasised that those who had paid for significant upstream assets, through up-front, 'deep' connection charging, should not be required to pay twice through a GDUoS charge. Equity required some mechanism for the 'grandfathering' of access rights for which the generator had previously paid. The only acceptable change to existing terms for established distributed generators would be reimbursement in respect of a 'second-comer'. Some generators warned that the retrospective application of GDUoS charges to existing distributed generation would cause them to face the stranded cost of connection assets paid for in capital sums as well as out of revenue.

- 4.50 Some generator responses suggested that existing distributed generators might be offered a choice. One considered that some existing generators might favour a partial refund of up-front charges accompanied by liability of future GDUoS charges. Similarly, another argued for choice between immunity from GDUoS charges and an option to sell back relevant plant to the DNO.
- 4.51 Other generator responses emphasised that those investing in distributed generation on the basis of any interim arrangement should not be disadvantaged by development following the distribution price control review. Some suggested that any interim measure should be accompanied by Ofgem's undertaking to that effect. One organisation representing generators considered that any generator securing a connection agreement under the current or an interim charging regime should be guaranteed the option of remaining under those arrangements for a minimum period of 15 years from the commencement of operation. Alternatively, such generators should have the option of migrating to the arrangements under the new distribution price control. Another generators' association also considered that generators should be accorded this choice.
- 4.52 **The majority of DNO responses agreed that it would not be feasible to change the status of existing distributed generators before the introduction of the next distribution price control in 2005.** One suggested that the price control review might seek a way of aligning all generator charges on a consistent and non-discriminatory basis.
- 4.53 Another DNO made the point that future investment in generation might be deterred if potential investors were to perceive that existing agreements could be unwound. Some emphasised that any GDUoS charge should recognise that connection charges, calculated on the basis of full cost recovery, had already been paid.
- 4.54 Although one DNO foresaw some complexity in billing existing and prospective distributed generation on different bases, the company was of the view that it would be inappropriate to impose further charges on those already connected. There might be justifiable exception in the case of smaller generators that had not paid reinforcement costs. They might legitimately be asked to pay their share of future reinforcement costs.

4.55 **Ofgem favours the maintenance of a stable regulatory regime, and adheres to its previously-expressed view that the position of existing distributed generators should not be altered by any transitional arrangements, prior to 2005.** This would not, however, extend to the 15-year guarantee suggested by one organisation representing generators. In what will inevitably be a rapidly changing business environment, such guarantees would not be appropriate.

#### **Capacity variation by existing distributed generation**

4.56 **The consultation paper had suggested that only increases and decreases in capacity by existing distributed generation need be affected by transitional arrangements. Capacity increases should be treated in the same way as completely new generation, while decreases should attract some form of rebate in respect of the released capacity.** Two generators supported that proposal, one emphasising the desirability of a genuinely negotiated process.

4.57 **A generator response doubted whether released capacity would necessarily have a value to the DNO. Much would depend on the way in which the DNO planned its network with respect to diversity and allocation of capacity.** In the interests of minimising commercial uncertainty and risk, this response favoured bilateral commercial agreements, specifying the time period over which capacity would be made available to connectees. Some suggested that it might prove difficult to resolve capacity reductions in a transparent and equitable manner, but considered that attempts should be made to secure progress.

4.58 **A major distributed generator was of the view that the variation of capacity was not so straightforward a matter as the consultation paper had suggested. In many circumstances, additional generation could release capacity at higher voltages (to support additional demand), while removing generation generally meant that the system could support less demand.**

4.59 Of the DNO responses, only two agreed that both increases and reductions in capacity could be treated as Ofgem had proposed. One said that either could be the subject of negotiated adjustments, on the same basis as for new generation connections. The other suggested that decreases would not constitute a problem, but that generators would probably take account of the sunk cost of their connection as part of any decision to reduce capacity.

- 4.60 Other DNOs, while content to treat increases in capacity on the same footing as any interim arrangement for new generators, disagreed that refunds would be appropriate in respect of generators' capacity reductions. Advocating termination charges as a way of mitigating the risks of stranded assets, one DNO saw no case for rewarding reduced capacity. Another doubted whether, in the timescales envisaged in the consultation, capacity reductions could result in a release of value back to the generator. The licence planning standard would already have discounted the presence of the generation when establishing network capability.
- 4.61 Another DNO response asked how any refund would be funded. Their response suggested that second-comer contributions (should the capacity be taken up) would be a source preferable to connection or UoS revenue. Another DNO referred to their common connection charging policy for demand and generation connections. In these circumstances, their response argued, generators had not paid for the capacity in question, and should not receive a rebate in respect of capacity reductions. The company believed that a refund of the sort envisaged in the consultation paper might create a perverse incentive to reduce generation capacity.
- 4.62 **It is clear that capacity reductions would not necessarily result in reallocation of capacity and a rebate to the generator. A negotiated, site-specific approach would be appropriate in the interim period.**

## 5. PART V - EXISTING PRICE CONTROL AND PROPOSED LICENCE MODIFICATION

### *Summary of responses: re-opening the price control*

#### Introduction

5.1 As the aim of the consultation paper was to seek an interim solution that could be implemented before April 2005, the question of the continuation of the existing distribution price control assumed some importance. The policy options considered in the paper (from paragraph 5.72) were, in outline, to:

- re-open the distribution price control;
- close the present control early;
- adjust allowed revenue within the existing control; or to
- consider some element of GDUoS charging, treating the revenue as excluded service revenue.

5.2 There were 22 responses dealing with this question, of which nine were from DNOs and ten from generators or those representing them.

#### Views of DNOs

5.3 Seven of the DNO responses broadly favoured the excluded service option for any GDUoS revenue, perhaps provided that means could be found of taking account of the increased risk of stranded assets. Termination payments might achieve that in the interim. However, the price control review would create an opportunity to consider bringing all GDUoS under the price control – thus eliminating the need for termination payments.

5.4 One company suggested the creation of a separate regulatory asset base (RAB) for distributed generation assets, thereby enabling DNOs to earn a rate of return commensurate with the different level of risks involved. Such separate treatment would avoid transfer of generation-associated risk to demand customers.

- 5.5 Another DNO argued that re-opening the price control would upset DNOs' business plans, while risking price disturbance for customers. A further DNO response supported the excluded service revenue option for any GDUoS charge (at least until the next price control period), but suggested that the 'PUM Cap'<sup>18</sup> should not be applied to this revenue. A third suggested a mechanism for aggregation of unrecovered non-contestable costs (below EHV) and their recovery through a common £/kVA-year rate. To avoid the volatility attendant upon ex-post calculation of these charges, the company suggested that it would be feasible to forecast them, treating only the outturn cost recovery as excluded revenue.
- 5.6 This last response also noted that UoS charges in respect of most (SVA-settled<sup>19</sup>) distributed generators would be levied on suppliers, rather than on generators. The company considered that this fact should not have a material impact on the economics of distributed generation, as the value of the product would not be affected. This would also more closely link the recovery of non-contestable costs with the economic instruments already implemented to promote environmentally sustainable generation. Both would relate to suppliers' energy trading.
- 5.7 Other DNOs had reservations about the excluded revenue option for GDUoS charges. For example, investment costs falling to be recovered through GDUoS might, under Ofgem's interim proposal, be outside the Regulatory Asset Base (RAB). The risk of such assets being stranded would require a substantial increase in rates of return.
- 5.8 Another DNO pointed to the low level of generation connections in their area and to the timescale of two to three years for the construction of generation. It questioned whether interim arrangements were necessary. The company concluded that resource would best be spent on developing the price control framework for the next review period.

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<sup>18</sup> 'PUM' is the basic allowance, comprising operating expenditure, depreciation and rate of return. EHV DUoS currently contains an allocation of these components. 'PUM' does not expand like a normal acronym. The letters indicate that some elements of base revenue (P) relate to UoS (U) and some to metering (M).

<sup>19</sup> SVA = Supplier Volume Allocation. This refers to smaller generators, whose output is traded under NETA by inclusion in a supplier's portfolio rather than participating directly in the balancing mechanism.

- 5.9 One company suggested that any change before the next price control review would be likely to affect the assumptions underlying the existing price control and that this would be tantamount to re-opening the control. The proper time to introduce changes, in the company's submission, was April 2005. The proposed excluded service GDUoS charge would, this response suggested, be highly volatile, particularly in the interim period envisaged in the consultation.

