THE STATUS OF THE UK DOMESTIC PV MARKET – A REVIEW OF THE IMPACT OF THE LOW CARBON BUILDINGS PROGRAMME

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Introduction

As the issue of climate change rises up the agenda, coupled with high fuel prices, many householders are looking for ways to reduce their energy bills and carbon footprint. Alongside energy efficiency and other small scale microgeneration devices, solar photovoltaics are seen as a key means of achieving this [1]. To this end, the government has instigated the Low Carbon Buildings Programme (LCBP) – a capital grant scheme to support the adoption of new technology [2]. This work examines installation and cost data from the domestic stream of the Low Carbon Buildings Programme, to assess the current state of the domestic PV market in the UK.

History of the Low Carbon Buildings Programme

The Low Carbon Buildings Programme was launched on 1 April 2006 and set out to support solar photovoltaics (PV), wind turbines, small hydro, solar thermal, ground source heat pumps, and wood or wood pellet fuelled stoves and boilers. It was established to replace the Major Demonstration Programme (PV) and the DTI's Clear Skies Programme and support the installation of all low and zero carbon technologies within a single support scheme.

The Programme's aims were to:

- To support a more holistic approach to reducing carbon emissions from buildings by demonstrating combinations of both energy efficiency measures and microgeneration products in a single development.
- To see demonstrated on a wider scale emerging microgeneration technologies.
- To measure trends in costs of microgeneration technologies. It is expected that these costs should reduce over the lifetime of the programme against a 2005 baseline.
- To raise awareness by linking demonstration projects to a wider programme of activities including developing skills and communicating the potential of microgeneration to change the attitudes and behaviour of consumers.

The programme was awarded a budget of £30 million over three years. The domestic stream of the LCBP was originally awarded £6.5 million for three years, with £3.5 million to be spent in the first financial year (1 April 2006 – 31 March 2007). However, in October 2006, £3.6 million had already been allocated, raising fears that the booming microgeneration market would cause the funds to dry up (See Figure 1). In response, the government re-allocated £6.2 million LCBP funding to the housing stream, but limited funding to £500,000 a month. These measures caused 'panic buying' with the allocated funds running out in 20 days in December 2006, 12 days in January 2007, and a mere 12 hours in February 2007. In March 2007, within 2 hours of LCBP opening for applications for the month, 189 projects had been allocated over £635,000. [3]. The scheme was temporarily suspended in April 2007 for restructuring. The LCBP reopened in May 2007 with an extra £6 million allocated from the budget, for a total of £11.9 million for the household stream, with the monthly cap removed. However, maximum grants were cut severely for PV, down from a maximum of £15,000 to £2,500 per household and demand has subsequently dropped (Figure 1).

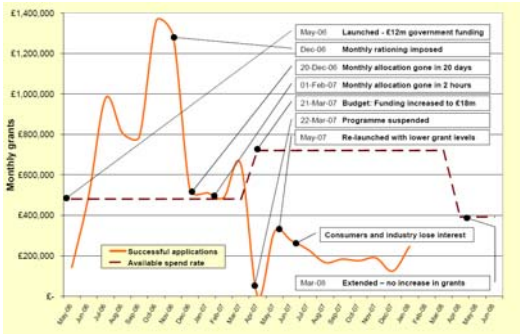

Figure 1 History of grant allocation from the LCBP Phase I (all technologies) [4]

Data

Data were obtained from DBERR detailing all microgeneration installations undertaken under Phase Ia (households) of the LCBP, of which the subset of PV installations is analysed here. The database includes the region, month application received, installer, kW_p installed, estimated total cost at application ex VAT, cost at claim ex VAT, grant offered, PV module manufacturer, PV module model, inverter manufacturer, inverter model, collector area, and estimated energy yield. This database has been cross-examined to reveal a picture of the current state of the domestic PV installation industry in the UK.

The LCBP data relies on self-reported details from householders although in practice they will have been assisted in the application by the installation company, so confidence in the data quality can be moderately high. For the purposes of this analysis, the first two years of the LCBP can be divided into the first 'year', May 2006 – March 2007, and the second 'year' May 2007 – May 2008. This division reflects the freeze on grants in April 2007, after which the programme was relaunched with lower maximum grants for PV.

