The regulatory implications of domestic-scale microgeneration

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Introduction

Ofgem's consultation on regulatory implications of domestic-scale microgeneration is timely and welcome. The UK is in a unique position to become a world leader in microgeneration technologies. Technologies such as micro-CHP, micro-wind and PV could potentially make a substantial contribution to the UK energy supply mix, and help to achieve government targets on renewables and CHP. Whilst many of these technologies are at an early stage of technical development, clear regulatory arrangements are essential to ensure that the microgeneration market has the opportunity to grow.

This response to the consultation draws on work in progress under a research project funded by the Economic and Social Research Council (ESRC). The project: *Unlocking the Power House: Integrating micro-generation in energy networks and buildings*[2] is being carried out by a team drawn from the University of Sussex, the University of Southampton and Imperial College. The main objective of the project is to help tackle the challenges associated with micro-generation by identifying the technical, regulatory and institutional changes that might be necessary to enable up-take on a large scale. A central task of the project is to assess the economics of different micro-generation technologies under a range of different implementation scenarios. Where possible, this response includes preliminary results from the project. Further details of the calculations behind these results are available on request.

Summary

This response includes the following main observations on the consultation document:

- Installing and operating microgeneration should be as simple as possible for consumers;
- The installation of microgeneration should build on the supplier hub, providing consumers with a 'one stop shop' for their dealings with the electricity industry;
- There should be an obligation on electricity suppliers to offer terms for the purchase of exported electricity from microgenerators;
- Microgeneration investment should be accompanied by the installation of 'future proof' meters which have the capability to collect and exchange half-hourly data;
- There should be a simplified procedure for microgenerators to access ROCs; and
- The 28 day rule on supplier switching should be abolished - with appropriate safeguards - to provide encouragement for energy service contracts.

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[2] For further details see: http://www.sustainabletechnologies.ac.uk/Project%20pages/site/brief9.htm.

General Observations

The consultation document covers some – but not all - of the main regulatory issues related to domestic microgeneration in the UK. However, some of the assumptions that inform the analysis in the document merit further scrutiny. When designing appropriate regulatory frameworks, it is important to recognise that microgeneration technologies are consumer goods. Purchasing decisions – whether they are made directly by consumers or indirectly via an energy supplier – are likely to be influenced by a number of factors. Cost is only one of these. Others will include convenience, aesthetics, status, the novelty value of 'owning a power station', the need for a more secure on-site power supply and so on.

Against this background, any factors that make the process difficult or complicated are likely to put potential microgenerators off. Therefore, this response to the consultation has tried where possible to think about how the complexities (or transaction costs in economic language) can be minimised. The aim is to give microgeneration developers a clear opportunity to demonstrate that their products can be an attractive, economic and environmentally sustainable option for consumers.

If the need to minimise barriers to microgeneration is accepted, it is curious that the consultation document does not include a discussion of the 28 day rule under which consumers can change their supplier every four weeks. A trial suspension of the 28 day rule for a limited number of domestic consumers is currently underway. Recent statements by Ofgem suggest that this trial has had a limited impact on the development of longer-term energy service contracts between suppliers and consumers. From some of its public statements, Ofgem seems to have concluded from this that the 28 day rule is not an important barrier for energy service contracts that might include the installation of micro-generation. However, this conclusion might be false since the trial is subject to time limits that make it very difficult to finance micro-generation. The maximum period of 5 years is not likely to be long enough (see detailed figures below).

There is no fundamental reason why the 28 day rule needs to be retained. It has served its purpose as an important transitional safeguard to protect consumers in the early stages of retail competition. Unless the current trial suspension reveals strong evidence of abuse by suppliers, Ofgem should propose a timetable for abolition of this rule and to replace it with new safeguards that mirror those in other consumer product markets (e.g. financial services).

Specific Comments

Building on the 'supplier hub' (6.1)

As pointed out in the consultation document, the main objective of regulatory changes for micro-generation must be to make it convenient for consumers to install a micro-generation unit. Ideally, this should be facilitated through a 'one-stop shop' for customers. However, several proposals in the consultation document appear to retain unnecessary complexity and run the risk of putting potential microgenerators off.