#### **Generators' views**

- 5.10 **Generators' responses advanced a range of views. Three favoured the excluded service option for any GDUoS charge. Considerations of regulatory uncertainty and risk prompted one to reject either the re-opening or early closure of the price control. This response emphasised that the excluded service option would be acceptable as part of an interim arrangement, but that the position should be fully reassessed during the price control review. Another considered that excluded service treatment of GDUoS would allow DNOs to make a reasonable return.**
- 5.11 **A generators' association also agreed that the excluded service option would constitute an acceptable interim arrangement, involving minimum disruption. In the longer term, however, the association hoped that the positive contribution of distributed generation could be recognised and DNOs incentivised to connect it. At present, DNOs were at best neutral to such connections.**
- 5.12 One generator saw little benefit in applying GDUoS charges based on connection costs, allowing DNOs to recover them over a period of time, and then treating them as excluded revenue. In their view, the Net Present Value (NPV) to the connecting generator would mean that there would be little change from the present, full-cost approach. The fundamental issues could only be addressed during a price control review.
- 5.13 Another organisation representing generators suggested that a limited re-opening of the price control might be desirable. It was not convinced that treating all generator contributions and GDUoS revenues as excluded service revenue would ultimately offer the best value to the final consumer. The effect of this option, this response suggests, would be to increase the cost of capital to DNOs

for the provision of generator connections. This would inflate the overall cost of connection, producing a deterrent effect on the connection of distributed generation. The response further suggested that, since TNUoS charges are not treated as excluded service revenue, the excluded service option for distribution connections was potentially discriminatory.

- 5.14 Another generator warned that measures seen as short-term would not support long-term investment decisions, and might result in projects being shelved until the 2005 rules were set. This response also challenged the statement in the consultation paper that much distributed generation is unpredictable. In the company's experience, effective liaison with DNOs and site CHP operators could do much to overcome the effects of start-up and shut-down. Others expressed a similar concern in emphasising that investment decisions taken in the interim period must remain robust into the future.

#### **Views in other responses**

- 5.15 One response agreed that the existing price control should remain until 2005. This response recommended that the period 2002 – 2005 should be used to trial innovative arrangements that might be adopted in the longer term. DNOs should be rewarded for making long-term investments in the networks, to accommodate increased distributed generation.
- 5.16 A supplier also opposed either the re-opening or the early closure of the price control. To do so would undermine the stability of distribution revenue, and lead to increased risk and uncertainty. The company considered the excluded service treatment of GDUoS revenue to be appropriate as an interim solution, subject to review for the next price control.
- 5.17 **The response from energywatch also favoured the excluded service option for any GDUoS charges – on the grounds that re-opening the price control would generate uncertainty, and tend to result in costs for customers.**

#### **Ofgem comment**

- 5.18 **In recognition of the likely complexity of the next distribution price control review, including the need to give careful consideration to long-term**



investment in anticipation of distributed generation connections, Ofgem is starting work immediately on the framework for the price control review.

### *Summary of responses: proposed licence modification*

#### **Introduction**

- 5.19 **The consultation paper included, at Appendix 1, a draft licence modification. This was proposed for the situation in which it was decided not to reopen the price control, but to treat any GDUoS charges as excluded service revenue. The paper sought comments (paragraph 1.8 in Appendix 1) on the proposed text of the licenced modification. Five DNOs commented.**

#### **Views of DNOs**

- 5.20 One DNO considered that, as the proposed licence modification mirrored the existing EHV provisions, it would be fit for its purpose. The company emphasised, however, that it would expect other points raised in its response to be addressed as part of the overall suite of changes.
- 5.21 Another DNO also noted the direct equivalence to EHV demand provisions, but pointed out that the quantities referred to were not available from the Price Control Submission Data. It would not, therefore, prove possible to ascertain whether a DNO was in compliance with the modified licence condition.
- 5.22 A third suggested that the text should specifically say that all income from distributed generators would be treated as excluded service income, and that it would not be subject to the PUM cap.
- 5.23 A fourth reiterated its view that no change should be made to charging arrangements until the next distribution price control.

#### **Ofgem Comment**

- 5.24 **As Ofgem has concluded that a short-term, interim GDUoS solution would not be a workable proposition, it will not be necessary to proceed with the proposed licence modification. Annualised connection charges would continue to be treated outside the price control – as capitalised receipts, netted-off**

against the asset base. Existing licence conditions will remain sufficient for their proper regulation.

## 6. PART VI – METERING AND SECONDARY ISSUES

### *Summary of responses: metering*

#### Introduction

- 6.1 The consultation document suggested that, in general, little change to existing metering policy might be required to accommodate increased connection of distributed generation prior to April 2005. The consultation was, however, an opportunity for interested parties to raise concerns in this area. The consultation paper asked (paragraph 6.4) for any instances in which existing or prospective distributed generators had encountered problems with metering technology – and particularly where such difficulties had deterred or might deter otherwise viable schemes from going forward.
- 6.2 Paragraph 6.25 sought views on metering policy in general, as set out in the consultation paper and within the context of Ofgem's March 2001 metering strategy consultation<sup>20</sup>.
- 6.3 There is a clear need to decide on appropriate metering arrangements for micro-generation and DCHP units. The need to make the right decisions is reinforced by responses to this consultation that identify DCHP and smaller micro-generation schemes as likely to have one of the earliest impacts on distribution networks. Although Ofgem started from the opinion that basic import and export metering should be a requirement even for the smallest distributed generation, views were requested.

#### Problems of metering technology

- 6.4 **Of the eight responses addressing this question, six were from DNOs. There was general agreement that metering technology would not present a significant problem for the expansion of distributed generation.**
- 6.5 None of the DNOs responding to this question had evidence that metering technology might constitute a problem, although some mentioned that the cost

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<sup>20</sup> 'Ofgem's strategy for metering. A consultation paper', March 2001, 28/01.  
[www.ofgem.gov.uk/public/pub2001q1.htm](http://www.ofgem.gov.uk/public/pub2001q1.htm)

of paying for suitable metering might sometimes be a deterrent. One considered that the location of metering would require consideration in individual cases.

- 6.6 A meter manufacturer pointed to the increased problems of meter security that can arise when a generation capability is present. The scope for detecting tampering is reduced - especially where a combined import/export meter is used in domestic premises. This response suggested that the overall installation would require appropriate auditing and sealing upon initial connection of the generator. This response suggested that the use of a generation meter with half-hour recording or daily/weekly register snapshotting would allow generator operation to be monitored. It might, for example, be desirable to check that generation was available and actually running on winter weekdays, rather than just at weekends. As the recorded meter data would be collected electronically, it could include status flags and checks to enable adequate auditing to be carried out.
- 6.7 **Ofgem concludes that, in general, only meter security is likely to present a technical problem. There is clearly merit in the suggestion that both imports and exports of DCHP and micro-generation installations are measured, and that thorough inspection and sealing is carried out. Some might argue that half-hourly recording for DCHP could prove prohibitively expensive. These costs will have to be balanced with the losses likely to arise from tampering.**

#### **Metering strategy**

- 6.8 **Four DNOs commented on general metering policy in the context of distributed generation. All were broadly supportive of Ofgem's declared metering policy.**
- 6.9 One DNO accepted that exported power might, under certain circumstances, be a benefit that would have value for a DNO, but argued that there was another side to the debate. The capability of the network to cater for the maximum demand imposed on it (irrespective of the direction of the power flow) would be likely to have a more significant impact on the cost of providing a distribution network. There was a need for significant analysis to establish what services might be traded in future. However, installation, now, of import-export metering

would give additional flexibility in the future. It could assist in the development of more sophisticated charging methods than those currently in use.

- 6.10 Although having nothing to add to its response to the March 2001 consultation, one DNO emphasised that imports and exports should be measured independently of one another. Any net readings could be obtained using these figures.
- 6.11 Another DNO urged Ofgem, as part of its metering strategy, to bring forward a suitable commercial framework to incentivise the installation of advanced metering. Such metering could allow generation and demand to be managed remotely and so facilitate the development of consolidation services under NETA. Advanced metering would also allow aggregation of individual distributed generation units for network support. In its response to the March 2001 consultation, the company had suggested that the installation of a basic, communications-ready meter, to which other devices could easily be attached, would also significantly enhance competition in metering.

