

## Distributed Energy Working Group

### Discussion Paper 2: the nature of Distributed Energy

The purpose of this discussion paper is to explore the various settings in which DE is deployed to develop an understanding of the specific issues that relate to the development of DE schemes.

From	Ofgem
To	Workgroup participants
cc	
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#### 1 Introduction

1. This is the second in a series of papers that explores the issues associated with Distributed Energy (“DE”) with a view to consulting on measures in the Autumn (2007). The specific purpose of this discussion paper is to explore the various settings in which DE is deployed and:
  - develop an understanding of the specific issues that relate to the development of DE schemes. We have set out our understanding of the issues facing the practical development of DE schemes in a range of settings and are seeking the input of practitioners in the industry to provide insight to assist us develop relevant measures; and
  - set out the high level issues surrounding the application of the Electricity (Class Exemptions from the Requirement for a Licence) Order 2001 (as amended) (the “2001 Exemption Order”).

#### Distributed Energy

2. DE as defined by the “Distributed Generation Review”<sup>1</sup> is *any generation which is connected directly into the distribution network, as opposed to connecting to the transmission network, as well as CHP of any scale. The electricity generated is generally used in the local system rather than being transported for use across the UK.*
3. In relation to the local use of the electricity it is worth making the distinction between physical and commercial flows. When DE is connected to the grid the laws of physics determine where that electricity flows and is subsequently consumed. This is irrespective of the commercial arrangements that have been established by the developer to construct the plant, be they with local or national customers.
4. This has an impact on realising Government’s policy objective of reducing carbon and the role that DE can play in meeting a lower level of emissions in the energy sector. The primary benefits of DE amount to:
  - the lower level of losses that occur when the plant is situated close to demand sites. These losses directly translate into lower generation requirements (and consequently lower carbon emissions).

<sup>1</sup> We note that the Working Group has asked for that the term “Distributed Energy” be used throughout our discussions instead of “Distributed Generation”.

- certain types of DG such as CHP have even greater advantages in that if the plant is situated close to demand the heat can also be distributed to customers improving overall energy efficiency.
  - locating generation close to demand gives consumers a greater awareness of their consumption and thought to induce behaviour changes.
5. We observe that in respect of electricity the carbon benefits have been largely realised merely by situating the plant close to demand without commercial arrangements with local customers.
6. The DE definition reflects a broad scope of consideration for the Working Group as it covers many technologies including wind turbines, solar photovoltaics (PV), heat pumps which are installed by individuals, businesses, communities, schools, commerce and industry. For the purpose of exploring the variety of use of DE we have identified four key settings, described below:
- **Independent - single site / sell to third party supplier:** the most relevant form of this setting is the development of green schemes such as waste, biomass or wind which are connected to the distribution network. In these circumstances the developer sells all the output to a third party supplier via a Power Purchase Agreement;
  - **Industrial & Commercial - single site / own consumption:** energy plant that is built on site for own use consumption and often includes electricity and heat. This category includes industrials such as oil refineries, chemicals and tobacco production, but we also include in this category any generation where the output is used on site – Ofgem’s office, for example, has a base load CHP plant;
  - **Industrial & Commercial - multiple site / own consumption:** energy plant that is built for own consumption but often extends over several sites. In this category we include hospitals, universities and council buildings (offices and dwellings) that have many sites in a local vicinity;
  - **Community - multiple premises / multiple customers:** energy plant that is built as part of a community scheme that is intended for a range of customers (both residential and commercial) each at separate premises in a local area.

### Rest of this paper

7. In the rest of this paper we set out the issues that arise from considering DE within the context of independent, industrial & commercial and community settings. In respect of these settings we explore five key issues as follows:
- the application of the Electricity (Class Exemptions from the Requirement for a Licence) Order 2001 (as amended) (the “2001 Exemption Order”);
  - the export value of electricity from the generation;
  - the value of own-use electricity consumption;
  - the trade off between constructing private wires and using the public network;
  - providing small scale supply and generation in a competitive market

8. Our discussion draws out the additive nature of these issues across the various settings that we have identified. Independent generators for example are primarily focussed on realising the maximum amount for their production whereas Community scale schemes face all of the issues mentioned above (Table 1).