Installations

A total of 919 domestic PV installations have been installed in the first 2 years of the LCBP, dropping from 489 in the first year to 430 in the second. A drop in installations per year is a concern, reflecting a stagnating domestic PV business. This can be attributed to the reduction in maximum grant from £15,000 to £2,500 which dramatically increases the payback time of the systems.

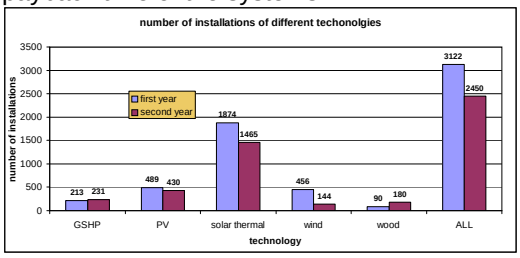

Figure 2 Number of installations under the LCBP

This change has also had an influence on the size of system installed. In the second year, the number of smaller installations (<2 kWp) increased, as the maximum £2,500 grant makes a greater percentage contribution to overall cost for smaller cheaper systems. This led to a significant decrease in the average size of installations, from 2.7 kW_p to 2.0 kW_p (Figure 3).

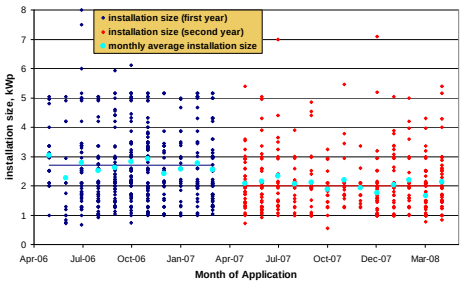

Figure 3 Decrease in number of jobs and average system size after grant restructuring.

The combined drop in installation size and number led to an overall drop in installed capacity of 45%, from 1439 to 794 kW_p (Figure 4). These data clearly illustrate the dependence of the market for PV, and consequently the wider industry, on the policy framework within which it operates.

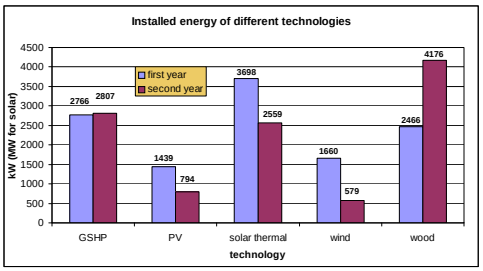

Figure 4 Capacity installed under the LCBP

Price Over Time

One of the key aims of the Low Carbon Buildings Programme was to stimulate the market, increase installation expertise and reduce the cost of installations. From a theoretical perspective, the price of PV modules has been shown to decrease with increased production (learning curve) [5], and one would expect to see similar learning curves from non-capital costs (labour etc.) as installation expertise increases, and putting up roofs becomes more streamlined. Figure 5 shows the actual trends observed in the price of domestic PV systems over the two years of the LCBP, alongside those for other microgeneration technologies..

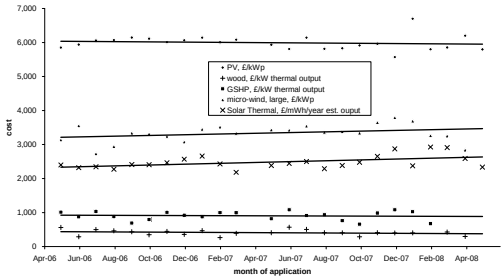

Figure 5 Price trends for technologies supported under the LCBP

It can be clearly seen that there has been no noticeable cost reduction over time for any of the microgeneration technologies, for which there are several possible reasons.

Installation companies may be accepting 'umbrella payments' – keeping their prices to customers high, despite reaping the benefits of learning curves for their components and installation practice. In a small installation market, there is insufficient competition between companies to force them to reduce installation costs and margins until the market does become competitive and they risk getting undercut. It is argued, therefore, that one

would not expect to see cost reductions over time until such point as there is sufficient installation capacity in the UK, and that the LCBP was naïve to expect cost reductions to be observed from such a small programme.