#### **Metering for DCHP and micro-generation**

- 6.12 It was to be expected that the issue of metering for DCHP and micro-generation would be of widespread interest. Twenty-six responses put forward views on this subject, of which nine were from generators or organisations representing considerable numbers of generators, 11 were from DNOs, and three were from companies in the metering field. As all but one of the DNOs supported Ofgem's initial view that DCHP and micro-generation units should have both import and export metering, 14 of the twenty-six responses were in favour of that solution.
- 6.13 An organisation representing generators suggested that, at the present stage in the commercial development of micro-CHP and associated metering technology, a requirement to adopt import and export metering for micro and domestic CHP would impose such costs that the commercial offering of the technology might not prove viable. This cost burden would partly be capital costs, but would also include the additional costs incurred in installation, meter reading, settlement, etc. Another response indicated that, in most cases, these costs would be likely to exceed the export revenues (approx. £50/unit/year). Reliance on export and import profiles was a better alternative.

- 6.14 It was another generator organisation's view that metering arrangements should be the simplest consistent with the need for market-based, fair and transparent charging regimes. There was no need to for additional metering for the smallest generators. A regulated, nominal DUoS allowance should then be accorded to the installation owner or operator, reflecting the amount of power likely to be exported. Values from this band would be extremely low and dual import-export metering would be appropriate.
- 6.15 One generator organisation considered that, as well as helping to launch DCHP, 'net metering' would be of benefit to small-scale domestic renewable energy sources, including photovoltaics (PV) and domestic wind power. This response emphasised that prospective small-scale generators required clear and straightforward means of connecting to the network. They were not able to carry the high overheads of the regulatory and metering frameworks developed with much larger power generation in mind.
- 6.16 A research organisation pointed out that the optimum size for a DCHP unit would be around 1kW peak electrical output. This was similar to the peak diverse load of many properties. The majority of power generated would be used within the home, minimising exports. As exports would occur when the householder did not require the power, it would follow that his neighbours would be unlikely to want it at the time of export. The value of exports would be low. As exports from DCHP units would be heat-led, they would be highly amenable to profile analysis. Accordingly, it would be possible to devise metering and settlement strategies based solely on import metering, without the need to replace existing meters.
- 6.17 Another response stressed the importance of considering low-cost metering technologies for smaller installations. It considered there to be grounds for examining the costs and benefits of additional profiles and non-half-hourly metering.
- 6.18 A major energy company agreed with Ofgem that, in the long term, some form of export metering would be desirable. In time, instruments offering greater transparency and customers choice and incorporating import/export or bi-directional functionality would replace the existing metering stock. However,

the cost of purchasing and installing a meter was significant in the domestic market. If the cost of early upgrading of the metering stock were to be placed on individual customers, such as DCHP purchasers (or on DNOs as an additional unrecoverable expense) it would represent an impediment to the development of DCHP. Until more sophisticated metering could be installed as part of the normal replacement cycle, the volume and time of day or exports from DCHP units should be determined by profiling.

- 6.19 **Most responses seemed to recognise that telemetered half-hourly metering would not be suitable for these small generators. Average generation profiles or logged data would constitute alternatives.**
- 6.20 A distributed generator noted that the aim of 'net metering' was to ascertain the advance (or retreat) of a single meter register from readings at approximately three-month intervals. It was not possible to deduce from this when the generator was operating (if at all). In DCHP and PV applications the import-export condition may swing backwards and forwards several times within a 30-minute period (as appliances and thermostats switch on and off). The response suggested that class profiling based on quarterly meter readings might not be satisfactory for either import or export energy advances. Unknown and varying proportions of household consumption and generation would have been mixed together in the import-export metering process. The response concluded that there were likely to be merits in separately metering generation and consumption energies. Moreover, the generation meter would, if required, be able to provide one channel for half-hourly data for settlements.
- 6.21 **A meter manufacturer's response identified several other potential advantages of separately metering generation and consumption. These included:**
- **separate handling of exports under a long-term contact;**
  - **consolidation of output with similar sites (under modified trading arrangements and with some central control of the group of generators);**
  - **validation of generator operation;**
  - **avoidance of cross subsidy from demand to distributed generation;**

- possible benefit from Renewables Obligation Certificates; and
- the possibility of handling Economy 7 (2-rate) sites by class profiling.

- 6.22 This response also suggested that the equipment costs for advanced metering could, given similar production volumes, be similar to those for domestic prepayment and radiotelemeters. Use of daily or weekly register snapshots would involve far less data processing than would half-hour recording. The company believed that significantly lower processing costs could thereby be achieved.
- 6.23 **The consultation paper (paragraph 6.8) mentioned the subsidies made available in Germany through 'net metering' schemes. One response advocated similar initiatives for Great Britain, suggesting that Danish and Spanish experience had been similar in giving a boost to the renewables industry. Another, however, took the view that what were in effect compromises applied to local monopoly utilities would not be valid in the competitive, liberalised electricity market operating in Great Britain.**
- 6.24 A metering company suggested that 'net metering' might be too much of a compromise solution. It said that import/export metering could be provided using currently-available technologies and at a reasonable cost. The company thought it feasible to provide half-hourly metering for distributed generation, down to domestic level. The additional data charge would be small.
- 6.25 **Some considered net metering to be the obvious choice for smaller distributed generation, and suggested setting a threshold below which separate export metering would not be a requirement. They suggested that the consultation document had exaggerated the potential of net metering to mask cross-subsidy. Many small customers already received highly 'smeared' bills that inevitably involved a degree of cross-subsidy.**
- 6.26 **Some suggested that, in the short term (at least to 2005), micro-scale generation (i.e. 3kW or less) could be profiled rather than separately metered for import and export. Currently import/export metering would be too expensive for household applications, outweighing the value of the electricity exported.**



- 6.27 **The response from energywatch supported import/export metering as the best way of ensuring that customers would receive their fair share of the benefits that DCHP could bring in flattening load profiles.**
- 6.28 Two vertically-integrated energy companies supported Ofgem's initial view that import/export metering would best protect the customer interest. This was on the grounds that bi-directional metering would tend to restrict charging flexibility for both import and export in the future.
- 6.29 While observing that statutory metering obligations rested with suppliers, one DNO emphasised that the choice of metering crucially affected DNOs' abilities to send economic signals to the market. Robust arrangements would be required as the penetration of small generation increased.
- 6.30 Another also saw suppliers as having the key influence on choice of metering for domestic generators. However, their response supported import/export metering as allowing the most freedom in an open marketplace. The key issue for DNOs was that of DUoS recovery, in that the kWh import of a customer was currently used as a proxy for a connection infrastructure charge. This response claimed that net metering would not support the needs of DNOs in terms of the regulatory formula to record units entering the system. Nor would it support the settlements system. Its widespread introduction would require a substantial revision of electricity industry processes. Import/export metering, in contrast, would allow DUoS charges to be levied on the units imported. Such an arrangement would reward the household with micro-generation
- 6.31 **Other DNOs supported import/export metering and profiling and for all small distributed generation. Although half-hourly metering would have benefits for energy trading, the company considered it to be uneconomic for smaller generators. Some favoured half-hourly metering for three-phase distributed generation connections. For single phase connections, a non-half-hourly solution, supplemented by load research and profiling might be appropriate.**
- 6.32 **While entertaining some concerns about data processing costs for large numbers of small generators and while acknowledging that very small power flows might be amenable to profiling, a further DNO supported Ofgem's**

**proposal for import/export metering – at least until further analysis and consultation should have taken place.**

- 6.33 Another response called for an early statement as to whether settlements processes require half-hourly data for all generator connections.
- 6.34 One response regarded the choice of metering as being a matter for commercial judgement. Half-hourly metering of micro-generation and DCHP seemed unnecessary. However, a requirement for a special meter change on installation in domestic premises might constitute a significant cost deterrent. Suppliers would be faced with the need to change registrations so as to incorporate additional Metering Point Administration Numbers (MPANs). Import/export metering should not, therefore be seen as obligatory. As profiling was seen as a valid alternative, this response supported import/export metering as a non-obligatory option.
- 6.35 **Having carefully considered the various responses on metering, Ofgem regards the measurement of both imports and exports as a minimum for all distributed generation, including DCHP. Profiling based on the average of customer groups would seem to be insufficiently precise to allow for robust pricing. DCHP and micro-generation customers are expected to display diverse behaviours and characteristics. Metered data on import and export volumes will be essential to taking proper account of these differences.**
- 6.36 **Exports from early patterns of DCHP installation may be small. However, Ofgem is aware that larger capacity equipments are planned, and that DCHP may be installed in significant quantities. It would be unsafe to assume that generation would necessarily take place when the power could be absorbed either on the premises or on the local distribution network. Similar considerations will apply to the increasingly efficient photovoltaic installations now being developed and Ofgem regards it as important to establish an appropriate and consistent policy for the metering of these small distributed generators.**
- 6.37 **There would be a range of metering options for measuring power flows in both directions in domestic and small commercial premises. Ofgem considers that the early installation of half-hourly metering for the smallest generators is**

likely to be expensive – until volumes increase and suppliers perceive benefits in trading significant consolidated quantities of export from these installations. Import/export metering need not be complex, although there is scope for work on the development of more sophisticated metering in the medium term, and in response to commercial drivers.

