London Energy Partnership

LONDON RENEWABLES

Skills and Jobs from Renewable Energy Policies and Targets

Brook Lyndhurst

September 2004

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1 Introduction

London Renewables commissioned Brook Lyndhurst in June 2004 *"to provide a broad understanding of the potential skills issues that may arise in the context of developing a market for renewable energy sources."*

1.1 Research Objectives

The study aims to clarify the extent to which skills issues might hinder the future development of the Renewable Energy sector in London. Its purpose is four-fold:

- to identify the particular skills required to install and maintain renewable energy systems;
- to develop scenarios for future employment potential in the renewable energy sector in London;
- to review current training practices in the sector and consider the availability of education and training;
- to devise a process of engagement with training institutions, Learning and Skills Councils and other organisations involved in the planning of training with the aim of raising awareness about skills needs in the renewable energy sector in London.

1.2 Methodology

The research was conducted over a six week period in June-July 2004. It consisted of three strands:

- A **quantitative phase** consisting of establishing three scenarios identifying the total number of jobs implied by the Mayoral targets. In this phase, we followed a triangulation process by using a variety of sources.
- A **qualitative phase** involving primary research with key renewable energy developers in the sector in order to identify the range of skills required per project and to gain an insight into recruitment and training. (A list of consultees is provided in the Appendix.)
- A process of **synthesis**, drawing these strands together and complementing the findings with discussions with organisations involved in planning and delivering training in the Construction/Engineering sectors in London.

This study focuses on **the installation and maintenance aspect of the renewable energy industry**. Our consultations focused upon businesses treating the installation of renewable energy as a core business.

It is also important to note that there is no universally agreed definition of renewable energy industries. This applies both within the policy/strategy community, as well as among the enterprises we consulted within the industry itself. For the purposes of this study, we focused on the technologies identified in the Mayor's Energy Strategy "Green Light for Clean Power".

We have concentrated on issues specific to London. However, the majority of businesses interviewed were located outside London. Businesses who worked in London did not

specifically employ a London workforce, except for those who sub-contracted work to local businesses.

The brief was to look at six technologies:

- wind
- photovoltaics (PV)
- solar water heating (SWH)
- anaerobic digestion
- biomass-fuelled combined heat and power (CHP)
- and heat pumps.

The last three technologies have not, however, been treated with the same level of detail as wind, solar water heating and photovoltaics for two reasons. Firstly, there are no definite targets on the number of systems to be installed for these three technologies in London by 2010 in the Energy Strategy for London. Secondly, businesses interviewed in anaerobic digestion and biomass-fuelled combined heat and power reported that the installation was not necessarily carried out by themselves but sub-contracted to construction companies. Therefore, they were only able to comment on how easy it was for them to find sub-contractors rather than on the recruitment and training practices of those who installed such plants.

2 Current Employment in the Renewable Energy Industry

This section provides an overview of the current state of the renewable energy labour market. It sets out the findings from other studies on current employment numbers and characteristics in the UK. This is followed by a discussion on the London case.

The renewable energy industry is not a discrete sector in the ONS (Office of National Statistics) Standard Industrial Classification. As a result, there is no official estimate of the numbers employed by this industry in the UK, let alone in London. Various studies have produced employment estimates but since they all used a slightly different definition of the renewable energy sector, employment estimates vary and are difficult to compare.

2.1 Nationwide

The industry is characterised by a high number of micro-SMEs (Small and Medium-sized Enterprises) and SMEs, frequently headed by engineers/scientists. The majority of the workforce in the sector is highly skilled, with strong academic and vocational levels of qualifications. Many of those interviewed for this study reported having gained experience in renewable energy abroad - often Africa or Asia - before coming back to set up their business in the UK.

2.1.1 Estimates from the DTI

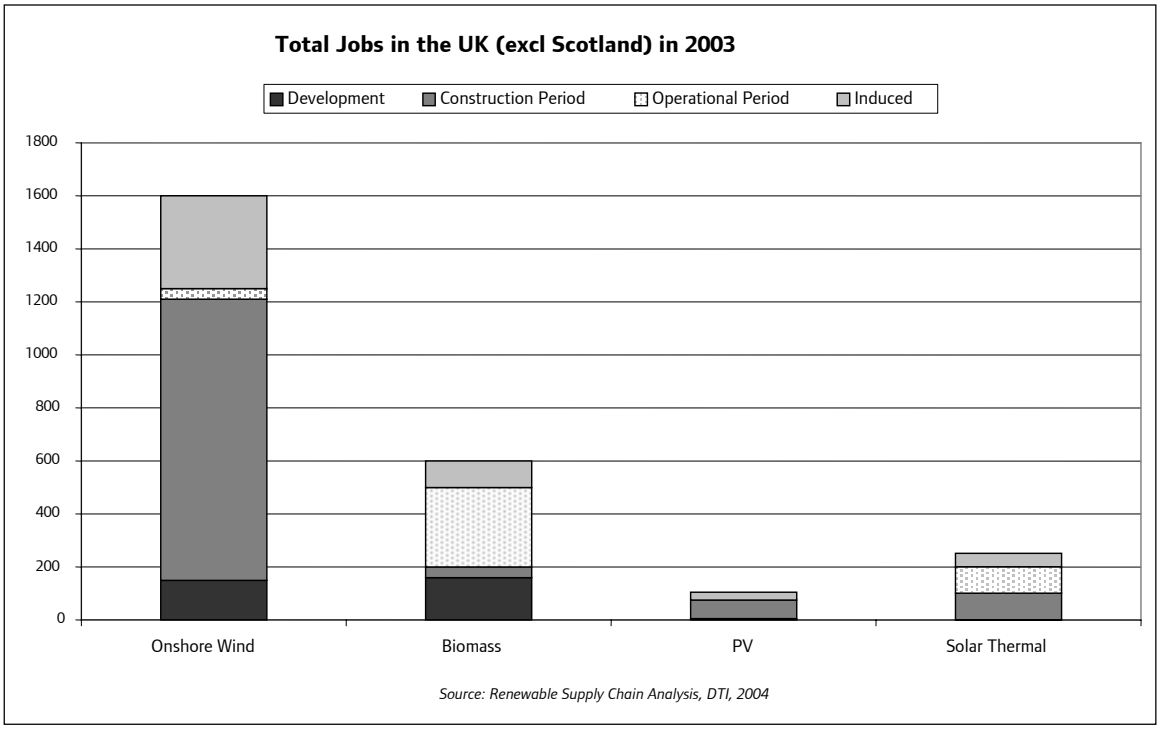
The DTI study[1] assesses the monetary value and employment potential of the UK renewable industry throughout the supply chain. In this study, the renewable industry includes wind, biomass, wave and tidal, hydro, energy from waste and landfill gas, photovoltaics, biofuels, and solar thermal (or solar water heating). It is estimated to currently sustain ***5,500 jobs*** in the UK (1,300 in Scotland and 4,200 in the rest of the UK). This includes employment in the manufacturing, development, construction and operation parts of the renewable energy industry.

The methodology used to derive these estimates is very comprehensive. Industry activity has been derived by listing current project activity, deriving the value added per megawatt and jobs per megawatt for each technology at each phase of development, allowing for import content and export activity, adding in jobs in emerging technologies as well as induced jobs (i.e. jobs outside the industry but sustained because of industry activity).

Chart 2.1 shows the distribution of employment by technology and phase in 2003 in the UK (excluding Scotland) and reflects the current portfolio of projects under development, construction and in operation. It is noticeable that biomass, photovoltaics and solar water heating sustain a relatively small number of full-time equivalent jobs during the construction phase. Only wind reportedly sustained around 1,000 jobs in the UK (excl Scotland) in 2003 during the construction phase. This partly reflects the number of jobs involved in manufacturing goods and services for export in the wind industry.

[1] *Renewable Supply Chain Gap Analysis*, Summary Report, DTI, January 2004

Chart 2.1



Assuming an entirely flat rate of capacity addition per year, the report states that the UK renewable energy industry could sustain 17,000 to 35,000 jobs per year to 2020 (including jobs abroad sustained by UK demand, mainly in manufacturing).

2.1.2 Estimates from the Electrical Training Association

A survey[2] by the Electrical Training Association estimated that there were around ***3,800 full-time equivalent (FTE) jobs*** in the UK in the renewable power industry[3] in 2002. This is a lower estimate than the DTI's, which partly reflects the more limited number of technologies under consideration. Also, this estimate does not take into account induced jobs and jobs generated abroad by UK demand for renewable energy technologies.

Almost 40% of these jobs were in manufacturing and another quarter in owners/operators/project developers businesses. The survey suggested that by 2010, numbers employed in this sector would more than double to 9,700. The wind industry accounted for two-thirds of these jobs in 2002. This share is expected to increase to three quarters by 2010. These figures are illustrated in Chart 2.2, overleaf.

The occupational make-up of the industry shows a concentration of employees in professional occupations[4] (see Chart 2.3). There are, however, significant differences across sub-sectors, with technicians making-up almost half the workforce in engineering services, and craftsmen a third of the workforce in manufacturing.

[2] *Electricity Training Association: Employment and Skills Survey 2003*, EA, 2003
[3] Includes Biomass, Biogas, Energy from waste combustion, water power, onshore and offshore wind and solar photovoltaics. Does not include solar water heating.
[4] The occupational classification shows how different kinds of employment are distributed across the different business sectors in Chart 2.2.