**Table 1: Issues facing Distributed Energy settings**

Distributed Energy Setting	Key issue
Independent	Export value of electricity
Industrial & Commercial – Same site	Value of own consumption
Industrial & Commercial – Multiple sites	Private wires vs Public network
Community	Operating in a competitive market Sizing plant Obtaining Exempt Supplier Services

**Note:** the specific licence exemption issues are discussed separately for each setting

9. We have already indicated in the previous discussion paper that microgeneration (plant less than 50kW) is outside the remit of this Working Group and is being considered separately in a parallel workstream. However, we have undertaken to distribute the working papers from this workstream to the Working Group as and when they are prepared.
10. This paper is not intended to present a fully comprehensive legal analysis of the applicability of the 2001 Exemption Order as this will likely be case-specific and differ depending on the facts of each particular project.

## 2 Independent

11. We define Independent generators as those that build a stand alone plant where all the output is sold to a third party supplier. The most current and relevant form of Independent generator to this discussion is the development of green schemes such as waste, biomass, wind or Good Quality CHP. The ability of developers to finance these schemes is dependent on obtaining a competitively priced Power Purchase Agreement typically from a third party supplier.
12. These developers want to maximise the return on their investment by ensuring that they obtain the greatest value from the sale of the electricity to any third party. This value is driven by a number of factors (covered in the first discussion paper) including:
  - **the predictability of the generation:** this is largely dependent on the reliability of the plant and the predictability of its output profile. In the case of CHP and other self dispatch plant if operators are prepared to commit to a given output profile this value increases;
  - **supplier transaction costs and expected margin:** having to compete in a tender for export electricity can be time consuming and the costs have to be spread over the expected exported units. Suppliers will also expect to take a margin on the transaction further reducing the value of the export electricity;
  - **the embedded benefits** which can include avoided network losses, avoided distribution network reinforcement<sup>2</sup>, avoided TUoS and BSUoS

<sup>2</sup> DNOs are currently considering the structure of DUoS charges that are applicable when connecting Distributed Energy.

- for green energy schemes any **carbon related benefits** realised via ROCs and LECs.
13. The ability of generators to negotiate a fair value for the electricity is dependent on the vibrancy of the competitive market for such exports. We understand that for tenders that involve 100% export of the plant output only a few suppliers will respond.
  14. It would be necessary to consider whether a generation licence would be required for this type of scheme or whether the owner could be exempt under the 2001 Exemption Order
  15. **Discussion question:** We would like to understand how competitive the market is for purchasing electricity for all forms of DE. *If competition is limited due to the relatively small scale of the DE schemes under consideration, what are the causes?*

### **3 Industrial & Commercial - single site / own consumption**

16. This setting covers those Industrial and Commercial customers that have a single generation plant installed on site which is entirely for own use. We understand that the industrial sector represents the majority of these types of settings and often involve CHP plants. In 2005<sup>3</sup> there was 5,792MWe of installed CHP electrical capacity with around 94% of this capacity spread between the chemicals, oil refinery, beverages and tobacco industries. The remaining 6% is used for agricultural, commercial, public administration, residential and transport sectors. These schemes are particularly attractive to industrial and commercial customers with high own-use requirements that require a steady source of heat such as oil refineries.
17. In developing a business case for investment these schemes need to determine:
  - whether the scheme is exempt from any licence requirements;
  - the value of the electricity produced by the plant for own use consumption; and
  - value any surplus electricity that is sold to a third party supplier.

#### **Licence exemption**

18. In the circumstances described in paragraph 15 above, under the 2001 Exemption Order, an owner is likely to be exempt from the requirement to have a generation licence as long the plant has a declared net capacity of less than 100MW<sup>4</sup>. Additionally, a supply licence is unlikely to be necessary given that the electricity is intended for own use and a distribution licence is unlikely to be required as the electricity is intended for non-domestic use.

#### **Value of own use consumption**

19. It is argued that the electricity produced by the plant can be valued at the avoided retail tariff on the basis that for every unit of electricity produced on-site, one less unit has to be imported at the retail tariff. This valuation assumes that the import retail tariff

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<sup>3</sup> Source: DUKES

<sup>4</sup> We have assumed that in all our settings the developer does not already hold a generator, distribution or supply licence.

remains the same regardless of the level of electricity production – ie no matter how much or how little the customer imports the per unit tariff remains the same.