- 6.38 Ofgem would not insist that metering of DCHP and micro-generation installations should necessarily take the form of separate import and export active power meters, but rather that the quantities of import and export be identified. Alternatives might be recording of 'net' registration, with import metering or a combination of 'net' registration and an export meter. Either of these alternatives would allow the consumer directly to read the net position.
- 6.39 Existing meters used for domestic and small commercial supplies have a reverse stop which, without modification, would prevent them from displaying a net registration of imports and exports. The installation of micro-generation or DCHP would, therefore, seem to necessitate some work at the meter position. Accordingly, the marginal cost of installing a bi-directional meter (or a separate export meter) would be relatively small. Further work would be required on detailed costings, but initial indications are that the additional cost might be in the region of £15 per installation.
- 6.40 As Ofgem attaches importance to the establishment of workable and comprehensible standard arrangements for the installation of DCHP and for the associated pricing and charging mechanisms, a separate workstream will take these issues forward, in consultation with other interested organisations. This workstream will need to address detailed issues of access, meter installation and safety, as well as the commercial and contractual implications of DCHP for suppliers, energy service companies and DNOs. Ofgem considers it important that installers of DCHP equipment should be suitably qualified to undertake necessary metering changes. It will require co-operation between DNOs, installers and meter operators to ensure that consumers can expect the convenience of a one-stop call to complete all the necessary work.
- 6.41 While arguments for the use of import metering supported by profiles, as an interim measure, have some force, it would be difficult to require retrofitting of

export meters to established DCHP and micro-generation installations. Dispensing with export metering would involve a loss of transparency. The normal meter replacement schedule – extending to some 20 years – is too long to constitute the basis for the introduction of import/export metering for micro-generation and DCHP.

- 6.42 **Ofgem notes that some responses call for the sort of ‘net-metering’ incentives offered in other EU member states. These might include the equation of prices for imported and exported units, or paying the DCHP or micro-generator a premium for exported units. However, any arrangements involving cross-subsidy would not be appropriate in the liberalised market now prevailing in Great Britain. Any subsidy for this class of generator would be a matter for the Government. Nevertheless, the treatment of DCHP in settlement remains to be determined.**

### *Summary of responses: secondary issues*

#### **Condition 4 statements**

- 6.43 The consultation paper sought views (paragraphs 5.43 and 5.54) on the scope for improving on existing condition 4 statements, and for ideas as to the level at which distributed generation connections should be site-specific (rather than covered by principles and methodology set out in the statements).
- 6.44 **Most generators supported the publication of sufficient information to facilitate understanding of key network issues. This would tend towards the optimum location of distributed generation and to the maximisation of its potential to support system performance.**
- 6.45 **Most considered existing Condition 4 statements to be too general, some argued that the new distribution licence presented an opportunity to line up Condition 4 statements with NGC’s Seven-Year Statement. There were calls for user-friendly charging statements that clearly and unambiguously explained the connection and UoS charging policy of each DNO.**
- 6.46 Some responses called for a greater degree of standardisation of Condition 4 statements, and suggested that a complementary Distributed Generation Access

and Connection code might be helpful. Revised charging statements (perhaps to be developed by the Electricity Connections Steering Group) might include:

- a flow diagram illustrating the end-to-end process;
- worked examples, showing likely costs;
- guidance on contestable and non-contestable works; and
- guidance notes for potential customers.

6.47 **Some DNOs declared themselves willing to review the statement as suggested in the consultation document. Others were in the process of so doing, but pointed to the additional complexity of generator information when compared to that required for demand connections. Yet others were prepared to review the detail and accessibility of their Condition 4 statements, but suggested the requirement for regulatory approval of their form had hitherto discouraged innovation. A generator, in contrast, suggested that Ofgem should approve the content of statements prepared for England and Wales, as they already did for the Scottish statements.**

6.48 One DNO considered that, given the variation in costs of individual connections, a schedule of rates (e.g. charges per metre of a given size of cable) might be more helpful than a menu of standard prices. There might be a case for preparation of separate demand and generation statements. The latter could contain lists and explanations of both connection and GDUoS charges.

6.49 Another DNO suggested that they should be drafted in the light of increasing competition in connections. The company expected the market place, rather than DNOs' statements, to determine prices. There was a case for a series of plain-language guides, to supplement Condition 4 statements.

6.50 Although clearly interested in further discussion of Condition 4 statements, one energy company suggested that charging methodology, being fairly straightforward and easily documented, was not the problem. The electrical plant required to construct connections varied. Early discussion between DNO and potential generator might be more useful in budgeting. In contrast, an organisation representing renewable generators emphasised the need to define

clear rules about which existing network assets could be used to provide a connection for a particular generation project. Although acknowledging that drafting such a protocol would not be an easy task, the response clearly favoured certainty over separate discussion of each proposal.

- 6.51 **There was a general consensus that Condition 4 statements should cover generator connections up to the same limit as demand connections (EHV/33kV), but that any size of generator should be able to contract to provide benefits to the network.**
- 6.52 There were, however, a number of alternative suggestions. A DNO suggested that charges should be site-specific. The development of competition for connection work meant that standard charges would distort competition. Developers would only contract with the DNO where costs were above the average.
- 6.53 The response from a large distributed generator looked forward to the time when all but the smallest generation could be charged on a site-specific basis, reflecting the costs and benefits that it would bring to the system. Until more sophisticated network management and pricing systems could be established, however, it would probably be appropriate to treat generators connected at 11kV and above individually.
- 6.54 Domestic installations seem to be recognised as exceptional. One DNO suggested that Condition 4 statements should apply to all except this group. Discussing incentives for small distributed generation, one response suggested that no connection charge should be imposed.
- 6.55 Although agreeing that early discussions between the DNO and prospective generator would generally be a constructive way of moving from general charging statements, Ofgem regards it as disappointing that DNOs did not respond more positively to suggestion in the consultation document that system studies are frequently perceived to be slow and expensive. Indicative worked examples would be a helpful adjunct to Condition 4 statements.
- 6.56 **While accepting that DNOs may have something to learn from the NGC's Seven-Year Statement, Ofgem recognises that transmission and distribution**

**systems are different and may not always lend themselves to description in the same way. Should helpful and innovative statements not develop, the time might come when more specific regulatory action might be considered.**

- 6.57 Some DNO responses seemed to be insufficiently clear in distinguishing between contestable and non-contestable connection work. While competition would be expected to determine prices for the former, the latter clearly lend themselves to clear charging statements.
- 6.58 A connection charge may not be appropriate for individual DCHP installations connecting to an existing electricity service. Ofgem would need to be satisfied that any connection charge levied for this type of installation reflected genuine costs borne by the DNO. The building or up-grading of whole housing estates equipped with DCHP would clearly be a different matter.

#### **Condition 25 statements**

- 6.59 Although Ofgem has consulted separately on Condition 25 statements ([www.ofgem.gov.uk/docs2001/licencecon25.pdf](http://www.ofgem.gov.uk/docs2001/licencecon25.pdf)), the consultation paper (paragraph 7.14) gave an opportunity for responses to comment on them, specifically in the context of distributed generation. Only eight responses addressed this topic.
- 6.60 None of the five DNOs responding had anything significant to add to the earlier consultation, although some of them took the opportunity to repeat concerns about the cost of providing information to the required level.
- 6.61 A major generator suggested that there was scope to build on Ofgem's work on Condition 25 statements to secure common information provision, modelled on NGC's Seven -Year Statement. This response acknowledged that DNOs should be appropriately recompensed for the provision of this information.

#### **Provision of basic information for micro-generation and DCHP**

- 6.62 **There was widespread support for the provision of comprehensible, basic information for those planning small generation installations. Such prospective generators might not always be familiar with the requisite procedures and**

**technical considerations. Of the 13 responses touching on the issue, eight were from DNOs.**

6.63 The energywatch response suggested that there was scope for DNOs to improve the manner in which they respond to requests for network information. A meter manufacturer said that a 'Plain English Guide' covering network issues for very small distributed generators would be helpful. Also favouring comprehensive and comprehensible information, a generator cautioned that its value would depend on the availability of all the information required to assess the viability of a particular micro-scale or DCHP scheme.