Building on the 'supplier hub' principle, owners of microgeneration should not be obliged to declare their unit to their local DNO and to their supplier separately. It should be compulsory for them, an installer or an electricity supplier to inform their current supplier. The supplier

will in turn be responsible for informing other parties including the DNO, metering provider etc. The supplier should also be obliged to notify the consumer of their export MPAN (7.18).

Purchase obligation (7.23)

While there is currently an obligation on electricity suppliers to supply domestic premises if requested, there is no such obligation for the purchase of electricity exported by microgeneration operators. Whereas the obligation for supply is regarded as 'social necessity', Ofgem believes that an obligation of purchase might be a distortion to the market and an extra regulatory burden on licensed electricity suppliers (7.23.f).

Whilst these arguments have some merit, there are two strong arguments for including such an obligation. First, providing a value for the electricity produced and exported to the grid helps to make microgeneration investment economically viable, and could help the market to become established. Second, this will allow microgenerators to capture some of the value that they provide to the electricity system. This cannot currently be quantified in detail due to limitations within the billing and settlement system.

A purchase obligation is not necessarily a burden to incumbent energy suppliers. The economic valuation of the exported electricity would, for example, acknowledge the reduced use of system charges since the microgeneration output is netted from suppliers' settlement volumes. However, a more accurate reflection of the economic value of microgenerated electricity to energy suppliers will only be possible once microgeneration deployment has reached a certain threshold (5.4). At present, most electricity suppliers contend that it is uneconomic to extend their settlement systems to allow this because of the low volumes of electricity involved (5.8.). An obligation to purchase exported electricity could be a powerful instrument to move microgeneration towards the required threshold.

Export reward (5.)

It is argued in the consultation document that investment in microgeneration technologies might be regarded by some consumers as an investment in energy efficiency. It considers that these consumers might agree to spill electricity not consumed on-site into the grid without seeking any export rewards (5.3 and 10.7). Furthermore, the document assumes that "many [microgeneration] installations will have minimal electricity export" (10.15), which may lead to the conclusion that the export rewards are not very important.

However, this view contradicts that of the DTI in its recent consultation on the government's microgeneration strategy. This states that 'some energy companies already pay customers for excess electricity and the Government would like to see this aspect of the energy market develop to become more competitive'. Export rewards are likely to be crucial for most micro-generators. The successful take-up of PV technologies in Germany, for example, has been largely driven by such export incentives. Initial calculations for the *Unlocking the Power House* project show that this will also be important for the UK. Depending on the technology and site, up to 50% of generated electricity is likely to be exported to the grid. Thus, the valuation of exported electricity has considerable implications for the economics of these technologies and their future market share. This suggests that it makes little sense for regulations to make any distinction between the spilling of surplus electricity and its export in exchange for a reward. As argued above, an obligation for suppliers to purchase exported electricity is a sufficient and appropriate approach.

Ofgem considers two export reward options: first, a direct payment for each unit exported, second, reduced import tariff rates as compensation for hosting a microgeneration unit while the exported units are owned by the energy company (5.5.). Results from *Unlocking the Power House* indicate that the first option of paying a reward for each unit exported to grid would be a good incentive for microgeneration investments. They also show that reduced import tariff rates may have a negative impact on the economics depending on the microgeneration technology.

Table 1 shows the impact of export tariff on payback time on the left hand side, and the influence of reduced import tariffs on the right hand side for PV and micro-CHP. An export tariff of only £0.04/kWh – half of the current average import tariff – could reduce simple payback times for PV by between 7 and 17 years, for micro-CHP by 1 to 5 years depending on the households' annual electricity consumption. A reduced import tariff has different impacts on the two technologies: while micro-CHP with a high share of avoided electricity imports would be negatively affected by a reduced import tariff, payback times for PV could be reduced by up to 13 years.