Chart 2.2

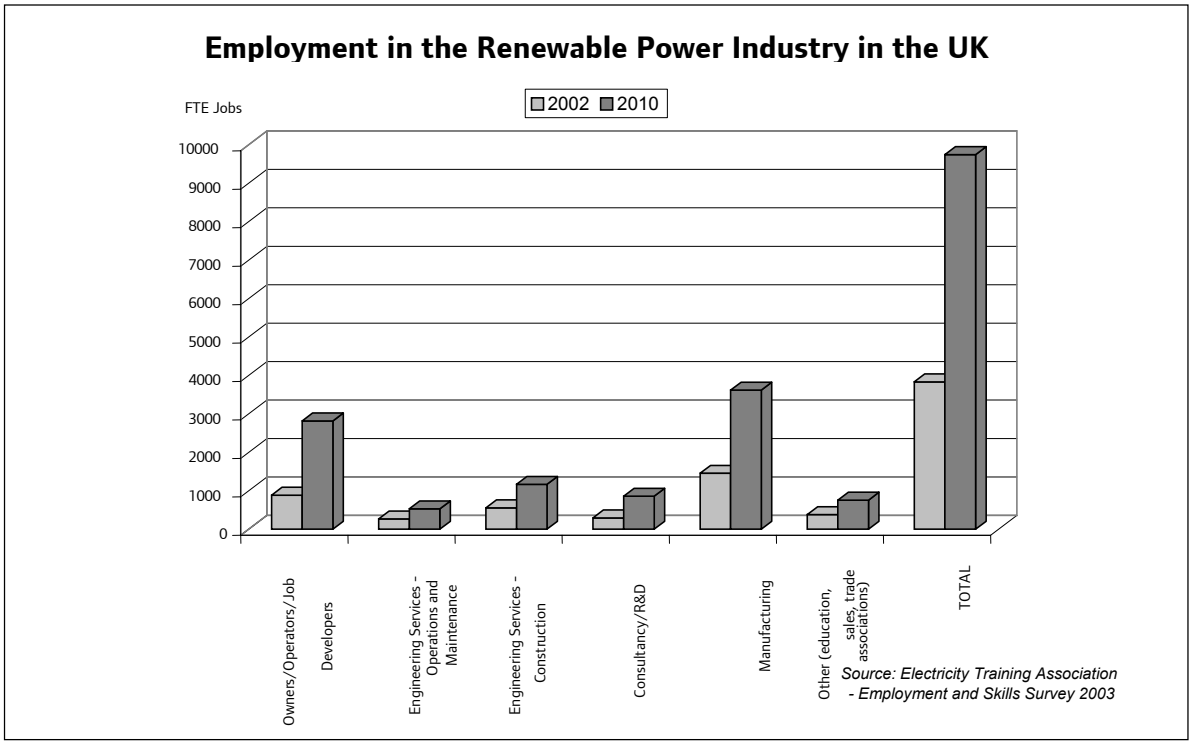
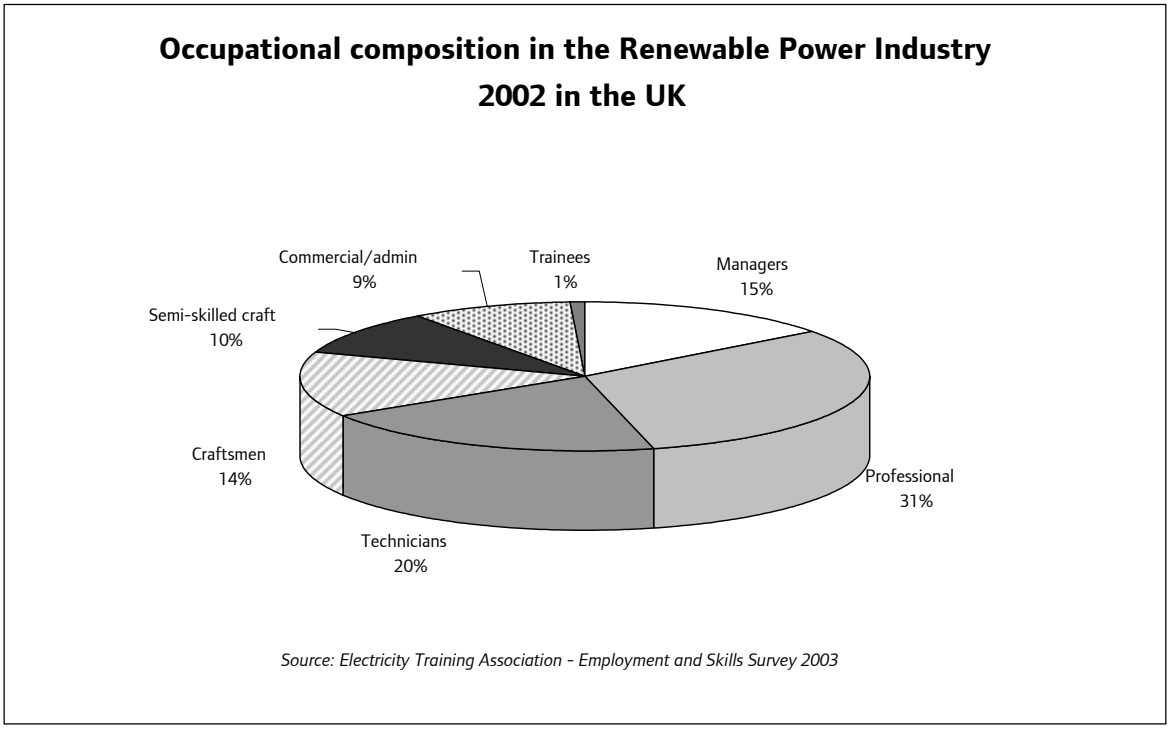


Chart 2.3



Between 2002 and 2010, numbers of full time equivalent (FTE) jobs across all the occupations are expected to increase. The numbers of professionals, technicians, craftsmen and commercial/ administrative staff are anticipated to increase most quickly.

2.2 London

There is no published estimate of current employment in the renewable energy industry in London. Judging by the list of installers registered in the Clear Skies scheme, the number of accredited London-based installers is relatively small. The London Development Agency (LDA) study 'Powering London's Future'[5] indicates that in the capital, the bias in the renewable energy sector is generally towards design, finance and consultancy services. This mimics the general bias in the London economy, in which many "manufacturing" jobs are actually administrative, managerial or consultative.

Most installers working in London are based outside London and only come into the capital to install systems. Our interviewees indicated that they did not employ people from London to do these jobs but brought in their own workforce. Again, this mimics a more general London picture, in which many contract workers are based outside the capital.

However, not all UK installers can work in London. Some manufacturers/distributors have stringent conditions attached to the licence they grant and some installers can only work in a defined geographical area.

What makes it even more difficult to estimate the number of people currently installing renewable energy systems is that there are a number of companies for which sustainable energy is not the core business. Some London plumbers, for example, have been trained to install solar water heating. However, they do not install renewable energy system on a full-time basis and continue to carry out other plumbing jobs.

For example, the Shine 21 programme (see Section 4 on Training for more details) reportedly trained between 80-100 plumbers in London to install solar water heating. The ending of the funding stream, however, means that there has been no follow-up to find out whether these plumbers are active in renewable energy installation.

2.3 Summary

Several studies have produced employment estimates for the UK but since they all used a slightly different definition of the renewable energy sector, employment estimates vary and are difficult to compare.

The DTI study[6] *'Renewable Supply Chain Gap Analysis'* assesses the monetary value and employment potential of the UK renewable industry (defined as wind, biomass, wave and tidal, hydro, energy from waste and landfill gas, photovoltaics, biofuels, and solar thermal) throughout the supply chain. The sector, as defined by the DTI, is estimated to currently sustain ***5,500 jobs*** in the UK (1,300 in Scotland and 4,200 in the rest of the UK).

[5] *Green Alchemy Turning Green to Gold: Powering London's Future – a Study of the Sustainable Energy Sector*, LDA, 2003
[6] *Renewable Supply Chain Gap Analysis*, Summary Report, DTI, January 2004

The Electrical Training Association estimated that there were around ***3,800 full-time equivalent (FTE) jobs*** in the UK in the renewable power industry[7] in 2002. This is a lower estimate than the DTI's, which partly reflects the more limited number of technologies under consideration.

There is, however, no estimate of current employment in the renewable energy industry in London. Judging from available information, it appears that the number of installers in London is relatively low and that most installers working in London are based outside the capital. It is also difficult to capture the number of businesses involved in renewable energy installations for whom this is not their core business.

[7] *Electricity Training Association: Employment and Skills Survey 2003*, EA, 2003. Includes Biomass, Biogas, Energy from waste combustion, water power, onshore and offshore wind and solar photovoltaics. Does not include solar water heating.

3 Future Employment in the Renewable Energy Industry: Employment Scenarios

This section focuses on presenting scenarios of potential future employment for the renewable energy industry in London. Formal forecasts are inappropriate for the industry, partly because of its small size, partly because of its relative novelty and partly because of the absence of robust baseline data.

Four different scenarios are presented:

- A first, based on estimates derived by the London Development Agency (LDA) in the 'Powering London's Future' study
- A second, based upon the "Renewable Energy Supply Chain" analysis from the DTI, mentioned above
- And a third and fourth, devised by Brook Lyndhurst on the basis of information gathered specifically for this project from businesses engaged in installing the various renewable energy technologies

The Mayor's Energy Strategy announced targets for a number of renewable energy technologies to be met by 2010[8]. The Strategy also stated that *'London should then triple these technology capacities by 2020'*. The scenarios in this report look, where possible, at implications for employment in London in the renewable energy sector up to 2010 and also to 2016, as specified by London Renewables, in order to fit in with the lifespan of the London Plan.

It is important to remember that because we are interested in the implications of the Energy Strategy targets on labour demand, we are focusing on specific parts of these technologies (i.e. only domestic and pools installations for solar water heating). It is therefore conceivable that other parts of these industries (such as off-grid street furniture for photovoltaics, for example) may generate other jobs. Also, no estimates of employment have been produced for anaerobic digestion, biomass-fuelled combined heat and power and heat pumps as no definite targets have been defined by the Energy Strategy in these technologies.

Employment figures in the following scenarios are not definitive estimates of future employment in the renewable energy sector in London. The aim was to establish orders of magnitude in each technology.

3.1 'Powering London's Future': Employment Forecasts from the LDA

The LDA study estimated potential employment distribution by 2010 within the Sustainable Energy Sector in London. The sub-sectors within Sustainable Energy were defined as:

- Domestic energy efficiency
- Community Heating and combined heat and power
- Renewables (excl solar water heating)
- Commercial energy efficiency and
- Transport.

[8] See Appendix 1 for details of these targets

Job creation potential has been derived using the following two publications as sources:

- *'Power for the New Millennium'*, Forum for the Future for Greenpeace, with economic modelling from Cambridge Econometric and
- DTI *Rethinking Construction* – Construction Statistics Annual 2002.