6.64 **Several DNOs indicated that they were either in the process of updating existing guidance to take account of new generating technology, or that they were prepared to do so.** One mentioned work that DNOs were taking forward with ETSU to update existing guides<sup>21</sup>. Another suggested that voluntary 'Plain English Guides' would be a helpful adjunct to Condition 25 statements – avoiding their technical content. One response suggested that each DNO should be able to publish details of a single point of contact for prospective distributed generation connections.

6.65 Two responses cautioned that the provision of information about suppliers offering DCHP tariffs and about equipment suppliers (as suggested in paragraph 7.12 of the consultation paper) might compromise DNOs' impartiality. Ofgem, energywatch or some other independent source, they suggested, should publish this sort of information. One of these considered that Ofgem or an energy efficiency agency might undertake publication of a 'Plain English Guide'.

6.66 **Ofgem welcomes the readiness expressed by some DNOs to publish information for this category of customers and would urge others to follow examples of best practice. Ofgem also accepts that information about other products and services, offered competitively, would best be published by some independent agency. It is quite clear, however, is that it is for the DNOs, not**

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<sup>21</sup> ETSU have supported three publications by the Association of Electricity Producers: 'Electricity Production Connected to the Local Network – a Guide' (1996), 'Electricity Production Connected to the Local Network – a Guide for Scotland' (April 1998), and 'Full Competition in Electricity Supply – a Guide for Small Suppliers and Generators' (August 1999). Additionally, ETSU have produced 'A Technical Guide to Connection of Embedded Generators to the Distribution Network' (1999), which is available on the DTI's New and Renewable Website. [www.dti.gov.uk/renewable/renew.htm](http://www.dti.gov.uk/renewable/renew.htm)



the regulator or the consumer council, to make comprehensible network information readily available to their prospective customers. It might, however, be appropriate for DNOs to make such information available via suppliers.

### *Summary of responses: other issues*

#### **Introduction**

6.67 A number of issues were raised in only a small number of responses to the consultation. Although these were not a major focus of interest, it seems important not to lose sight of them. They are briefly discussed in this section.

#### **Flexibility in contracting for energy supply and other services**

6.68 The response from energywatch indicated that the consumer council would welcome moves amongst suppliers to offer micro-generation and DCHP alongside smart metering as added-value services. This response suggested that contractual and pricing arrangements should not be allowed to act in such a way as to erode choice of energy price and billing service provider.

6.69 A metering company expressed concern at the inability of suppliers to enter into longer term agreements encompassing not only the equipment provided but also the supply and purchase of electricity to and from the generator. This response suggested that consumers would be adequately protected by contract clauses providing for:

- contracts limited to three years, with annual extension thereafter;
- termination on change of tenancy; or
- termination in the event of price increase.

6.70 Another response called for the modification of the 28-Day Rule to allow energy service contracts over longer periods<sup>22</sup>. Failing that, it considered that there should be mechanisms for the transfer of debt from one supplier to the next.

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<sup>22</sup> The '28-Day Rule' is in standard licence condition 46 of the new Electricity Supply Licence ([www.dti.gov.uk/energy/licences/electsupply.pdf](http://www.dti.gov.uk/energy/licences/electsupply.pdf))

- 6.71 **Some would support the retention of the 28-Day Rule, provided that it did not prevent the provider of a DCHP unit from contracting with the domestic customer to purchase power (or represent the customer in selling the power) produced by the unit, for a period up to the useful life of that unit.**
- 6.72 A DNO considered that it would be inappropriate to prevent suppliers and customers from agreeing contractual relationships that envisaged a long-term relationship in respect of 'other' (i.e. non-energy-supply) services.
- 6.73 Ofgem held a seminar, on 30 November 2001, to consider, with a wide range of organisations, why energy services were not being taken up to a greater extent in the domestic sector. The widely held view was that the fundamental issues are commercial and that they relate to lack of interest by households in energy efficiency products and services. Householders seem to perceive that there are more attractive ways of spending disposable income. Ofgem has already issued guidance (in March 2001) about the important flexibility which exists in the regulatory framework for those marketing energy services to secure their financial position in circumstances in which a customer wishes to switch energy supplier. Customers do not, of course, have any regulatory right to terminate any energy service part of a contract. Many delegates at the seminar pointed to the benefits of customers' being able to switch supplier. This is an important safeguard – particularly where prices have become uncompetitive or where quality of service is deteriorating.
- 6.74 **Ofgem agrees with energywatch that electricity consumers must not be constrained in their ability to respond to the competitive supply market by changing supplier. In this respect, the '28-Day Rule' is an important customer safeguard. It means that any customer can switch supplier by giving 28 days' notice. Equally the rule should not have the effect of preventing long term contracts for the provision of micro-generation or DCHP equipment. There is nothing to prevent a consumer from contracting with an electricity supplier for imported electricity and with an Energy Service Company (ESCo), for example, in respect of a DCHP unit and its electrical output, some of which may be exported to the network. In this context, Ofgem's advocacy of separate metering of imports and exports down to DCHP level aims to safeguard the position of the consumer.**

## Developing DCHP

- 6.75 One response pointed to the social role of DCHP and to its potential contribution to tackling fuel poverty. Because of the nature of the accommodation in which the fuel-poor tend to be housed, there is greater scope for cost savings and improved energy efficiency than in the average household. This response also stressed the need for large-scale trials better to understand the impact of DCHP on networks.
- 6.76 A meter manufacturer set out the issues that they considered to require resolution if micro-generation and DCHP were to evolve further. Detailed points from this response are covered elsewhere in this paper – under the appropriate subject headings. It seems helpful, however, to summarise the list of issues here as;
- scheme types, classes and bands;
  - alternative metering and data collection arrangements;
  - integrity, security and validity of metering systems;
  - network issues; and
  - economic aspects.
- 6.77 **Ofgem’s Social Action Plan may present opportunities to help optimise the social benefits of DCHP. Any measure having significant financial implications would, however, be a matter for the Government<sup>23</sup>.**

### Impact on transmission systems

- 6.78 A major generator’s response highlighted some important issues relating to the impact of distributed generation on transmission systems. Although these seem to be matters on which early conclusions will not be possible, it would be helpful to keep in mind the possibility of:

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<sup>23</sup> The Government has announced that intends to install 6,000 DCHP units as part of its Warm Front programme. (DTI. ‘UK Fuel Poverty Strategy’, 21 November 2001, Chapter 4)

- increased stranded transmission assets;
- reduced revenue, as generation shifts to distribution networks;
- reduced influence on the pattern of generation; and
- less ability to balance supply and demand (e.g. frequency and voltage).

6.79 Ofgem recognises that these fundamental questions will have to be addressed. They are linked to the issue, discussed in this paper under 'zonal charging', of benefits that distributed generation will bring to consumers connected to other distribution networks. In some cases there may also be choices to make between reinforcing transmission networks or higher-voltage distribution circuits.

## 7. PART VII – OFGEM’S REVISED PROPOSALS

### *Introduction*

- 7.1 The consultation paper set out (from page 65) a set of initial proposals for short-term changes that might be introduced from April 2002. The paper made it clear that these interim proposals were advanced to promote discussion of likely options, and that they did not represent settled regulatory thinking.
- 7.2 The revised proposals set out in this summary document have been drafted in the light of responses to the consultation. They represent Ofgem’s considered view of what is possible in the short term. That is to say that they would seem to be both workable and broadly acceptable to the parties concerned. They should go some way to ameliorating the position of prospective distributed generators, while causing minimum disruption to existing arrangements. They would not appear significantly to limit the options that may be available for the next distribution price control period. They should not necessitate work that will have to be undone when the next price control takes effect.
- 7.3 These proposals preserve the assumptions underlying the existing distribution price control. They should not result in cross-subsidies, and demand customers should not be worse off as a result of their implementation. Existing distributed generators should not be disadvantaged.
- 7.4 It was clear from responses that DNOs – and especially those in Scotland and the Northwestern parts of England and Wales – place particular value on the preservation of locational signals in charges for generation connections. These proposals preserve those locational signals. They allow for generators to pay some of the costs of connection over time, but avoid the risks of volatility that a fully-fledged GDUoS mechanism would currently entail. Generators should now have a choice as to how they pay for connection.
- 7.5 Ofgem hopes that the resulting improvement in the position of prospective distributed generators, and particularly the reduction of the deterrent effect of full-cost, up-front connection charging, will facilitate an early increase in the number of distributed generation connections. If some schemes that would not otherwise have gone ahead are now able to do so, there may be increased

opportunities to learn of the effect of distributed generation on distribution networks. This information will help to inform decisions in the next distribution price control review and beyond.