20. Pricing policy is a commercial matter for each of the suppliers in the market and is likely to vary between market participants. However, we note that the retail tariff has fixed and variable components. The variable elements cover the energy cost and network distribution costs and the fixed element covers the customer acquisition, transaction and supply costs. By reducing the amount that is consumed by constructing on-site generation the customer avoids the variable costs of consumption, but they do not avoid the fixed costs. By way of an example if costs-to-serve for a customer are £100 per annum and they consume 4MWh per annum then the per unit cost is 2.5 p/kWh. However if they only take 2MWh then these costs double on a p/kWh basis;
21. This increase in the average import price which results from reducing consumption exists in the domestic market where most suppliers offer a two tier tariff. The first tier is designed to cover the fixed costs of supply with the second, typically lower, tariff cutting in at a pre-determined threshold largely reflecting the variable energy costs. Those that import little electricity due to low consumption, or the existence of microgeneration installed at their premises, will pay a higher average cost per kWh for import than if they consume larger amounts.
22. We would also anticipate that suppliers also need to build in to the import tariff for customers with on-site generation, the fact that the load factor could well change. If the plant is largely base load then the load factor of the residual requirements would fall with a corresponding increase in the cost of supply as more expensive peak plant is required to balance demand.
23. If suppliers do price in the residual imported electricity to include the fixed costs and the change in load factor then the value of the on-site generation is reduced by an amount equivalent to these additional costs.
24. **Discussion question:** *what pricing policy do suppliers adopt to customers with on-site generation?*

#### **Exported electricity**

25. Obtaining the maximum possible value of any surplus electricity sold to a third party supplier is important in improving the business case for investment. What is not clear to us is if the concern about the export value of the electricity is based on the expectation that it should be equivalent to the import value – which as we outlined in our first discussion paper is not a valid expectation – or there is concern that the market is not sufficiently competitive to ensure a fair value is realised.
26. **Discussion question:** *even though surplus export electricity tends to be difficult to predict is there a genuine concern that the full value is not being realised in the competitive market?*
27. **Discussion question:** *are the export volumes and the number of installations too small to be of interest to suppliers?*

#### **4 Industrial & Commercial - multiple site / own consumption**

28. This is an extension of the previous setting discussed in Section 3 and covers those Industrial & Commercial customers that have a number of sites in the same vicinity.

29. We have made the distinction between I&C customers that use their electricity on the same site and those that have multiple sites because it raises the issue of whether they should construct a private wire between the various sites to maximise the level of own-use electricity. This the single most important issue, then, facing these customers, over and above those we considered in Section 2 and 3 and raises two issues:

- what are the legal restrictions on own-use consumption in these settings;
- how significant is the incentive to construct a private wires network.

### **Exemption conditions**

30. For a pure I&C multiple site project, where electricity is consumed entirely for own use:

- a generation licence is unlikely to be required since the plant has a net declared capacity of less than 100MW;
- the owner is likely to be exempt from the requirement for a distribution licence for any private wires as the consumption is for I&C purposes only .
- the owner might also be able to supply own-use off-site demand without a supply licence by using the public (or a private) network as long as premises on these secondary sites are classed as on the same site as the generating station by the 2001 Exemption Order (eg immediately adjoining the generating station or separated from the plant by a road, railway or watercourse). However, premises situated further afield in the vicinity may also be considered as own-use, and so exempt from the requirement for a supply licence if they are connected using private wires.

31. In the case where the development includes residential dwellings such as council owned housing or campus accommodation on a university site it is not clear if such (sometimes unmetered) supply counts toward the domestic exemption limits set out in the 2001 Exemption Order. This also impacts on whether the exemption from the requirement to have a distribution licence could apply.

32. **Discussion question:** We note that as the nature of the scheme becomes more complicated the legal issues raised by the 2001 Exemption Order in respect of determining eligibility for exemption become more onerous. *Does the Working Group consider that there is a case for introducing more clarity into the 2001 Exemption Order?*

### **Incentives to construct private wire networks**

33. It is important to understand the incentives to construct such networks and whether any changes could be made to the arrangements to exploit any benefits within the existing arrangements.