Altogether, the study states that by 2010, London could sustain a workforce of between 5,000 and 7,500 people across all the sub-sectors mentioned above. Considering 'renewables' only, the potential for employment in this sub-sector was calculated at around 1,000 full-time equivalent (FTE) jobs. One hundred of these jobs would be in consultancy, 200 in the operation sector and ***700 within contractors***.

3.2 Employment Forecasts based on the DTI's 'Renewable Supply Chain Analysis' Study

This scenario was developed using estimates from the DTI study of the number of jobs generated per MW for wind, photovoltaics, solar water heating and biomass-fuelled combined heat and power. Other technologies specified in the Energy Strategy, such as heat pumps or anaerobic digestion were not considered in detail by the DTI study and no employment forecast has been produced for these sub-sectors.

At this stage, it is worth noting that the rate of installation of solar water heating in the UK (excl Scotland) has been relatively slow and is currently 8,000 sq m per year[9]. The Mayoral target (25,000 domestic installations and 2,000 pool installations by 2010) corresponds to a surface area of 175,000 sq m[10], to be installed over 7 years, suggesting an average installation rate of 25,000 sq m per year. This indicates the scale of the increase required in the rate of installation to achieve the target.

The methodology used here to derive potential employment needs implied by the London Energy Strategy targets is as follows:

- The DTI study provides the number of jobs sustained by each technology per MW produced.
- The number of jobs implied by the targets is derived by multiplying this figure by the targets for renewable electricity generation for London for each of the technologies.
- The annual average is calculated by assuming a constant rate of installation in the seven years to 2010.

Table 3.1 Full Time Employment Forecasts to 2010 based on DTI study

	Total Number of Jobs implied by Mayoral Targets	Average Annual Employment (assuming a flat rate of installation)
Biomass	60	9
Wind	43	6
Solar water heating	2,188	313
Photovoltaics	349	50
TOTAL	***2,639***	***377***

Source: DTI, Brook Lyndhurst
Further details on calculations can be found in Appendix 2. Totals may not add up due to rounding errors

[9] *Renewable Supply Chain Gap Analysis*, Summary Report, DTI, January 2004
[10] *Green Light to Clean Power The Mayor's Draft Energy Strategy*, January 2003

These estimates show that achieving the 2010 London Energy Strategy targets could involve ***an average of around 380 jobs per year up to 2010***.

3.3 Employment Forecasts based on Businesses' Interviews

This methodology is a bottom-up approach to calculating employment numbers implied by the London Energy Strategy targets. The following scenarios were based on information gathered during the interviews. Participants were asked to specify the length of time spent installing typical systems and the skillsets required to carry out installations.

Two scenarios were developed. The first scenario estimates total number of jobs involved assuming the same number of systems is installed every year; while the second scenario assumes that the number of installations increases over the years (that is, reflecting the fact that current installation rates are low). Both scenarios assume that the London Energy Strategy targets are met in 2010 and 2016[11] and that there are no productivity improvements over the forecast period.

3.3.1 Flat rate of capacity addition

In this scenario, we worked out the average number of installations needed to meet the Energy Strategy targets, by technology, between 2004 and 2010 and again between 2010 and 2016.

Interview findings on the average length of time needed to install a typical system, whether commercial or domestic, the number of people needed and the mix of skills required allowed us to derive the average number of installations that can be carried out annually, per installer or engineer depending on technologies.

The number of FTE jobs required to meet the targets were then calculated by dividing the average annual number of installations by the average annual number of installations installers/engineers can make. Summary results can be found in Table 3.2, whilst detailed results are presented in Appendix 2.

Table 3.2 Scenario 1: Employment Forecast assuming a flat rate of capacity addition to meet the Mayor's renewable energy targets

	2004-2010		2011-2016	
	Number of Installations	Number of FTE Jobs (annual average)	Number of Installations	Number of FTE Jobs (annual average)
Photovoltaics				
- domestic	1,000	37	1,400	52
- commercial	36	12	50	17
Wind				
- large	1	<1	1	<1
- private or public building	71	45	100	63
Solar water heating				
- domestic	3,571	133	5,000	186
- pool	286	6	400	9
TOTAL		234		328

Source: Brook Lyndhurst, "Green Light to Clean Power" GLA

[11] The 2016 target has been derived from the Mayor's target for tripling installed capacity to 2020

Table 3.2 shows that, for the wind, solar water heating and photovoltaics industries, the Energy Strategy targets will sustain ***around 235 FTE jobs annually between 2004 and 2010*** and around ***330 jobs between 2011 and 2016.*** Around 60 per cent of these jobs will be in solar water heating whilst photovoltaics and wind will each account for around 20 per cent of all jobs.

3.3.2 Increasing rate of capacity addition

It is unlikely that new capacity will, in fact, be built at a constant annual rate. It is most likely that issues such as planning, financing incentives and investor confidence, the regulatory framework and technology developments will shape the market development rate of the renewable energy sector.

This second scenario endeavours to reflect changes in market conditions by positing gradual increases in the number of systems installed. We have assumed that the average number of installations is reached at mid-point between 2004 and 2010. The starting point reflects our judgement in the current state of the market in London for the different technologies. Numbers of jobs implied by these installations were derived using the same methodology as in the previous scenario.