### ***Connection charges***

- 7.6 Until at least April 2005, generation connections (with the exception of DCHP installations) should continue to pay site-specific charges. **Ofgem would need to be satisfied that any connection charge levied for a DCHP installation reflected genuine costs borne by the DNO.**
- 7.7 **As an interim step, Ofgem proposes that prospective distributed generators should have the choice of paying the costs of connection 'up-front' or paying only for the 'shallow' costs in this way, the balance being collected through an 'annualised connection charge' negotiated with the DNO. Disputes as to these matters can be referred to Ofgem for determination.**
- 7.8 While it is not presently feasible to introduce a formal 'with-without' test aimed at reflecting in charges the costs or benefits that a particular distributed generator might bring to the system, **DNOs should be prepared to negotiate charge variations on the basis of such costs and benefits as are reasonably identifiable. In this regard, avoided investment in distribution assets - including deferment of asset replacement - would be a likely topic for discussion, as would contributions to fault level. In order to facilitate negotiation, Ofgem would look to DNOs to make genuine attempts to reduce the time and cost that is frequently associated with the preparation of network studies and connection quotations. Increased transparency in quoted charges would, in some cases, also be welcome.**
- 7.9 **There is a strong case for the modification of deferred 'deep' connection charges in recognition of deferment of asset replacement. Ofgem will be seeking confirmation from DNOs that this will be their practice from now on.**

### ***Annualised connection charges***

- 7.10 **Ofgem considers that it is not yet possible to create what might be a relatively complex GDUoS mechanism. As an interim arrangement, however,**

**prospective distributed generators should have the choice of opting to pay connection charges over a period of years - negotiated with the DNO.**

- 7.11 DNOs will need to develop appropriate strategies for managing the increased risk attendant upon annualised connection charges. Termination payments would be one way of addressing this.
- 7.12 Where generators require the enhanced levels of security accorded by firm connections, Ofgem expects that DNOs may wish to recover the additional cost through the 'up-front' connection charge rather than through an annualised connection charge, but this would be a matter for negotiation between the DNO and the generator.
- 7.13 In those instances where generators agree to be contracted for capacity contributions to meet the needs of the DNO (e.g. peak-opping), it would be appropriate to take account of such agreements through commercial contracts separate from the connection charging mechanism.
- 7.14 **Some responses indicated that, as presently drafted, ER P2/5 constrains DNOs from harnessing the benefits that distributed generation could bring to network security. The DGCG's Technical Steering Group will be giving preliminary consideration to the governance and future of P2/5.**

#### ***Initial contributors and second-comers***

- 7.15 **Removing the possibility of 'free-riding' by second comers would be helpful in creating a generally more benign environment for distributed generation. Ofgem will be discussing with DTI a separate consultation on the changes that may be desirable to extend the Electricity (Connection Charges) Regulations 2002 to non-domestic premises.** In the meantime, DNOs should review their record-keeping arrangements, with a view to ensuring that they will be sufficient to support reimbursement of initial contributors in respect of subsequent connections.

#### ***Banding of distributed generation***

- 7.16 **Ofgem intends that the DGCG's Technical Steering Group should advise on an appropriate system of banding for distributed generation.** However, it seems

desirable, as some responses suggested, to align the first band with the coverage of ER Gcc-007. That would facilitate separate treatment of DCHP. A second band covering larger micro-generation connections at LV has some appeal.

### ***Metering***

- 7.17 **Ofgem regards the separate metering of active power imports and exports as a minimum for all distributed generation, including DCHP installations. Such metering would support pricing likely accurately to reflect the varying behaviour of DCHP users as they connect to networks in increasing numbers and with higher-capacity generating units. Consistency with metering of the increasingly efficient photovoltaic units now being developed is another relevant consideration.**
- 7.18 Apart from the benefits of reducing the scope for cross-subsidy, separate metering of exports would create demand for sufficient appropriate meters to bring down their unit cost. Separate metering of exports would, moreover, permit their treatment separate from imports, thus avoiding any constraint that might result from the '28-Day Rule' and obviating unnecessary restrictions on the operations of Energy Service Companies. DCHP installers should be able to complete all the necessary work, including metering changes, during a single visit to the customer's premises.

### ***Existing distributed generation***

- 7.19 **Existing distributed generators should not be affected by these interim proposals. Capacity increases of existing distributed generators should be treated, on a case-by-case basis, in the same way as new connections.**
- 7.20 Ofgem acknowledges that capacity reductions may not always result in a benefit that the DNO can share with the generator. However, genuinely identifiable benefits should not be overlooked in negotiation of capacity reductions. There may be cases in which their financial recognition would be appropriate.

### ***Information***

- 7.21 **Work to date on Long-Term Development Statements (under distribution licence condition 25) will be of material assistance to potential distributed**



**generators.** Ofgem has no additional recommendations to make as a result of the September 2001 consultation on distributed generation, but work on Long-Term Development Statements is progressing as a separate work project.

- 7.22 **Some DNOs have indicated that they intend to review their Condition 4 Statements with distributed generation and new generating technology in mind. Ofgem would urge all DNOs to conduct such reviews.**
- 7.23 **The advent of micro-generation and DCHP will make it desirable for each DNO to produce a 'Plain English Guide' to connections of this size.** Ofgem would expect to receive copies, together with evidence of appropriate consultation as to form and content (specifically with energywatch, equipment manufacturers and 'plain English').
- 7.24 Organisations representing generators might consider whether their members might be in a position to share information about some individual connections that might be of use to the wider generator community.

## 8. PART VIII – FURTHER WORK AND ISSUES FOR THE NEXT PRICE CONTROL REVIEW

### *Summary of responses: commercial incentives on DNOs*

#### Introduction

- 8.1 Several responses to the consultation discussed the question of commercial incentives on DNOs to connect distributed generation. There was a range of views. Although the consultation document asked no specific question on this subject, it seems appropriate to set out the various comments here.
- 8.2 Of the eight responses to address this issue, three were from generators or organisations representing them. Only one DNO response explicitly discussed it. This was perhaps because it cannot fully be addressed in advance of the distribution price control review. Nevertheless, preliminary discussion is constructive.

#### The case made by a DNO

- 8.3 One DNO argued strongly that the regulatory environment should give DNOs a positive incentive efficiently to provide assets that would enable renewable generation and CHP to connect to their networks – and to secure Government objectives.
- 8.4 In essence, the company's case was that certainty of cost recovery, in respect of distributed generation connections, only represents the removal of a disincentive. A positive incentive would be required to make significant progress with distributed generation.
- 8.5 This response argued that Ofgem's work on an incentive scheme (the Information and Incentives Project - IIP) had resulted in a narrowly defined scheme considering performance under the three headings of the number of supply interruptions, their duration, and the associated call-centre response. The company thought it debatable whether distributed generation would have a consistent, significant or attributable effect on any of these.

8.6 This response therefore argued for a separate income source reflecting the level of distributed generation, but going beyond the simple issue of cost recovery. It cited a recent OFREG paper<sup>24</sup> that proposed “an incentive on Northern Ireland Electricity’s distribution business to carry more kWh than the transmission system (after allowing for losses)”. Such a scheme, the company argued, would positively reward the growth of distributed generation in a distribution area. Similarly, the Office of the Rail Regulator had created an adjustment to Railtrack’s allowed revenue to reflect increases in train miles, against a baseline volume. The DNO argued that Ofgem could initiate similar approach, perhaps establishing a new component of the Regulatory Asset Base (RAB) reflecting the capacity of distributed generation connected to a DNO’s network.

#### Generators’ views

8.7 Generators responding to Ofgem’s consultation paper were not, of course, commenting directly on the DNO’s proposals. It is, however, interesting to consider their views in the same general context.

8.8 **A generators’ association suggested that incentives within the current price control should be altered to give an economic incentive to connect, and actively to manage, distributed generation. The response attached particular importance to incentivisation of a move to more actively-managed networks.** It also suggested that active support of renewable generation should be on a generic basis, as well as relating to the finance of individual projects.