Table 1: Simple payback times for PV and micro-CHP in years*

Annual household electricity consumption	Export tariff (£/kWh)	PV	µCHP[3]	Annual household electricity consumption	Reduction in import tariff	PV	µCHP
3000 kWh	0.04	59	14	3000 kWh	10%	70	20
	0.08	48	12		5%	76	19
	0	76	19		0%	83	18
3300 kWh	0.04	57	14	3300 kWh	10%	65	18
	0.08	48	12		5%	71	17
	0	71	17		0%	78	17
3500 kWh	0.04	56	14	3500 kWh	10%	62	17
	0.08	48	12		5%	68	17
	0	68	17		0%	76	16
4000 kWh	0.04	54	13	4000 kWh	10%	56	15
	0.08	47	12		5%	62	15
	0	62	15		0%	70	14
4500 kWh	0.04	51	13	4500 kWh	10%	52	14
	0.08	46	12		5%	58	14
	0	58	14		0%	65	13

* This assumes an installed capacity of 1.5 kW for PV and 1.1 kW for micro-CHP at total installation costs of around £9,000 and £3,000 respectively at a reduced VAT of 5%. Furthermore it includes a 50% grant for PV.
Source: Own calculations

To guarantee reasonable export rewards, it may be appropriate to prescribe a minimum level or at least a calculation method. This could be introduced for a time-limited period while the market is established. As argued earlier in this response, this period might also allow the settlement system to be modified so that a more accurate economic value for exported electricity can be captured by microgenerators. As pointed out in the consultation the current energy supplier does not have to be identical with the purchaser of the export electricity. This could create a market for microgenerated electricity.

[3] These need, however, further research considering different house types and heat demand profiles.

In this context, Ofgem should further investigate two major issues. First, regulations to prevent incumbent players from misusing their market power and information advantage against individual microgenerators. Second, the scope for perverse incentives such as those that might over-value export rewards and undervalue on-site consumption which is potentially desirable for environmental and other reasons.

Metering (10.)

Regardless of which metering option is chosen for domestic microgeneration, the consultation notes that the existing meter will have to be thoroughly examined (e.g. to see if it has a backstop) since reliable data records are not available. The challenge is to make the best use of the meter inspection and upgrade process for the long-term. As microgeneration deployment increases, it is likely to contribute to a reduction in the costs related to metering. Thoughts about future metering arrangements in the domestic sector should not only focus on the requirements for microgeneration units. They should also consider challenges for energy suppliers in the liberalised market such possible customer demand for broader energy services, better pricing and more transparent bills.

The consultation document rightly argues that net-meters (reverse running meters) are not sufficient for microgeneration units since imports and exports have different values. However, it is short sighted in its proposal that current meters should be retained or replaced with the cheapest alternative that does not run in reverse. This quick fix will only shift the costs of upgrade on future consumers, and represents a missed opportunity to kick-start the upgrade of the UK's outdated stock of domestic meters.

Import-export metering ensures necessary flexibility for appropriate export rewards. Furthermore, this could give important generation/consumption feedback to customers with potentially powerful impacts on behavioural change. An obligation to install import-export meters with microgeneration would help to ensure compatibility with possible future requirements. These should include the capability to collect half-hourly data (see below). This will allow a future owner of the house and/or microgeneration unit to measure imports and exports, or to access advanced services.

A third meter to measure generation is already necessary to have access to renewable obligation certificates (ROCs) and levy exemption certificates (LECs). With respect to further policies to value the 'quality' of microgenerated electricity (CO_2 emissions, transmission losses, etc.) generation meters are a pre-condition. Generation meters have the great advantage of valuing the entire microgeneration output and not only the export. Combining a half-hourly import-export meter and a generation meter would guarantee the most forward-looking framework for microgeneration in the UK.

Profiling of exported electricity

In general, there are two options for the valuation of microgenerated electricity exported to the grid: half-hourly (HH) metering and the development of profiles. The decision in favour of one of these options does not only have huge implications for the economics of microgeneration technologies, but also for consumers' energy consumption patterns.