Chart 3.1

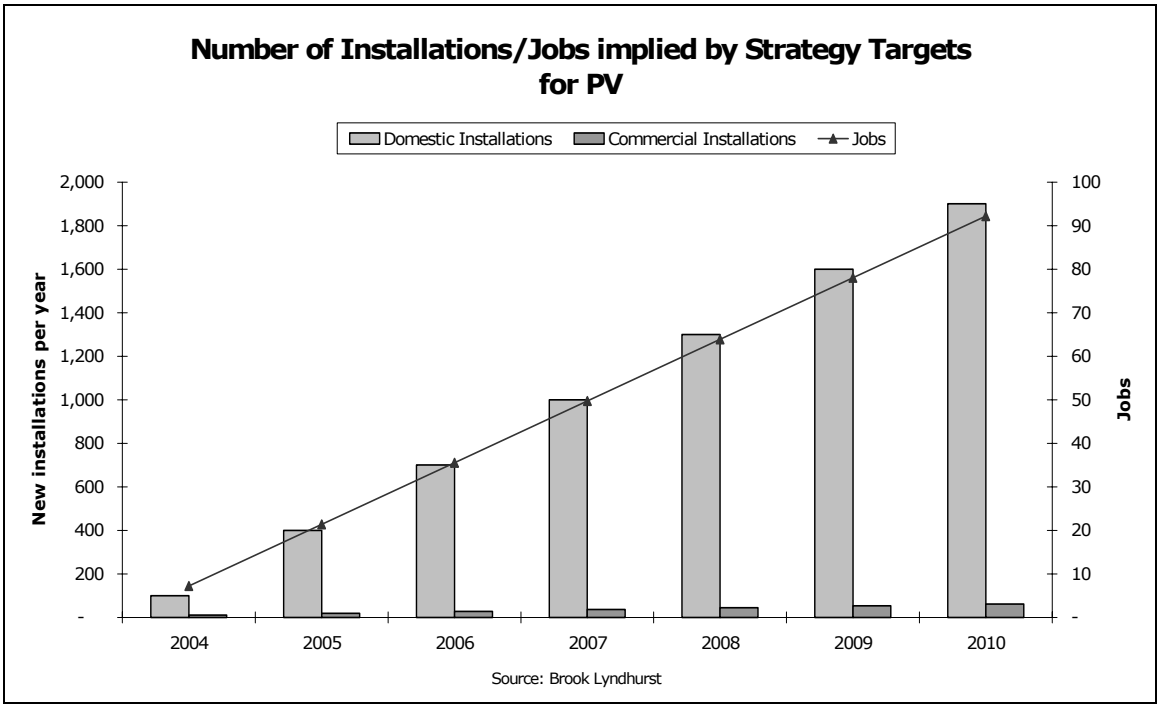


Chart 3.2

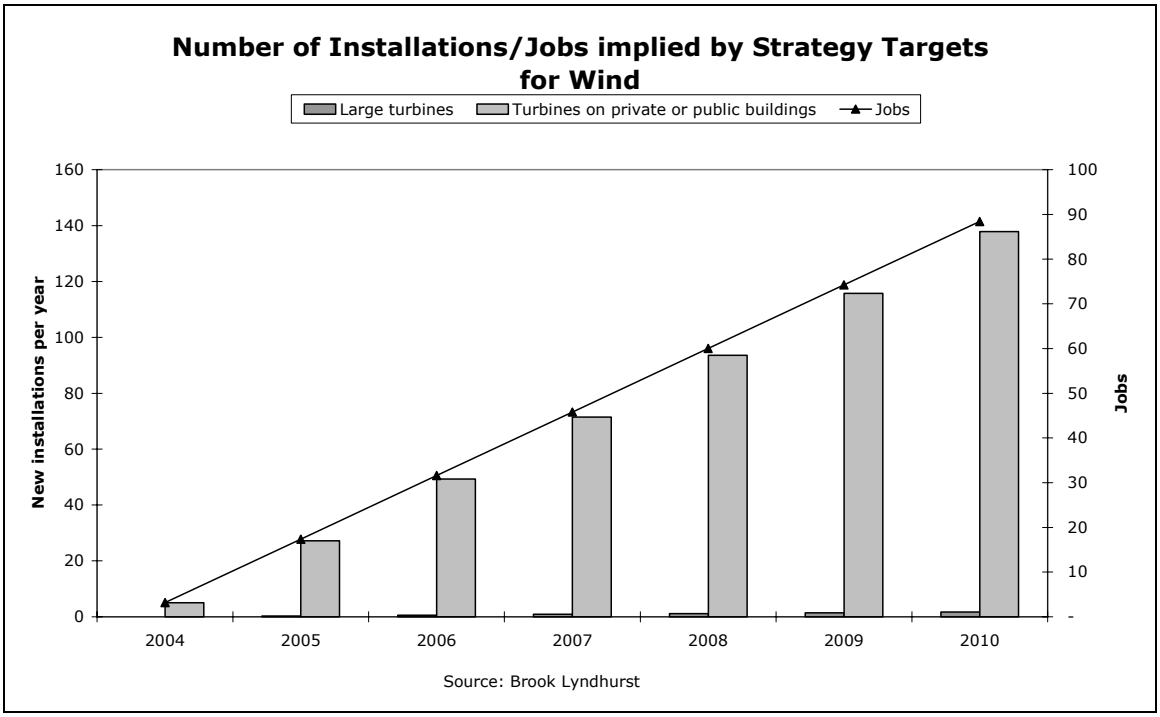
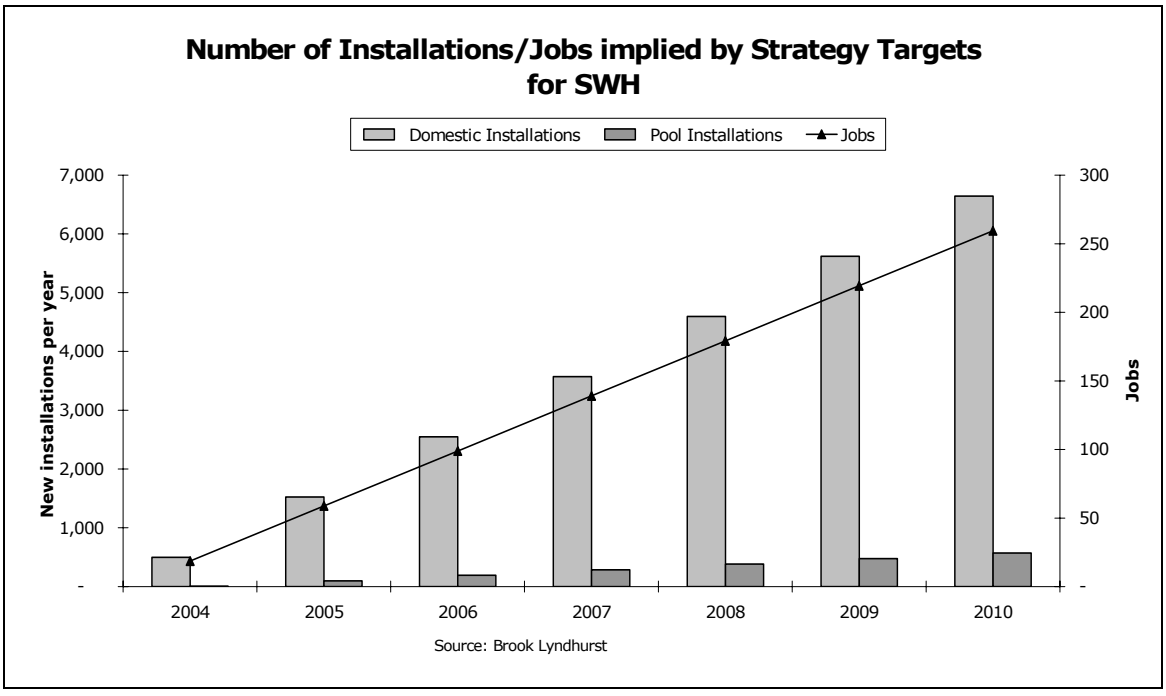


Chart 3.3



Charts 3.1 to 3.3 show the number of installations implied by the Energy Strategy targets for photovoltaics, wind and solar water heating in London between 2004 and 2010. In order to reach the 2010 targets, there needs to be a steep increase in the number of FTE jobs in all three technologies. In terms of both installations and number employed, ***the peak is reached in 2010 when 440 FTE jobs could be sustained*** in the wind, photovoltaics and solar water heating industries.

The Energy Strategy specifies that capacities in these technologies should be tripled by 2020. Should the 2010 targets be achieved, the figures indicate that there will be ample capacity (in terms of skills and jobs for installation and maintenance) to meet or even exceed the 2016 target.

3.4 Summary

The scenarios suggest that by 2010, the Energy Strategy Targets could sustain between ***350 and 500 FTE jobs***. It is important to recall that these are the jobs involved in the installation and maintenance of renewable energy systems – they include site specific engineering and design skills, technical skills and trade skills. Excluded are the jobs and skills involved in manufacture, planning, research and development, sales and promotion, and administration. Assuming that most of these jobs are created within London, this implies a relatively high growth rate for the small number of organisations currently based in London.

It is difficult to assess at this stage whether these jobs will be concentrated among businesses whose core activity is renewable energy installation, or whether plumbers, electricians and roofers will make up the bulk of the workforce installing renewable energy technologies (albeit not on a full-time basis). It is probable that in the short-term, renewable energy installation will remain the prerogative of specialist businesses, and indeed from a skills development point of view (see subsequent sections of this report) this is probably preferable. In the longer term, however, as demand for these technologies increases, installation skills will need to be spread more generally, with concomitant implications for the delivery of training.

Table 3.3: Summary

	LDA forecast	DTI-based estimates	Interview-Based Estimates	
			Flat-Rate of Capacity Addition	Increasing Rate of Capacity Addition
2010	700 contractors in Renewables	380	235	440
2016	-	-	330	-

Source: Brook Lyndhurst, LDA, DTI

4 Skills Issues

The findings presented in this section are based on interviews carried out with businesses in the wind, photovoltaics, solar water heating, heat pumps, biomass-fuelled combined heat and power and anaerobic digestion sectors[12]. Findings from the interviews have been complemented and contrasted with other generic and renewable energy-specific research in skills issues, both in London and in the UK as a whole.

4.1 Skills Requirements

4.1.1 Current Skills Requirements

Skills required in the installation and maintenance side of the renewable energy industry are those associated with an expanding and evolving high-tech industry. In particular, they include engineering and technical skills, particularly civil, mechanical and electrical/electronic engineering.

Project development and management skills are also paramount to an industry that is developing rapidly and which needs to focus on exploiting new business opportunities and technology application.

Many smaller businesses also sub-contract parts of an installation such as scaffolding in the photovoltaics and solar water heating sectors or the construction of foundations in the wind industry. Anaerobic digestion and businesses developing biomass-fuelled combined heat and power also tend to design and manage the installation of plants but contract out the installation phase to civil engineering/process engineering businesses. There is therefore a need for contract management skills within renewable energy businesses.

Non industry-specific skills such as sales and marketing, administration and financial skills are also required by all renewable energy businesses, but are not covered as part of this study.

Table 4.1 Skills Requirements to Install a System

Solar Water Heating Industry Plumbing Roofing & scaffolding Attention to detail Basic knowledge of solar principles Health & Safety	***Photovoltaics Industry*** Electrical/Electronic Roofing & scaffolding Health & Safety (implications of converting electricity from DC to AC)
Heat Pumps Industry Plumbing Practical skills Basic knowledge of heat pumps cycles	***Wind Industry*** Engineering/Design Construction skills (for foundations) Crane driver (for larger turbines) Electrical/electronic
Anaerobic Digestion Scientist/chemical engineer Process engineering Construction/civil engineering skills Health & safety	***Biomass-fuelled CHP*** Electrical fitters Mechanical fitters Mechanical engineer

12 Please find a list of organisations interviewed in Appendix 3

Consultees report that there is very little maintenance involved for solar water heating, photovoltaics and heat pump systems. Most businesses recommend a yearly service that can usually be carried out by the installer. In the wind industry, 6 monthly checks are usually carried out by an engineer.

A further important issue concerning current skill requirements is that this study has not specifically addressed whether the *standards* of skills are actually adequate. In the case of the majority of renewable energy technologies, market demand is still sufficiently limited that issues of poor quality installation are not apparent. Solar water heating, on the other hand, is a more established technology, and whilst we have no formal, quantified evidence, there have been several anecdotal suggestions during our research that poor quality installation is a significant problem in the solar water heating sector. One (anonymous) consultee with experience of assessing installations suggested that to call the average standard of solar water heating installation 'poor' would be generous.

Moving forward, therefore, issues of quality are going to be especially important, a theme we pick up in Section 6 of this report.

4.1.2 Future Skills Requirements

Businesses interviewed did not believe skills requirements were going to change dramatically over the next 5 years or so. In the wind industry, the potential areas of skills changes are related to circuits' installation, as it is believed that systems could become more electrically complicated. The skills issues associated with turbines of different sizes are, reportedly, similar. Potential diversification of solar water heating into air conditioning and electricity production could also bring about skills changes in solar water heating.

Businesses however, do not foresee large changes in technology that could render current skills obsolete.

The Electricity Trade Association study also identified a number of areas where skills demand is expected to grow over the next few years. These include increasing needs for:

- Management and project development teams offering both management and professional skills such as environmental, planning and financial/legal expertise in order to take advantage of expansion opportunities.
- Operations and maintenance teams particularly at technician and craft levels. This has been confirmed in our interviews, especially in the wind industry, as businesses tend to work all over the country and sub-contract maintenance to local businesses.

4.2 Recruitment practices

4.2.1 Methods of recruitment

Methods of recruitment in the renewable energy industry reflect the industry's limited size. Employers interviewed tend not to use traditional sources of recruitment. Most of them reported to use word of mouth to recruit as motivation to work in the industry seems to be more important than qualifications held. One business had reportedly advertised and gone through a job centre. The people recruited through this channel however, did not have the 'right' attitude and willingness to learn.

Few of the businesses we talked to recruited in London as they were mostly based outside London. One solar water heating business we talked to was keen to expand his business by finding sub-contractors in London rather than recruiting himself. By sub-contracting, businesses can shift the risk involved in expanding to other areas. It also means that renewable energy businesses are not so much exposed to the conditions prevailing in that particular local labour market. This is an important thing to bear in mind, considering that in London, labour supply problems are more likely to be skills-related than in other regions[13].

Only one business we talked to reported a hard-to-fill vacancy, at senior level. Most interviewees did not report particular problems although they acknowledged it could take some time to fill a vacancy.

4.2.2 Recruitment and Skills Shortages

The maturing of certain technologies such as solar water heating has led to the rapid expansion of micro-SMEs but none of our interviewees reported recruitment difficulties as such. There seems to be an implicit acknowledgment within these businesses that they are operating in a niche market and they do not therefore expect to find people readily-qualified in renewable energy technologies.