#### Views of other organisations

8.9 **Some responses expressed concern that DNOs seemed to rely too much on regulatory incentives as drivers of their policies and actions.** The energywatch response suggested that DNOs’ monopoly status did not render them immune from other drivers for change, and that, like other businesses, they must adapt to changes in the operating environment. For DNOs, the growth of distributed generation was an example. **Others made similar points, suggesting that they**

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<sup>24</sup> ‘Greening Transmission and Distribution: A consultation paper by the Director General of Electricity Supply for Northern Ireland’, OFREG, June 2001. The paper is available on [www.nics.gov.uk/ofreg](http://www.nics.gov.uk/ofreg)

**would expect DNOs to do much more than they currently did to come forward with innovative ideas for fulfilling the new statutory duty.**

- 8.10 One response indicated that NGC's practice of offering more options than just up-front capital contributions allowed the company to make a return on relevant assets in a way that the present distribution approach did not. The pattern of risk would be different for DNOs, and risk-sharing arrangements would require careful consideration. This response also suggested that the IIP initiative might discourage DNOs from making distributed generation connections. There was a risk of adverse impact on demand customers - at least in the short term, as connection works progress.

**Ofgem comment**

- 8.11 It was acknowledged, in the discussion of the advantages and disadvantages of 'deep' and 'shallow' connection charging policies that even 'deep' connection charges would not, for example, usually extend to reinforcement of 132kV networks in anticipation of clusters of major renewable connections. Some mechanism to facilitate such reinforcement might not constitute discrimination in favour of distributed generation. Ofgem has previously stated that it would be inappropriate for the regulator to favour one form of generation over another. **Ofgem recognises, however, that the main thrust of the DNO's case can be seen as the commercial parallel to the recognition that, in terms of engineering the networks, the spread of distributed generation connotes more than just connecting individual generators.**
- 8.12 While understanding the concerns of some generators to move quickly to a more favourable incentive framework, Ofgem is alive to the many arguments advanced in responses for not re-opening the price control. The technical issues surrounding active network management are well understood and they will form an important aspect of the next distribution price control review. In the meantime, a separate workstream will consider the impacts of increasingly sophisticated network management.

## *Issues that can be addressed now, as Ofgem workstreams*

### **Introduction**

8.13 While, as this document has explained, some important issues will have to await consideration, either as part of the next distribution price control review, or within the ambit of the review of distribution charge structures, Ofgem consider that some can be taken forward now. These new workstreams are identified in this sub-section.

### **Establishing when underlying conditions may change**

8.14 Ofgem has declared, in its Corporate Plan consultation, that it will use 2002 to consider the framework for the next distribution price control review. An important aspect of this work will be giving consideration to when increased distributed generation may change the conditions underlying the existing approach to these price controls. Specifically, it will be helpful to understand:

- when distributed generators may become a large enough class to support GDUoS charges;
- when DNO charging may start to move away from unit-based pricing;
- the developing role of distribution networks, including:
  - reduced or reversed power flows;
  - areas of islanded operation; and
  - local, sustainable energy communities;
- when more active management of distribution networks will start to become a reality; and
- when it may become necessary to ascribe values to system support services provided by distributed generators (currently provided by NGC).

## **Consultation on Engineering Recommendation P2/5**

- 8.15 In England and Wales, ER P2/5 would seem to have some significance in unlocking the potential of distributed generation as an alternative to the construction of network assets in contributing to system security. The Technical Steering Group (TSG), created to support the Joint DTI/Ofgem Distributed Generation Co-ordinating Group, is taking a broadly-based approach in working with a range of organisations and interests to develop this workstream. It will probably be appropriate to produce a short-term update, before carrying out a more comprehensive review.
- 8.16 In Scotland, the 132kV network forms part of the transmission system, and is covered by NSP 366 (similar to NGC's transmission planning standards). Accordingly, smaller generation, including renewables and CHP, are connected in Scotland under different rules. The desirability of consistency of treatment suggests a review of NSP 366 in parallel to any review of P2/5.
- 8.17 Ofgem will shortly be consulting on the appropriate governance of these engineering recommendations and standards.

### **Benefits of distributed generation**

- 8.18 A work programme will be put in place now to start to address the uncertainties associated with the benefits of distributed generation. This will relate to work on planning standards and network design. It would be sensible to look at a range of scenarios for the amount of distributed generation. The work programme might need to encompass treatment of certain transmission issues (e.g. losses and reactive power).

### **Standardisation and simplification of connection arrangements for DCHP**

- 8.19 Many consultation responses called for the establishment of simple, workable and comprehensible arrangements for DCHP installations. This is another project that the TSG is taking forward. It will be important to ensure that recommendations are translated into broadly-accepted standards, and these are compatible with technical standards and codes already applying in the industry.

## **Performance standards on 'network studies' and connection quotations**

8.20 The time and expense involved in the process of 'network studies' and formulating quotations can constitute a serious problem – especially for distributed generation schemes with relatively low overall costs. As part of a wider initiative on the provision of connection quotations by monopoly network operators, Ofgem will consider whether service levels might be improved by the establishment of binding standards of performance on the timing and cost of 'network studies' and connection quotations for prospective distributed generators.

### **'Premium power zones'**

8.21 Ofgem considers there to be potential advantages in finding ways in which DNOs could signal to generators that connection in certain areas, and down to specific substations, would be beneficial to all parties. One option might be the development of 'premium power zones' where DNOs could plan and invest in anticipation of the connection of distributed generation. It would be helpful to consider the feasibility of this option before the start of the next distribution price control review.

8.22 Provided that the question of appropriate funding could be resolved, 'premium power zones' could offer potential distributed generators confidence of economic connection. Other benefits could include:

- focused and efficient investment in active networks, as part of a longer-term strategic plan;
- gaining experience, in a controlled area, of managing the challenges of active distribution network operation (e.g. voltage regulation and islanding capability);
- exploring the potential for the provision and consolidation of ancillary services by distributed generation – and particularly the extent to which this might enhance the quality of supply to consumers;
- gaining experience that would be of assistance in developing zonal GDUoS charging mechanisms;

- piloting the integration of storage technology to distribution networks, and considering the services that they might offer;
- local improvements in network performance; and possibly
- the development of local energy communities and markets.

8.23 There would be benefit in making an early start on this workstream. Particular areas to explore would seem to be:

- the regulatory treatment of forward investment;
- ensuring that funding arrangements do not result in inefficient locational decisions;
- identifying responsibility for defining the areas to become 'premium power zones';
- safeguarding the interests of demand consumers; and
- assisting in the understanding of the impact of planning requirements on the development of distributed generation.

#### **Transmission Network Use of System (TNUoS) charges for distributed generators**

8.24 Distributed generators who are licensed generators or who choose to become parties to the Balancing and Settlement Code and submit bids and offers to the Balancing Mechanism pay TNUoS charges. With the development of unified trading arrangements across Great Britain, it seems sensible to develop policy on such charges as a single exercise, rather than holding separate reviews for England and Wales and for Scotland.

#### ***Issues for the distribution price control review***

##### **Introduction**

8.25 Although the immediate scope of the September 2001 consultation was to explore the possibilities for interim change (prior to April 2005 and probably from April 2002), it was inevitable that responses would express opinions as to



which topics would have to be resolved as part of the next distribution price control review. It seems important that these ideas are not lost.

8.26 **The purpose of this section of the paper is to highlight the price control issues that emerged from the responses. This does not purport to be an exhaustive list of topics for the review, nor has any attempt been made here to examine the issues in detail.** It should, however, constitute a useful aide-memoire for those who will be involved in the review process.

8.27 A key objective in setting a price control is to create a balanced package of incentives for quality of supply, efficient operation and network development. In designing these incentives, it is necessary to review historical performance, compare the approaches adopted by different companies, review the companies' plans for the future and the trade-offs between different objectives. The incentives for distributed generation need to dovetail into this framework. Therefore it would be appropriate to leave decisions on objectives to the next price control review. This would have the added advantage of allowing this work to be informed by the work streams identified in the previous section of this document.

8.28 The review should consider the issue of commercial incentives on DNOs, as discussed earlier in this Part of the document. This topic would seem to require the fully-rounded consideration that the price control review will be able to accord to it. Nevertheless, it will be important to ensure that DNOs have appropriate commercial incentives to connect distributed generation.

### **Connection charges**

8.29 Consideration will have to be given to achieving an appropriate balance between:

- 'up-front' connection charges;
- a possible move to a 'shallow' connection charging regime;
- UoS charges; and

- market-based solutions and contractual arrangements (perhaps for the provision of network support services).
- 8.30 In particular, it will be appropriate to consider a move to true 'shallow' connection charging where only the assets directly required to connect a distributed generator to the network are included in connection charges. All other reinforcement costs would then be spread across all users of the system.
- 8.31 It was clear from responses that, the issues of connection and DUoS charging being closely linked, it is not presently feasible to construct a robust set of arrangements to take account of these factors. The preliminary workstream on the timing and extent of changes to underlying conditions will help to inform decisions about connection and DUoS charging.
- 8.32 Several responses emphasised that the price control review should take full account of the interests of existing distributed generators, and that the outcome should not disadvantage them.