34. As discussed in the first I&C setting (Section 3), electricity consumed on-site is valued at the avoided retail tariff (less the additional per unit costs reflected in the import tariff). But what is not clear is how this value changes when electricity is consumed off-site and transported via the public network.

35. Let us consider the situation where a customer has two sites with a single on-site generation plant and uses the public network to connect the sites. To do this it has to enter into a set of commercial arrangements with a third party supplier that amount to:

- selling all the surplus electricity from the generation site to the supplier at the wholesale price plus embedded benefits; and then
  - purchasing electricity for the additional demand site at the full retail tariff.
36. The additional costs of entering into these arrangements as opposed to constructing a private wires network are:
- additional metering and multiple site billing;
  - supplier margin on the sale of the export generation; and
  - distribution use of system charges for wheeling electricity over the public network.
37. **Discussion question:** *do these costs represent the difference in value between the electricity consumed on-site and at a second site and reflect the costs of using the public network?*
38. **Discussion question:** There is a trade-off here between the cost and ongoing maintenance of the private wire network required to link up the two sites and the costs of transacting with a third party supplier and the public network use of system charges. We are not clear if this incentive is in favour of the private wire option and how the incentive varies depending on the distance of the second (or multiple) sites. *If there are incentives within the current arrangements do they arise out of:*
- a genuine economic benefit; or
  - a distortion in the pricing policies used by the suppliers; or
  - a lack of competition for export electricity; or
  - restrictions within the licensing framework.
39. **Discussion question:** *what can be done to improve the export value of DE:*
- develop a greater understanding of the output profile of various technologies;
  - reduce the transaction costs for exported electricity;
  - improve the underlying value of the electricity by simplifying the balancing mechanism;
  - encourage distance related DUoS in certain cases where all the electricity is consumed at the secondary sites.

## 5 Community

40. These schemes typically involve an Energy Services Company (ESCO) that is proposing to build plant to supply both heat and electricity to local customers. These schemes share many of the same issues faced by the other situations that we have already discussed, including:
- supplying off-site demand away from the generation and the incentive to build private wires;

- assessing fair reward for the export of electricity.
41. These issues have already been covered earlier in this paper and are not addressed again here. In addition, however, these schemes also face a number of other critical issues, including:
- legal thresholds for licenses particularly in respect of supply to domestic customers;
  - sizing the plant to remain within the thresholds and for the longer term aspirations of the scheme; and
  - costs and risks of operating in a competitive market including exploring the availability of Exempt Supplier Services.

Each is discussed in further detail below.

### Licence thresholds

42. A DE scheme that has a single on site generating station (with a declared net capacity of no more than 100MW) that supplies a mix of third party separately owned domestic and commercial customers on the same site and further afield connected by a public or private wire is likely to benefit from the following exemptions:
- **generation licence:** a generator is exempt from the requirement to hold a generation licence when the consumption is for own use as long as the plant has a net declared capacity of 100MW. If, however, the consumption is for third party use – such as in this Community Setting - then the threshold is 50MW (as long as the total net declared capacity is still less than 100MW).
  - **distribution licence:** a private wire network that connects a number of demand sites owned by separate legal entities would likely be exempt from requiring a licence as long as the supply to domestic customers does not exceed 2.5MW;
  - **supply licence:** a supplier would likely be exempt from the requirement to hold a supply licence as long as the plant does not exceed 5MW and supply to domestic customers does not exceed 2.5MW.
43. In respect of these thresholds developers face a number of issues in regard to initial and ongoing compliance:
- what planning assumptions should be used in planning the scheme so as to ensure compliance with the thresholds; and
  - what measures can be developed to ensure on going compliance with the threshold once it is operational. It is not clear what steps are required should the scheme consistently exceed the thresholds or even if the thresholds are breached on an excessive cold or hot day.
44. If the scheme does fall outside of these limits then it is necessary for the developer to become a licensed supplier and/or distributor and/or generator. Alternatively the Electricity Act 1989 (Section 5) allows for the possibility of the Secretary of State to grant an individual exemption from the requirement to have a licence.