In both photovoltaics and solar water heating, our interviewees reported that recruiting people with the right mix of skills (i.e. electrical and roofing for photovoltaics) is indeed difficult. People with construction qualifications will typically possess one of the two sets of skills required, but not both. As a result, renewable energy businesses tend to recruit anybody with 'the right attitude', i.e. willing to learn the installation process from beginning to end. Businesses installing heat pumps are the exception, as they tend to recruit people from within the heating and ventilation industry.

Another factor preventing businesses recruiting from a pool of qualified electricians or plumbers is the salaries people in these trades can command, especially in London. At the moment, it seems to make more financial sense for solar water heating and photovoltaics businesses to recruit unqualified people, train them in the plumbing or electrical areas required to install a system and hire a qualified electrician or plumber to commission the work in bigger installations.

At more senior level, two contrasting forces seem to be at work. On the one hand, rationalisation in the utilities sector has led to the availability of highly-qualified and experienced professionals with energy-sector experience on the labour market. These people are frequently keen to work in the renewable energy industry as they see it as an opportunity to work in an area they believe in. There also seems to be transfers of senior-level people from the mobile telecommunications industries to the renewable energy sector as the need for people with new product development experience is increasing in the industry.

On the other hand, there is a shortage of engineers on the labour market. Respondents to the ETA Employment and Skills Survey found it difficult to recruit people with electrical/electronic skills, both at the professional and technician levels. This is, however, not a factor specific to the renewable energy industry. There is a general shortage of

[13] *National Employers Skills Survey 2003: Key Findings*, Learning and Skills Council, January 2004

graduate electrical engineers in the UK. The number of students accepting places on electrical engineering degrees has indeed fallen by 29% since 1996[14].

4.3 Summary

Skills required in the installation and maintenance side of the renewable energy industry are mostly practical skills, as well as engineering and technical skills. Whilst the standards of skills have not been specifically researched in this project, a number of consultees reported anecdotally that the quality of installations was often rather poor.

Interviewees do not foresee radical changes in skills requirements over the next few years, although the need for management and professional skills is expected to increase as large projects become more numerous. There should also be an increasing need for technicians at craft level for operations and maintenance.

Although there do not seem to be widespread skills shortages, this is mostly because businesses have adapted their recruitment methods to current labour market conditions. Few businesses reported recruiting ready-skilled technicians. Most businesses trained new recruits themselves. A number of interviewees also do not recruit at all and prefer sub-contracting larger jobs to tradespeople that they train on-the-job.

Engineers are, however, in short-supply and whilst this is not specific to the renewable energy industry, respondents to the ETA Employment and Skills Survey reported difficulties in recruiting people with electrical/electronic skills, both at the professional and technician levels.

[14] *Electricity Training Association: Employment and Skills Survey 2003*, EA, 2003. Other common reasons for labour supply problems include lack of interest in the job and/or a low number of applicants.

5 Training

This section gives an overview of both training practices and training available to people who wish to enter the renewable energy industry. It does not give a comprehensive list of courses available but seeks to provide a general idea of the type of training available to the industry.

5.1 Businesses and Training

Many of the businesses we talked to were headed by self-taught engineers, who view training as the only way to both widen the renewable energy market and to employ staff with the necessary skills. As a result, all the businesses interviewed offered some kind of training to their new recruits and existing staff.

The predominance of small businesses means that many interviewees did not have formal procedures for training linked to strategic goals, but offered training on a need-to-know basis. The training procedure becomes more formalised the larger the business is and a couple of interviewees mentioned having training budgets.

This reflects findings from the ETA Survey, which reported that only 23 per cent of companies have a training plan and 27 per cent have a training budget.

Few businesses cited barriers to training. Barriers to training mentioned by interviewees included lack of time and cost of training. No one cited lack of relevant courses as a barrier although a large majority of businesses found the current provision of training in need of improvement. One interviewee also identified a mismatch between available (public) training provision and industry needs. For example, some courses were too long for this particular business to consider sending an employee.

In a rapidly evolving industry such as renewable energy, keeping abreast of new developments is critical, even for smaller businesses. One interviewee in the wind industry reported to be regularly buying support time from an academic to remain at the cutting edge. Another interviewee in the photovoltaics industry had forged links with a University and employed an MSc student. This worked for both parties as the student got business experience while the business benefited from the outcome of the student's research project.

Links with Education Institutions

All the interviewees were positive regarding getting involved with education institutions. Most would welcome the chance of giving advice and assistance in course development and would like to forge formal links with education institutions to help shape the strategic direction of future courses.

One interviewee in the North East had a formal involvement with local schools and participated in an apprentice scheme.

On-the-job training was the most widespread type of training offered. This partly reflects the importance of practical skills and of 'learning by doing', but also the fact that smaller businesses are more likely to perceive training as a cost than as an investment. Therefore,

they cannot afford to divert personnel from the installations and need to ensure that new recruits will become operational as soon as possible.

Although our interviewees were satisfied that they provided/received good quality training, there are persistent rumours of poor installations being carried out, particularly in the solar water heating sector. The lack of a recognised qualification coupled with relatively large number of slightly different products on the market and the fact that installation is not a full-time activity for some installers may explain the poor standards of some installations.

5.2 Workplace Training

Whilst all employers interviewed for this research reported to be offering training, they mostly resorted to two types of training:

- *In-house training*: for all new employees.
- *Training offered by manufacturers/distributors*: for all employees.

5.2.1 In-house training

Due to the recruitment practices outlined in the preceding section, employers across the various renewable energy technologies offer detailed training to their new installers. The new installer is usually allocated a team that he/she will shadow for 2 to 3 installations before being sent away on an installation as one of the lead installers.

One business in solar water heating also ran a manufacturing unit. This employer was adamant that his employees should be multi-skilled and be able to work in all parts of the company. This was the best way, according to him, for the employees fully to understand the product and, also, to ride out peaks and troughs in orders without resorting to temporary employees.

Employers offer in-house training mostly because there is, or is perceived to be, a lack of training available externally, but also to ensure installers are trained to their standards/products. In the solar water heating sector, one system can be different from another and even experienced employees may need to be 'fine tuned' in the installation of a particular system. It is a moot point, given the anecdotal evidence on quality referred to above, whether this mechanism for training is, from a strategic point of view, wholly adequate.

5.2.2 Private Sector Training

Renewable energy is still a rapidly changing, niche market industry and as such, there is very little training available from the public sector. The upside of this is that private sector training is relatively well developed since manufacturers have vested interests in the development of the market.

Manufacturers/Distributors

A large portion of the training market in the renewable energy industry is assumed by manufacturers and distributors. It is obviously in their interest to train as many people as possible to install their system, as this will ensure the development of their own business. As a result, they offer regular, good quality training free of charge.

Solar Water Heating Business

One interviewee in this industry not only installs systems but also manufactures components of the system. Therefore, they are running free training courses to anybody interested in becoming an installer and buying their system. Fifty to sixty people have gone through these courses in the past year and around one in three had gone ahead and had become an installer.

This business was offering either a half-day introductory course or a 3-4 days more detailed course involving 2 to 3 installations. The manufacturer also provides technical support to newly-established installers.

The manufacturer did not do any advertising for these courses but relied on word-of-mouth. Attendees indeed came from all walks of life and included customers having recently purchased a solar water heating system, tradespeople, a property developer etc…

Installers

The structure of companies operating in the renewable energy market is beginning to evolve. The well-established renewable energy businesses are usually relatively small, specialised businesses that both develop and install products. However, the government's commitment to generate 10% of electricity through renewable sources by 2010 means that large installation projects are in the pipeline. Those smaller, well-established businesses cannot cope with some of these installations but have the experience needed to advise and train other contractors in the installation of the renewable energy systems.

Training Contractors

One photovoltaics installer mentioned being awarded a contract in which they had to train staff from the civil engineering contractor. They kept the responsibility of overseeing the work and commissioning the installation but did not physically carry out the installation. This is an important process in spreading installation skills within the construction industry. Whilst the civil engineering contractor may not possess fully-fledged installation skills as a result of one installation, they may use this experience to bid for other contracts and sub-contract the specialist photovoltaics installer for design, advice and commissioning.

Another photovoltaics installer located in Devon sub-contracted all the work they had in London to two building companies: one specialising in electrical installation and one in roofing. They did not always use the same builders and routinely trained their chosen contractors. In their opinion, a day training course with each of the contractors was sufficient to enable them to proficiently install a domestic photovoltaics system.

5.3 External Training

Existing education and training in renewable energy is currently geared towards:

- Qualified plumbers/electricians wishing to branch out into renewable energy installation
- Graduate and post-graduate engineers

5.3.1 Grant-related schemes and Training

A number of schemes have contributed to increasing the number of installers of renewable energy technologies throughout the UK. Some schemes tie grant funding to the use of installers they have accredited. This is partly to ensure the quality of the installation.

Shine 21

Three years ago, the Energy Saving Trust funded a nationwide scheme which involved training plumbers in installing solar water heating. Once accredited, these plumbers were put on a database available to the general public. In London, this scheme was run by the Energy Conservation and Solar Centre who recruited plumbers mostly through Trade Associations. Eighty to one hundred plumbers attended the 3-day course in London. The database, however, stopped being maintained when funding ended, which means that the contact details of the plumbers trained is now unavailable to the general public. The course is still being run in Wales by the Centre for Alternative Technologies.

Major Photovoltaics Programme

This three-year programme was launched in 2002 by the DTI and offers grants to households, communities and businesses for the installation of photovoltaic systems. To become accredited under that scheme, organisations have to demonstrate appropriate technical knowledge and capability in relation to photovoltaics. Full accreditation is granted following the completion of other installations under the guidance of the scheme that are checked by the scheme's technical advisors. Two thirds of the scheme's £20 million budget has been allocated to medium and large scale projects, and one third to small-scale projects (less than 5kWp). So far, the project has offered 380 grants for small-scale applications, totalling £3.5 million, and 92 grants for medium to large scale projects, totalling £10.6 million.