However, the average size of system installed became smaller in the UK because of the restructuring of the grant scheme. Because smaller jobs have a lower percentage of cost attributed to capital equipment, and a greater proportion for labour etc. even keeping installation costs per kW level is an achievement. Second, a worldwide shortage of panels driven by the success of German and Japanese incentive programmes has led to price increases in the cost of modules in recent years.

Price by capacity

The data from the installation also provide a useful guide as to the range of costs customers may be expected to pay as a function of system size as shown in Figure 6

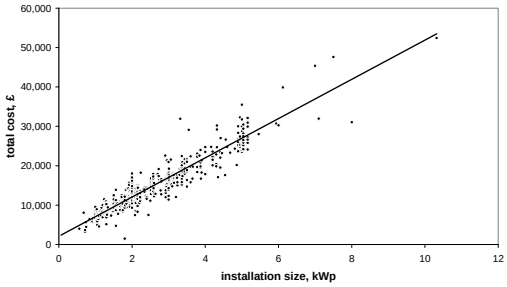

Figure 6 Cost of domestic PV installations as a function of size

At the domestic scale there is a straight line fit, with costs corresponding to £5000 per kW plus £2000. This simple formula is sufficient to give customers a good idea of typical costs. It is also worth noting there is very little spread in terms of cost, and the few outliers are installations using more expensive building integrated products. This pattern can be attributed to the comparatively large capital costs of modules and inverters as a proportion of the installation. Furthermore, these will be purchased from one of a handful of wholesalers, so there is unlikely to be price differentiation in wholesale price of system components. Furthermore, the PV installation industry has been tightly regulated since its inception allowing little scope for either profiteering or low cost, low quality installations.

This contrasts markedly with the solar thermal market (Figure 7). Here, equipment costs are relatively low, with much of the cost attributed to labour and installation. Some of this price

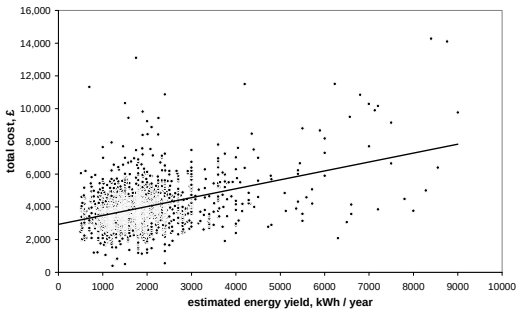

Figure 7 Cost of domestic solar thermal installations as a function of size

replacements being significant. However, it is also likely that a wider range of profit margins will be made in this industry, especially given its history of poor regulation.

Installation Companies

During the course of the LCBP a total of 59 different installation companies have installed domestic solar PV roofs in the UK. However, of these, 19 have only carried out 1 or 2 jobs.

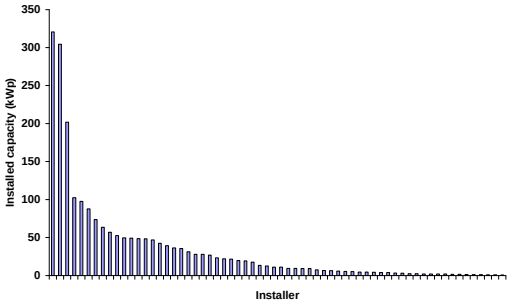

Figure 8 Installed domestic capacity by installer

The three largest installers are responsible for 290 jobs, more than 1/3 of the total. In the intermediate ground, there are a range of companies who have installed between 10 and 100kWp over the 2 years. Even at the top end of this scale, this works out to be only one or two jobs per month – a volume that is unlikely to support a company of more than a handful staff. However, some companies are offering more than one microgeneration technology – 30 companies are adopting this holistic microgeneration approach, but the other 29 companies are PV specialists entirely reliant on PV jobs (and the policy-led market for them). It should also be noted that companies may be installing jobs under Phase II of the LCBP as well, especially as non-domestic installations are more attractive to customers as they are still eligible for 50% grants.