HH metering has the big advantage of measuring the generation or exporting it when it actually occurs. HH metering therefore fully recognises the value of predominantly peak

generation of PV and micro-CHP. An alternative to HH metering is the usage of full export profiles or inverted chunked demand profiles[4].

Although the costs for HH meters may be double those for simple import-export meters, in absolute terms these additional up-front costs of between £15 and £25 are very small. They will have a negligible impact on the economic performance of new microgeneration units. This is particularly valid if the benefits of HH arrangements are taken into account.

The main costs associated with HH metering or the use of profiles are in billing and settlement systems. Cost assumptions for data collection and aggregation for these systems are very speculative as pointed out in the consultation document (10.38.). It makes sense to ask incumbent players about their experience and expectations regarding the additional costs of data gathering and processing for billing purposes. It is also appropriate to ask potential new entrants and those from other industries that have developed analogous systems. For example, the experience of developing complex pricing, billing and data systems in other consumer-oriented sectors such as mobile phones could be very useful.

As table 2 shows, the valuation of each unit of electricity generated from PV and micro-CHP at the average wholesale price as compared to the valuation at the actual HH wholesale price, a full export profile and a chunked profile is considerably different. While a full export profile would undervalue the exported electricity, a chunked profile would overvalue it. A chunked profile overvalues micro-CHP in particular. Therefore HH export would be the most accurate valuation of microgeneration export.[5]

Table 2: Value of microgeneration export in comparison with average wholesale prices

Average:*	**HH export**	**Full export profile**	**Chunked profile**
Micro-CHP and PV	111%	87%	122%
Micro-CHP	101%	91%	129%
PV	121%	85%	116%

* Average of four different annual consumptions (3000 kWh, 3500 kWh, 4000 kWh, 4500 kWh)
Source: Own calculations

The establishment and annual maintenance of full export profiles and chunked profiles are also associated with considerable costs[6]. It is an open question who would be willing to bear these high up-front costs at this early stage of the market.

In addition to providing a more accurate economic valuation of exported electricity, HH metering has the potential to bring about changes in householder's energy consumption since it considers the time of microgeneration and energy consumption. Consumers might seek to enhance their on-site consumption in order to avoid electricity import because avoided electricity purchase is an important source of income that can help to balance out the up-front investment of a unit financed and operated by the homeowner.[7]

[4] DGCG Technical Steering Group (2003). Metering for Micro Generation, P02a Work Stream 4.
[5] ILEX calculations with different data showed also a considerable overvaluation by chunked profiles (DTI (2005). Metering, Settlement & Export Reward, Options for Micro-Generation, DTI).
[6] DTI (2005). Metering, Settlement & Export Reward, Options for Micro-Generation, DTI.
[7] This assumes, however, that the export reward is never higher than the import/retail price.

We think that an obligation for HH import-export meters for microgeneration unit is the best solution from a longer-term perspective. Although the option of HH data collection will not be used immediately due to various reasons such as the absence of data collection infrastructure and settlement limitations, it will be available when the necessary systems are in place.

ROCs

For domestic microgenerators the transaction costs to acquire renewables obligation certificates (ROCs) are still too high. As pointed out (10.25.), the operator has to sign a 'sale and buy-back' contract with a licensed energy supplier. Only then is the microgenerated electricity is eligible for ROCs. However, the ROCs can only be provided to the operator but not directly to the supplier. If the supplier had direct access to the ROCs and shared the rewards with the operator accordingly, this would be a significant removal of regulatory burden for microgenerators.

A further issue for ROCs, is recognition of the value of private wires. The exemption of private wires from eligibility for ROCs is an anomaly that should be removed.

Usage of DC meters for the registration of ROCs (10.27.)

DC metering is unnecessary. In almost every case low voltage DC current will be transformed and inverted to 240VAC. The efficiency of conversion will vary with the DC input power and different inverters will not have identical efficiency curves. Therefore AC metering is recommended to measure system electrical output.