A relatively new route to installer accreditation is through the completion of a City & Guilds photovoltaics course. This course is aimed at practicing and experienced electricians with a NVQ3 qualification and runs for 5 days full-time. The cost is about £500 per student. The first course was run in May 2004 in Loughborough and is currently being developed in colleges throughout the country, including in the College of North West London. Completion of this course will give access to an interim stage of accreditation, which allows grant-funding for the organisation's first installation. Full accreditation is granted following the satisfactory outcome of the second installation.

Photovoltaics Installer Course in North West London College

The College of North West London is a Centre of Vocational Excellence (CoVE) in Refrigeration, Air Conditioning and Electrical Installation. One of the conditions attached to the status of CoVE is the need to keep abreast of new technologies. The College will offer from October 2004 a 5-day course to qualified electricians. This course is run by Fusion Training, the private training organisation belonging to the College of North West London.

The College anticipates running the course for 6 to 10 electricians although the exact format of the course has not yet been decided. It may be an evening course or a 1 day a week course. The course will also be offered to businesses on a private basis.

Clear Skies

Clear Skies is a £10 million DTI-funded scheme launched in 2003 offering grants to households and communities for the installation of renewable energy systems. The scheme is scheduled to run until March 2005. Applicants can only use installers registered with the scheme to benefit from the grants. Grants are available for solar water heating, wind, small hydro turbines, heat pumps, stoves with automated wood pellet feed, wood-fuelled boiler systems installations. None of the budget was allocated to advertising the scheme and the importance of renewable energy technologies or to training installers.

To become accredited, experienced installers have to work to a code of practice, be vetted beforehand and have two of their installations inspected by Clear Skies inspectors. Less experienced installers can become accredited via a mentoring route, whereby an accredited experienced installer will commission his first installations.

Solar for London

Solar for London started operating in 2002 and manages Local Authority grants to householders and Housing Associations for installing solar water heating. These can only benefit from the additional grants if they use installers registered with Solar for London.

Solar for London built their list of installers/suppliers by issuing invitations to tender to potential installers. Tenders are assessed on health & safety grounds, experience with scaffolding and price. Businesses also have to provide references for installations already carried out.

In 2002, installers who wanted to be accredited by Solar for London underwent training consisting of three days of theory, followed by four mentored surveys and two mentored installations. This training was funded by the Energy Savings Trust. However, when the funding ran out, training stopped being provided. Solar for London's accreditation is now conditional on being accredited by Clear Skies.

Over the past 18 months, around 185 installations were commissioned under the scheme, 150 of which were social housing schemes. Despite a high level of enquiries (3,000), only 35 private householders have so far taken full advantage of these grants.

5.3.2 HE Courses & CPD

In the Higher Education sector, the emphasis on environmental technology is usually at post-graduate level, for students with a degree in mechanical/electronic engineering or in building services engineering. The universities in London offering degrees with some focus on renewable energy systems and environmental technology are:

- South Bank University MSc in Sustainable Energy Systems
- Imperial College: MSc in Environmental Technology
- City University: MSc in Energy, Environmental Technology and Economics

Post-graduate degrees specialising in renewable energy are also offered in a number of universities around the country including Loughborough University, Reading University, De Montfort University, Salford University, University of Southampton, Napier University, Cranfield University and the Open University.

Specialist courses will play an important role in providing industry-specific skills although the shortage of undergraduate engineers may jeopardize the future of some of these courses. More needs to be done to promote engineering careers generally to ensure there is a sufficient pool of engineers ready to undertake post-graduate studies in renewable technologies. The number of engineers produced by UK universities is not sufficient to replace engineers retiring.

For existing professionals in building services, Continuing Professional Development (CPD) programmes in the area of renewable energy are beginning to appear. The CPD programme offered by CIBSE (Chartered Institute of Building Services Engineers), for example, includes modules on sustainable construction. The new CIBSE Carbon Network is another initiative aiming at providing information to practitioners on carbon reduction as well as forum for debate on carbon reduction issues. It is too early though, to assess the success of these initiatives.

5.4 Summary

All the businesses interviewed offered some kind of training to new recruits since this is viewed as the only way for the industry to widen the renewable energy market and to employ staff with the necessary skills. Also, in-house training is both a response to the lack of availability of external training and to the need for installers to be wholly familiar with the products they install. Manufacturers/distributors are currently the only external source of training used by installers who are satisfied with the training received.

Most grant-related schemes tie grant funding to the use of installers they have accredited, partly to ensure the quality of the installation. The accreditation process can also be an opportunity for scheme organisers to promote a code of practice and/or to provide training to potential installers.

A number of universities are offering sustainable energy courses in London. However, the general shortage of engineering students may jeopardize the future of theses courses. Promoting engineering careers is vital to counter this risk. Renewable energy programmes are starting to appear for existing professionals in building services and are raising awareness on the subject in the construction industry.

6 Analysis & Scope for Action

This final section of the report begins by summarising the overall context within which skills issues for renewable energy need to be positioned.

We then move to identify the key findings from the research, in particular:

- the position of skills in the context of other issues affecting the development of the renewable energy market in London
- an important distinction between the new build sector versus the retrofit sector
- the differential demand for craftsmen versus engineers and
- the significance of the quality of training as opposed to quantity.

The final part of this section sets out our propositions for interventions that could best address the needs of the renewable energy sector in London moving forward.

6.1 Overall Context

First and foremost, it is important to bear in mind that this research has focused only upon the skills associated with the installation and maintenance of renewable energy technologies in London. It has not considered issues such as the manufacture of those technologies; the research and development activity associated with those technologies; nor the promotion, sales and marketing of those technologies.

The various estimates of potential future employment in the installation and maintenance of renewable energy systems in London show clearly that the likely level of future employment is low in comparison with other types of employment in London. A few hundred jobs are likely to be supported if the targets set out in the Mayor's Energy Strategy are achieved.

Given wider skills and labour market issues in the fields of energy, construction and engineering – such as the ageing of the skilled workforce in the mainstream energy sector (in large part a consequence of the decline in formal training post-privatisation), the mobility of labour in the construction sector, and the shortage of graduates in engineering – it is, perhaps, little surprise that renewable energy issues do not have a high profile in these sectors.

Our consultations confirm that the profile of sustainability issues generally is rising among decision-makers in these sectors, and as demand for more sustainable solutions becomes progressively more apparent then it would be reasonable to expect this profile to increase further.

In the case of renewable energy, however, whilst the overall profile of the sector will almost certainly rise in the future – not least through the implementation of the Mayoral Strategy – the modest number of jobs associated with installation and maintenance in the sector is likely to act as a limit on the degree of attention that will be accorded by major, mainstream players in the construction and engineering sectors, in particular.

Given the current operation of the renewable energy market, however, this low profile is – in our view – unlikely to represent a major block on progress. **There are, certainly, a number of actions that could be taken to minimise the risk of skills issues becoming a block**

on the progress of renewable energy in London – and we set out our recommendations on these below – but, in general, we conclude that the renewable energy installation sector can be expected to have the capacity to deliver on the Mayoral targets without generalised or large-scale public intervention on skills.

There are two main reasons for reaching this conclusion.

On the one hand, our consultations revealed that all the private businesses with whom we spoke are already providing training of some kind. Much of this appears propelled by the specific needs of individual technologies and manufacturers of those technologies, all of whom are keen to see their product succeed, and for whom effective installation is not merely a means of delivering the product but is also a key marketing device. The various technologies and manufacturers are set to continue operating in a highly competitive environment throughout the next decade or so, so there seems no reason to suppose that this pressure to deliver the necessary skills through training will diminish.

Secondly, the industry at present relies very heavily on "enthusiasts", individuals who are simply passionate about the subject matter. If the industry (in employment terms) were set to multiply many times in scale, then a change in tactics might be necessary. However, given the high likelihood that the total numbers of jobs in the sector will remain modest, it in turn seems highly likely that there will be enough "enthusiasts" to support the growth in the sector. These enthusiasts will, in general, need little encouragement from the state to get the skills and training they might need.

An important rider to this conclusion concerns the *distribution* of skills. The employment figures presented in this report refer to full-time equivalent jobs. In principle, therefore, skills could be distributed across a narrow group of people who spend the majority of their time devoted to the installation and maintenance of renewable energy systems; or they could be distributed across a very large number of people, each of whom spends only a small amount of time undertaking such work.

In the light of the research, we are of the view that the focus in the short and the medium term should be on developing the capacity of a relatively small number of individuals and businesses to deliver high quality installations. (As we state below, ensuring the quality of installation is the highest priority action we recommend.) In due course, as the market becomes more mature and established, there will be greater scope for 'mainstreaming' renewable energy skills. Processes will therefore need to be in place to monitor the evolving situation and ensure that this transition can occur at an appropriate point in the future – but, in our view, to aim for widespread, mainstream uptake of renewable energy skills in the next few years would run the risk both of dissipating effort, and of failing to address the key short term issues.

The most pressing short term problems look most likely to occur at the upper end of the skills range, for reasons on both the demand and supply side. On the demand side, there are, potentially, countervailing forces – more widespread renewable energy installations may increase the number of standardised installation techniques, thus decreasing the need for (sophisticated) engineering solutions; on the other, the more widespread implementation of renewable energy in the built environment may pose ever trickier installation questions, requiring more engineering skills. On the basis of our analysis, the risk would appear to be on the upside, rather than the downside.

And, on the supply side, the numbers of engineers, and more especially power engineers, emerging from UK universities has been falling for many years, and, in the short term at least, this seems set to continue.

As with plumbers, the outcome of this process may well be a dramatic increase in the "price" of engineers with renewable energy skills. This will be good for those engineers with the relevant skills, but bad for renewable energy – the price of installations will rise (not good, given the already disadvantageous price differentials affecting many renewable energy solutions) and their uptake may therefore be slowed. Of course, higher wages will attract more young people to engineering – but the period required to gain the necessary qualifications may not be consistent with the various targets set for renewable energy in London.

6.2 Renewable Energy Specifics

6.2.1 Skills Issues versus Other Issues Facing Renewable Energy

There are several factors currently acting as constraints on the development of the renewable energy sector. In particular, the planning process, access to the Grid and access to finance are much greater concerns to businesses than shortages of available labour.

A study by Brook Lyndhurst[15], for example, found that the wind industry is the sub-sector most likely to have encountered planning barriers. Although developers of photovoltaics and solar water heating have not generally encountered planning barriers *per se*, the industry feels that it would benefit greatly from more positive planning policies. These policies are now coming forward, both in London and – via the forthcoming Planning Policy Statement 22 – at national level.