Geographically speaking, the 59 installers do not represent a good coverage of the UK – this works out as less than 1 installation company per county. In a business where clients desire site visits before installation the travel required

for installation companies is onerous and coverage is unlikely to be complete. Furthermore, it illustrates the uncompetitive nature of the industry.

This can be further seen, by looking at average price by installer (Figure 9). The larger companies, despite apparent economies of scale and streamlined installation process are not necessarily cheaper. Again this supports the notion of an uncompetitive industry where installers are taking umbrella payments.

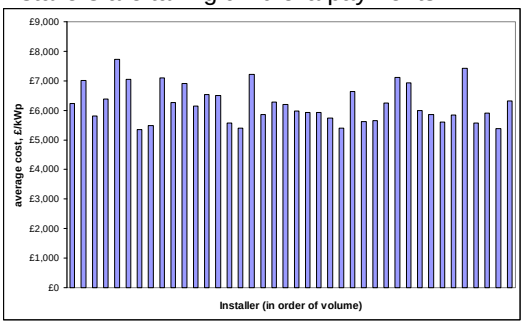

Figure 9 Average price by installer

Products Used

The market for PV modules in the UK is dominated by three manufacturers – Sanyo, Sharp and Kyocera. The Sanyo product installed in the HIT cell, whereas Sharp and Kyocera offer crystalline silicon products.

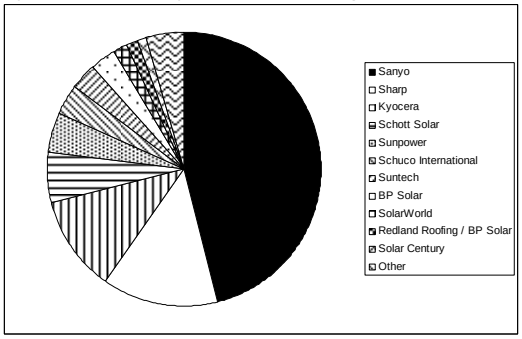

Figure 10 PV modules installed by manufacturer

The dominance of the HIT product in the UK market seems at first sight to be anomalous. Although it offers the highest commercially available efficiency, making it a good option for space-limited domestic installations, the price per kW_p is higher than that of its crystalline silicon counterparts, leading to higher cost installations and poorer value for customers.

The Sanyo HIT product is installed as the product of choice by the 3 largest installation companies – who are themselves sub-contractors of solarcentury, who act as wholesalers for Sanyo in the UK. Therefore the dominant product on the market is not determined by price or performance, but by the structure of the PV wholesale market in the UK.

The wholesale market in the UK is at present limited to two or three major suppliers. This has been reinforced by the requirement to purchase modules for LCBP Phase II jobs through the same companies acting as 'Framework Suppliers'. It is therefore likely that the observed picture will continue until there is a competitive wholesale market for PV in the UK as well.

Conclusions

The market for domestic PV installations in the UK remains small and is highly dependent on policy. The restructuring of the grant scheme, capping grants at £2500, has caused both a reduction in demand and smaller systems being installed.

The size of the industry is inherently limited by the size of the grant funding available. Nonetheless, the installation industry has grown to 59 companies, but there is evidence that it is not yet sufficiently large enough to be a competitive market. There has been no observed price reduction over time, and the larger installers are not delivering cheaper prices than smaller ones suggesting companies are taking 'umbrella' payments in he early stage of market development. Of the 59 companies, 1/3 have only completed 1 or 2 installations. This is insufficient if solar PV is to become a significant contributor to CO_2 emission reduction in the coming years.

The market for PV modules is heavily dependent on the wholesale market, which is heavily dependent on 1 or 2 suppliers. The products installed seems to reflect which modules are marketed by wholesalers rather than on technical or cost merit.

Looking to the future, a shift away from grant funding, where the funding available limits the growth of the industry, is desirable. Feed-in-tariffs, which may arrive in 2010, should lead to a larger, stronger, more competitive domestic PV industry capable of delivering cheaper domestic installations.

References

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3 Renew 168, 7-8/07

4 http://www.r-e-a.net/

5 A McDonald, L Schrattenholzer, "Learning rates for energy technologies", Energy policy, 2001