### **UoS charges**

- 8.33 Similar reasons suggest that UoS charges should be considered in tandem with the price control review. Responses to the consultation raised questions about:
- whether DNOs or suppliers should bill generators for UoS;
  - compatibility of transmission and distribution UoS charging, and the desirability of considering the two together;
  - zonal charging for distribution services
  - when excluded service treatment of generation-associated revenue should cease;
  - the extent to which UoS charges for generation should include existing network costs (as opposed to just incremental connection costs);
  - maintaining simple charging structures, to minimise transaction costs, aid understanding and to facilitate competition;

- possible scope for a transparent, national pricing structure capable of regional variation;
- transferring locational signals from connection charges to UoS; and
- small populations of generators resulting in volatility in UoS charges.

### **Entry and exit charges**

- 8.34 Some responses suggested that, in the longer term, DNOs should consider cost recovery through entry and exit charges. It was also suggested that any system of entry and exit charges should apply to all infeeds, including those from transmission networks.
- 8.35 While it is clear that the advent of DCHP and micro-generation may begin to blur the distinction between demand and generation connections in some areas, most respondents who commented on the issue seemed to consider that the distinction would remain valid for a considerable period. Again, useful preparatory work might include forming a view about the likely scope and timing of changes.

### **OPEX and CAPEX**

- 8.36 The response from a vertically-integrated energy company noted that, under the current regulatory regime, DNOs can only initiate infrastructure investments if there is a clear and immediate need or request, with suitable funding arrangements in place. The company suggested that this would inevitably lead to piecemeal network development, limiting the risk to a level consistent with the regulatory rate of return. This was a short-term view. The growth of renewable connections in South-West Scotland, for example, would require long-term thinking in terms of major network enhancement, reconfiguration of generation connections, and the redundancy of recently-installed assets. Despite the fact that customers throughout Great Britain would benefit from the development of these renewable resources, the resulting expenditure would fall on customers connected to the particular network. This suggested some way of spreading the costs more widely – perhaps through an inter-DNO charge.

8.37 The paper has already explained that it would not be appropriate for Ofgem to introduce new regulatory arrangements that cross-subsidised distributed generation. Nevertheless, it will be important that the price control review develops the work on 'premium power zones' highlighted in this Part.

### **The longer-term view**

8.38 Some responses suggested that:

- DNOs should be able to initiate infrastructure investment in advance of immediate need – avoiding short-term, piecemeal network development;
- greater attention might be paid to cost-recovery of CAPEX over more than one price control period;
- work needs to be done on future risk assessments and investment priorities; and
- the regulatory framework should encourage confident long-term decision-making.

8.39 As these are, by their nature, long-term issues, the proposed preliminary workstream on the likely timing and degree of fundamental change will need to be completed before these areas can be satisfactorily addressed.

### **Network access**

8.40 Some responses seemed to value choice as to the 'firmness' of network access. Others expressed concern that firm access rights, secured through payment of 'deep' connection charges should not be lost as a result of the introduction of revised access arrangements.

8.41 There is scope for debate about standard connection charging and the associated mechanisms for recovering the cost of 'firm' connections.

## **Commercial incentives on DNOs**

- 8.42 The review should consider the issue of commercial incentives on DNOs, as discussed earlier in this Part of the document. This topic would seem to require the fully-rounded consideration that the price control review will be able to accord to it. Nevertheless, it will be important to ensure that DNOs have appropriate commercial incentives to connect distributed generation.

## 9. PART IX – ISSUES FOR CONSIDERATION BY OTHER ORGANISATIONS

### *Introduction*

- 9.1 Some of the issues raised in responses to the September 2001 consultation fall outside Ofgem's remit. This section of the paper gives a brief outline of these issues.

### *Planning permission*

- 9.2 The steps necessary for obtaining planning permission are part of the democratic process. Concerns regarding the operation and effectiveness of the process have been raised with Ofgem. One DNO reported a 'wide consensus' that many distributed generation projects fail to obtain planning permission. An organisation representing generators commented:

*"We have great concern that the planning process is now of sufficient duration and complexity to present a barrier to further investment by embedded smaller generators. We urge Ofgem to ensure HMG is fully aware of the extent of this problem and is doing all in its power to ameliorate this difficulty".*

- 9.3 In the submission of one respondent, the rejection rate for renewable generation schemes, under current planning arrangements, currently approaches 90%.
- 9.4 An organisation representing renewable generators advocated co-ordination between Ofgem, renewables developers, environmental planners and DNOs to identify acceptable development sites.
- 9.5 A DNO suggested that Government Offices in the regions might act as one-stop-shops able to help potential developers to identify opportunities, smooth regulatory and planning consents, and signpost available grants.
- 9.6 Planning consent issues are wider than distributed generation alone. Delays can have a significant impact on the development of the electricity and gas infrastructures with attendant risks for the wider security of supply.

### ***The Electricity (Connection Charges) Regulations 2002***

- 9.7 Any amendment to the Electricity (Connection Charges) Regulations 2002 would primarily be a matter for the DTI. Ofgem will be discussing with the DTI what amendments might be appropriate to secure reimbursement of 'initial contributors' in respect of generation connections. Such amendments would be the subject of separate consultation.

### ***Building Regulations***

- 9.8 One response suggested that suitable adjustments to energy efficiency and building regulation policies might be required to ensure that DCHP would be fairly treated in relation to other energy efficiency equipment and treatments.

### ***Safety***

- 9.9 On safety, a DNO's response commented:

*"There is an urgent need for some key safety issues to be resolved. We believe that priority should be given to taking forward joint work with DTI and HSE on the safety of network operation for completion well before the January 2004 date indicated in the EGWG report".*

- 9.10 Ofgem also has safety duties. The Distributed Generation Technical Steering Group is aware of these issues, and of the need to involve DTI and HSE at an early stage of the relevant work projects.

### ***Promoting distributed generation***

- 9.11 Any initiative to promote distributed generation that would have significant financial implications for consumers would be a matter for DTI. Several responses advocated additional support of this sort.
- 9.12 A renewable generator suggested that DNOs' programmes of network refurbishment and reinforcement should give priority consideration to renewable, distributed generation options. Distributed generators also advocated positive discrimination for distributed generation.

- 9.13 One response pointed to the need to carry out large-scale trials, better to understand the impact of DCHP. Another stressed the need for research into new generating technologies (e.g. vehicle fuel cells connecting to domestic energy installations).
- 9.14 A local authority argued that recent changes to the licence exemption regime had not gone far enough. The Electricity (Class Exemptions from the Requirement for a Licence) Order 2001<sup>25</sup> still contained inappropriate barriers to local competitive generation, distribution and supply (e.g. the 1MW limit for domestic customers on private networks, and the 5MW – of which only 2.5MW can be supplied to domestic customers – aggregate limit).

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<sup>25</sup> The exemption order is made by the Secretary of State, and therefore a matter for the DTI.



## Appendix: Organisations that submitted responses to the consultation

Alcan Aluminium UK Ltd
Association of Coal Mine Methane Operators
Association of Electricity Producers
ATCO Power Generation Limited
BCN Data Systems Limited
Beacon Energy Limited
BG Group
British Energy plc
British Gas Trading
British Sugar plc
British Wind Energy Association
Chartered Institution of Water and Environmental Management
Combined Heat and Power Association
East Midlands Electricity Distribution plc
EA Technology Limited
Edison Mission Energy Limited
Energy Saving Trust
energywatch
First Renewables Ltd
Food & Drink Federation Ltd
GASTEC
GPU Power Networks (UK) plc
Impax Capital Corporation Limited
Innogy plc
LE Group
McLellan and Partners Ltd
Micropower Limited
The National Grid Company plc
Northern Electric Distribution Ltd
Powergen UK plc
Renewable Power Association
Scottish and Southern Energy
Scottish Power Transmission and Distribution
Secure Electrans Limited
Seaboard plc
Siemens Metering Ltd
Slough Heat and Power Ltd
TXU-Europe
United Utilities plc
Western Power Distribution (South West) plc
Woking Borough Council
Yorkshire Electricity Distribution plc