Nevertheless, the importance of issues not related to skills in the development of the renewable energy sector is also confirmed by the ETA survey[16] findings. When asked about the main barriers to their investment plans, skills were only quoted by 20% of respondents. (This may seem like a high proportion of firms – but is, in fact, in line with the economy-wide average, in which businesses in all sectors report difficulties arising from the current tight conditions in the labour market more generally). The most commonly cited barriers were:

- Difficulties in obtaining planning consent 75%
- Infrastructure/access to Grid 75%
- Difficulties in obtaining finance 46%
- Uncertain costs 33%
- Shortages of adequate labour 21%
- Political uncertainties 17%
- Supply chain constraints 8%
- Technology constraints 4%

[15] *'Planning For Renewable Energy'*, a study conducted for the New Horizons Programme of the ODPM, Brook Lyndhurst, 2003
[16] *Electricity Training Association: Employment and Skills Survey 2003*, EA, 2003

Political uncertainties have also recently been high on the agenda of businesses interviewed. The relatively low cost of gas and electricity means that the economic arguments for installing renewable energy technologies remain weak. It is the view of a number of our interviewees that they are still heavily dependent on government grants. This is especially true in the photovoltaics industry where capital costs are still high compared to expected benefits. Some of the businesses we talked to felt that their future was rather uncertain given the fact that the DTI grant programmes for solar water heating, photovoltaics, heat pumps, wind and hydro are coming to an end in March 2005 and no follow-up programmes have yet been announced.

More generally, the evidence presented above further explains the low priority currently given by most professional organisations and training institutions to the importance of training in the renewable energy sector.

A number of these organisations are also only just starting to 'mainstream' sustainability in their programmes. For example, the theme for CIBSE's forthcoming annual conference is 'Delivering Sustainable Construction'. They have also incorporated sustainability issues in their CPD programmes and have set up "The Carbon Network" for members to discuss and exchange ideas.

None of the organisations with whom we consulted, however, had specifically investigated skills issues in the renewable energy sector, mostly because their members are not pressing them to do so. Whilst the construction industry seems to be moving in the right direction on sustainability generally, there seems a great deal more to be done to create the kind of *attitude* necessary to ensure the Energy Strategy targets are met.

6.2.2 New Build versus Retrofit Sector

Work involved in installing renewable energy systems (mostly solar water heating, photovoltaics and heat pumps) in the retrofit sector is different from that involved in installing those systems in the new build sector, and has impacts on the type of skills that will be required by the renewable energy industry.

It is reportedly easier to install renewable energy systems in new build as those systems can be factored in from the planning phase. As a result, the cost of installing such systems is also much lower in new build than in the existing commercial and housing stock. A toolkit on renewables in new developments[17] shows that solar water heating and photovoltaics are two technologies that could easily be incorporated in hotels, care homes, medium density housing, schools and leisure centres. The capital costs of solar water heating in relation to annual carbon savings makes it a relatively economical renewable energy solution.

At the moment, however, solar water heating in new build tends to be an afterthought, often added at the last minute to obtain planning permission. It is also among the first things to go if construction is over-budget. As a result, developers do not necessarily accept the benefits of incorporating solar water heating in new build. Raising awareness among developers of the benefits of including solar water heating at the beginning of the design process is therefore a priority.

[17] *London Renewables: Integrating Renewable Energy into New Developments: Toolkit for Planners, Developers and Consultants*, GLA, September 2004, in particular sections 4.2 and 4.13

Skills requirements also appear to be different between the new build and retrofit sectors. Installers concentrating on the retrofit sectors have to be somewhat multi-skilled. In the new build sector, installing a renewable energy system such as photovoltaics can be separated into the tasks usually carried out by plumbers, electricians and roofers. The new build sector can offer the opportunity to integrate the installations of some renewable energy systems across a broader share of the workforce.

6.2.3 Engineers versus Craftsmen

There are two main categories of people involved in installing renewable energy systems. Craftsmen focus on the installation itself, while engineers advise on the type of installation necessary and have design and project management skills. On a straightforward renewable energy installation, the input of an engineer can be limited to the design and overseeing of the installation.

However, many businesses whose core activity is renewable energy installation are headed by engineers, who sometimes are heavily involved in the installation of the renewable energy systems they sell.

As mentioned above, it remains an open question as to whether the "engineering intensity" of renewable energy installation will increase or decrease, but our judgment is that it is likely to increase rather than decrease. Furthermore, as Section 4 "Skills Issues" pointed out, future needs are likely to be most acute in the project management aspects of renewable energy installations.

There is therefore likely to be an increase in the overall demand for high-level skills, as well as a shift in the nature of these skills. Together these points reinforce our proposition that the focus of future interventions should be at the upper end of the skills spectrum.

6.2.4 Quality of training versus quantity

As seen in the scenarios in Section 3, achieving the Energy Strategy targets will require a few hundreds of full-time equivalent installers in London. Our consultations have confirmed a widespread, but generally unspoken assumption, that this is not a "job generation" sector.

Whilst the number of jobs may not be very high, however, it will be vital to ensure a good standard of installation. Failed installations could contribute to slowing down the development of the renewable energy sector by giving it a bad reputation. The ***quality and content*** of training courses as well as the need for ***practical on-site experience*** should therefore be the main focus of training providers.

To some extent, the accreditation systems put in place by the DTI, through the Clear Skies programme and by Solar for London should ensure a good standard of installation, since businesses are only accredited after showing proof of the satisfactory installation of two or three systems. In practice, of course, even accredited installers can carry out poor installations. This may partly be due to the fact that these organisations grant accreditations to businesses rather than to individuals. Solar for London, who only recruit installers amongst those already registered through Clear Skies, did withdraw accreditation to a couple of installers.

As a result, there may be a need to tighten requirements, perhaps through the monitoring of installers after the first year and second year of their accreditation or maybe through a mentoring process although this would increase the cost of running the accreditation schemes.

6.3 Potential Interventions

Given all the foregoing, and as we set out in Section 6.1, we have concluded that the overall scope for intervention in respect of skills associated with installing and maintaining renewable energy systems in London is limited.

Nevertheless, there are a number of important potential interventions, most of which are concerned with developing suitable engagement and monitoring processes so that, as the market develops over the coming years, the relevant participants in the market are able to collaboratively decide on appropriate changes in strategy and tactics.

The two highest priorities are:

- **Quality Control** – a key issue moving forward will be to ensure the quality of installation, so there is an important quality control function for the future. It is not clear that this quality control function will necessarily be provided by the market, so there is a good case for intervention.

  Intervention will need to have two main dimensions: accreditation, and enforcement. Building on the methodologies deployed by Clear Skies and Solar for London, we recommend that any and all forms of support to individuals or businesses on renewable energy installation issues should have conditions attached that require the use of accredited installers; and that both accreditation and installation initiatives should be subject to regular monitoring for the purposes of enforcing quality control. We would also recommend accreditation to be delivered to individuals rather than to businesses.

  Whilst some accreditation, monitoring and enforcement mechanisms will undoubtedly require national-level decisions, we are convinced that there is scope for London-level action. Formulating the precise arrangements for this accreditation and enforcement operation, and calculating the precise resource requirements, lies outside the scope of the current work, but we suggest, in the first instance, that the work to specify these arrangements should be the first priority of the proposed Provider Network (see below).

- **Renewable Skills Network** – a key function over the next few years will be for key players in the field of renewable energy, construction, training and skills to be communicating effectively, so that, as the market evolves, appropriate discussion, research and co-ordination takes place[18]. Whilst it is reasonably straightforward to identify who these key players might be - the London institutions responsible for planning training (notably the Learning & Skills Councils and the London Development Agency via

[18] For example, IT Power is currently developing a course for solar water heating installers, in partnership with BPEC, the Solar Trade Association and Filsol. This course is aimed at qualified plumbers and will take 3 to 4 days to complete. Plumbers would be trained in the installation of a range of different systems. The first pilot course is expected to run in September/October 2004 and trained plumbers will receive a BPEC certificate after taking a final exam. No Colleges in London have yet expressed interest in running the course. This is the type of issue that could be raised amongst training providers.

the Framework for Regional Employment and Skills Action), private sector enterprises currently providing training in renewable energy, Further Education Colleges with a Centre of Vocational Excellence in Construction[19], the universities with relevant degree courses and representatives of the London Energy Partnership – it is less clear what form this communication vehicle should take.

Broadly speaking, there are two options: set up a new network, specifically for the purpose of sharing information and co-ordinating action; or adapt an existing network to tackle the same issues. Representations to the research team have suggested both options; and, in the case of the latter option, suggested a wide variety of suitable existent partnerships or networks.

The Brook Lyndhurst research team has concluded that a new network – lightweight, low intensity, mainly e-mail based and with a modest secretariat – is the appropriate way forward. The reason for this conclusion is our judgment that such a network will be most successful if its initial members are renewable energy enthusiasts – both from within the industry and the voluntary/public sector - who progressively draw in others from mainstream construction, engineering, education and training fields. By contrast – in our view – attempting to append renewable energy to an existing network would risk falling foul of a concern expressed throughout this report, namely the fact that renewable energy issues remain low on the agendas of most of the mainstream partnerships that could conceivably take this forward.

A key early priority for the proposed Network – which we think could most straightforwardly be initiated by the London Energy Partnership in the first instance - would be to work up the detail of the quality control function highlighted above. The network should also consider the other priority issues identified in these recommendations, keeping a watching brief over time.

We anticipate that a modest secretariat would be required to initiate and then look after the network. Given our expectation that (a) the network would need to meet only infrequently and (b) that the principal purpose is to begin the process that will provide future flexibility in order to adapt as the market develops, we conjecture that this secretariat would involve no more than 0.5 persons, based with one of the LEP partners.