45. **Discussion question:** There has been much discussion about the set up and ongoing operational costs of becoming a licensed supplier particularly in respect of becoming a signatory of the BSC and MRA. *Would the working group consider it valuable to explore the costs and risks of BSC and MRA compliance and what measures could be introduced to reduce these costs and risks?*
46. **Discussion question:** One of the constraints facing a DE scheme considering becoming a licensed supplier is that under the current arrangements it is not allowable to hold both a supply and a distribution licence. *Is this constraint impeding the development of DE schemes?*

### Sizing the plant

47. There are a number of competing factors in deciding on the size of the plant for any given scheme:
- **economies of scale:** as a general rule the larger the plant the lower the per unit capital costs are likely to be;
  - **aspirations of the scheme:** there is often a discrepancy between the number of customers that have already signed up (or been signed up on their behalf such as in a housing estate development) and the intended final geographical coverage of the scheme. We understand that customers such as councils are considering funding initial schemes based on their own use with a view to extending to other customers in the local vicinity once it is up and running. We understand this is not an untypical roll out strategy that has been observed in other countries that have district heating systems;
  - **heat demands:** CHP plant in particular is often sized to meet the heat demands of a particular industrial process which may result in a surplus of electricity for that same customer;
  - **planning requirements:** with the increased use of planning approval as a means of ensuring zero or low carbon developments, developers may size the plant to meet a proportion of demand locally;
  - **licence thresholds:** limits on domestic customers in particular reduce the amounts that can be supplied on an exempt basis before the ESCO is required to become a licensed;
  - **export value of any surplus electricity:** it is unclear whether the transaction costs reduce the incentive for ESCOs to export any electricity and consequently construct plant well within the expected demand of the final scheme.
48. **Discussion question:** *Would the working group find it useful to explore the economic trade-offs and regulatory thresholds in sizing plant in greater detail?*

### Operating in a competitive market

49. An issue has been raised previously that exempt suppliers are in a position to lock customers into long term agreements but once a scheme reaches a certain size it is necessary to become a licensed supplier and this raises the prospect of any given customer involved in the scheme switching to another supplier. We argued in the last paper that the risk of the customer switching away from the ESCO as a heat customer was very low given the high switching costs and the ability to tie these customers into long contacts.

50. In respect of electricity, we also note that the existing 28 day notice period required to allow a customer to terminate a domestic supply contract is shortly going to be removed as a result of the Supply Licence Review. This means that even licensed ESCOs might be more inclined to lock in customers on long term contracts for supply subject of course to general consumer protection and competition law. This still leaves a number of risks for ESCOs including:

- the householder wanting to move house during the term of the contract. There is nothing to stop the ESCO continuing to provide electricity to that householder at their new premises. But the risk remains that the new householder will not want to be supplied by the ESCO;
- the householder credit risk. With a geographically focused group of customers it is not clear what happens if the householder does not pay their bills.

51. In the context of a council, for example, one option for developing the scheme to reduce these risks is to finance the development on the back of own needs. We would presume a council would be prepared to meet the terms of the financiers in order to secure finance. The council then has the option of extending supply to the rest of the town on a marginal cost basis. This would inevitably increase the per unit costs for the council's own use and increase the cost of hitting any carbon objectives, but it would enable it to secure the necessary finance.

52. In the context of a new development, one option is to finance the energy scheme on the back of the entire development and include the cost of the plant in the price of the housing.

53. **Discussion Question:** *how would ESCOs manage the residual risks of householders moving house and customers defaulting on bill payment?*

54. **Discussion Question:** our understanding of the Independent market is that financiers often require AAA credit rating of the supplier that intends to purchase the electricity. *Can ESCO schemes be financed on the back of long term contracts with energy customers who do not have such a credit rating?*

### **Obtaining Exempt Supplier Services**

55. We understand that there are a number of suppliers that provide Exempt Supplier Services to third parties that are operating outside of the licensed framework. The services offered by these suppliers include:

- meeting the obligations of being a signatory of the BSC and the MRA
- providing top up and back up contracts to ensure the exempt supplier balances supply and demand
- providing metering and billing services on behalf of the exempt suppliers customers.

56. **Discussion question:** *is there adequate availability of these services in the market place?*

57. **Discussion question:** Another option facing developers that want to supply their own generation on a larger scale than permitted under the Exemption Order is to enter into commercial arrangements with an existing supplier to manage the obligations of the

supply licence. *Would the working group consider it valuable to explore how these commercial arrangements might be designed to facilitate DE projects?*