Beneath these two top priorities, there are five other areas in which we recommend intervention to be warranted:

- **High End Skills** – there is a need to ensure that existing high-level provision (at degree and postgraduate level) is maintained, by promoting the courses identified in Section 5 to undergraduates in engineering and raising awareness generally of energy and renewable energy issues within engineering education. This promotion will need to take place at both national level and regional level. At national level, the need will be for appropriately positioned members of London Renewables/London Energy Partnership to bring the issue to the attention of the relevant national bodies; while, in London, the proposed Renewable Skills Network should be used to identify the most appropriate and cost-effective routes (which should include not just public sector routes, but also – for example – by engaging with large scale private sector initiatives from major energy companies)

[19] There are three such colleges/training institutions in London East, one in London Central and one in London West.

- **New Build** – given the skills issues associated with new construction, there are opportunities to link renewable energy solutions in new developments (particularly, and obviously, those in the Thames Gateway, but also elsewhere in London and in Energy Action Areas in the capital) with local colleges' construction training courses, probably through small-scale pilot initiatives in the first instance. London Renewables/London Energy Partnership and/or its partners should identify a limited number of schemes around London where renewable energy issues are being considered, and explicitly introduce linkages to local colleges. Support/engagement should then factor in the quality control issues highlighted above. It may be, for example, that designation as an Energy Action Area could be commercially useful to a development, in which case this could be contingent on acceptance of accreditation and monitoring requirements. Raising awareness among developers of the benefits of including plans for renewable energy at the beginning of the design process is also important to ensure installation costs come down.

- **Retro-fit** – we conclude that focused action in the area of retro-fitting renewable energy solutions is also appropriate, on a modest scale. We recommend that action in this area be restricted in the first instance to pilot initiatives focused on the new Energy Action Areas, in which training for retro-fit solutions are an integrated part of the implementation programmes.

- **Mainstreaming** – more generally, the mainstreaming of sustainable development within construction sector and engineering training and education needs to carry with it awareness of renewable energy, possibly via specific modules. Particular opportunities for this would appear to lie with large-scale initiatives such as the Centre for Manufacturing Excellence, and the proposed centres of excellence in regeneration and/or sustainable communities. Again, the proposed Renewable Skills Network will be best placed to take this element forward, on a steady basis over time.

- **Funding** – uncertainty over grant-funding beyond 2005 is already acting as a block on progress, and this will need to be resolved as soon as possible. Instability about the future prospects for the sector generally has inevitable knock-on effects on skills and training issues and provision. London Renewables and/or London Energy Partnership and/or its partners should make urgent representations on this matter – the renewable energy industry in London is still relatively fragile, and prolonged uncertainty could not merely delay progress, it could actually damage capacity in the sector and leave it needing a recovery period.

Whether these interventions are taken forward by London Renewables, the London Energy Partnership, the putative Climate Change Agency or some subset or combination thereof lies beyond the scope of the current research. However, and finally, it remains the case that unless and until demand for renewable energy solutions in London accelerates, even the gentle and modest interventions suggested above will have little role to play. The priority for all those seeking to develop the sector in London must therefore continue to be to develop the interest in and uptake of renewable energy – the industry appears to have the skills and mechanisms in place to meet most future imaginable levels of demand without significant additional support from the state.

APPENDIX 1

Mayoral targets as stated in 'Green Light to Clean Power: The Mayor's Energy Strategy', GLA, February 2004, p.71.

"Proposal 6

London should generate at least 665GWh of electricity and 280GWh of heat, from up to 40,000 renewable energy schemes by 2010. This would generate enough power for the equivalent of more than 100,000 homes and heat for more than 10,000 homes.

To help achieve this, London should install at least 7,000 (or 15MW peak capacity) domestic photovoltaic installations; 250 (or 12MW peak capacity) photovoltaic applications on commercial and public buildings; six large wind turbines; 500 small wind generators associated with public or private sector buildings 25,000 domestic solar water heating schemes, 2,000 solar water heating schemes associated with swimming pools, and more anaerobic digestion plants with energy recovery and biomass-fuelled combined heat and power plants. London should then at least triple these technology capacities by 2020."

APPENDIX 2

This Appendix provides the details upon which the three scenarios presented in Section 3 are based.

1 Employment Forecasts based on the DTI's 'Renewable Supply Chain Analysis' Study

This first scenario was developed using estimates from the DTI study of the number of jobs generated per MW for wind, photovoltaics, solar water heating and biomass-fuelled combined heat and power. Other technologies specified in the Energy Strategy, such as heat pumps or anaerobic digestion were not considered in detail by the DTI study and no employment forecast has been produced for these sub-sectors.

Table A1.1

	MW Generated by Renewables* 2010	Jobs per MW**	Total jobs involved	Annual average number of jobs
PV	12	30	349	50
Wind	8.5	5	43	6
Biomass-fuelled CHP	4	15	60	9

	Annual rate of installation**	Number of people involved in construction phase**	Number of people involved /m2	Total Number of jobs in London to 2010*		Annual Number of jobs in London to 2010
SWH	8,000m2	100	0.0125	1,563	***domestic***	223
				625	***pool***	89
				2,188	***Total***	313

Sources:

*- * Green Light to Clean Power, The Mayor's Energy Draft Strategy p. 323*
The MW generated are based on those in the Draft Strategy but have been calibrated to reflect the targets in the final Strategy

For SWH, the number of jobs in London are based on a 2010 domestic capacity of solar receptors of 125,000m^2 and a 2010 pool capacity of solar receptors of 50,000m^2

*- ** Renewable Supply Chain Gap Analysis, p.25 & 29*
The job numbers include jobs involved in the Development, Construction and Operation phases and are import-adjusted

- Brook Lyndhurst

Totals may not add up due to rounding errors

2 Employment Forecasts based on Businesses Interviews

The following two scenarios were based on information gathered during the interviews. Participants were asked about the length of time spent installing typical systems and to specify the skillsets required to carry out installations. By relating this information to the targets, we were able to derive the number of jobs that could be sustained annually:

- assuming the same number of installations were carried out every year
- assuming the number of installations carried out every year increased gradually over the years.

2.1 Flat rate of capacity addition

The first step was to calculate the average number of installations done by each team member for each of the technologies. This was done by using findings from the interviews on the average number of days spent on installations.

We also worked out the number of days available per year per employee. Since we focused on installation, we assumed that not all the working time of an installer or an engineer was spent on the installation itself. Our judgment is that in a business whose core activity is installation of renewable energy systems, an installer would spend about 70% of his time on the actual installation and an engineer, 30% of his time. These proportions are bound to change from technology to technology but the sample of businesses we talked to was not large enough to allow for variations within technologies.

The average annual number of installations that can potentially be carried out by engineers/installers was derived by dividing the number of available days per year by the number of days involved for one installation (see Table A2.2).

Table A2.1

	Skills	Number of days involved for one installation	Number of installations per year
PV			
Domestic	Installer/Electrician	6	27
Commercial	Engineer	20	3
	Installer	10	16
Wind			
Large	Admin/Design	40	2
	Installer	15	11
Maintenance	Engineer	2	35
Private or public buildings	Engineer	30	5
	Installer/electrician	30	5
Maintenance	Engineer	1	69
Solar water Heating			
domestic	Installer/Plumber	4	40
pools	Installer/Plumber	2.5	65
	Engineer	0.5	139
Days available/year	Installer	161.7	
	Engineer	69.3	
Assumption: Installers work on installation for 70% of their available working time and engineers, 30% of their available working time			
Source: Brook Lyndhurst *Totals may not add up due to rounding errors*			

The next step was to find out the annual number of installations necessary for each technology to meet the Energy Strategy targets (See Table A.3 and Table A4 for the cumulative numbers of systems implied by the Energy Strategy).

Table A2.2

	Average Annual Number of Installations	
	2004-2010	2010-2020
PV		
Domestic	1,000	1,400
Commercial	36	50
Wind		
Large	1	1
Private or public buildings	71	100
Solar water heating		
Domestic	3,571	5,000
Pools	286	400
Source: GLA, Brook Lyndhurst		

Table A2.3

Cumulative numbers of systems to be installed																	
	2004	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**
PV																	
Domestic	1,000	2,000	3,000	4,000	5,000	6,000	**7,000**	8,400	9,800	11,200	12,600	14,000	**15,400**	16,800	18,200	19,600	21,000
Commercial	36	71	107	143	179	214	**250**	300	350	400	450	500	**550**	600	650	700	750
Wind																	
Large	1	2	3	3	4	5	**6**	7	8	10	11	12	**13**	14	16	17	18
Private or public buildings	71	143	214	286	357	429	**500**	600	700	800	900	1,000	**1,100**	1,200	1,300	1,400	1,500
Solar water heating																	
Domestic	3,571	7,143	10,714	14,286	17,857	21,429	**25,000**	30,000	35,000	40,000	45,000	50,000	**55,000**	60,000	65,000	70,000	75,000
Pools	286	571	857	1,143	1,429	1,714	**2,000**	2,400	2,800	3,200	3,600	4,000	**4,400**	4,800	5,200	5,600	6,000
Source: Brook Lyndhurst																	

The number of FTE jobs (see Table A.5) was then derived by dividing the average annual number of installations necessary to meet the targets by the average annual number of installations engineers/installers can potentially do.

Table A2.4

		Annual Number of FTE Jobs Sustained to 2010	to 2016
PV			
- Domestic	Installer	37	52
- Commercial	Engineer	10	14
	Installer	2	3
	Total	***50***	***69***
Wind			
- Large	Admin/Design	0	1
	Installer	0	0
Maintenance	Engineer	0	0
- Private or public buildings	Engineer	31	43
	Installer/electrician	13	19
Maintenance	Engineer	1	1
	Total	***46***	***64***
Solar water heating			
- Domestic	Installer	133	186
- Pools	Installer	4	6
	Engineer	2	3
	Total	***139***	***195***
ALL THREE TECHNOLOGIES		**234**	**328**

Source: Brook Lyndhurst
Totals may not add up due to rounding errors

2.2 Increasing rate of capacity addition

This second scenario reflects changes in market conditions and gradual increases in the number of systems installed. We have assumed that the average annual number of installations is reached at mid-point between 2004 and 2010. The starting point reflects our judgement in the current state of the market in London for the different technologies. Numbers of jobs implied by these installations were derived using the same methodology as in the previous Scenario.

Table A2.5

Increasing rate of capacity addition								
		2004	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**
PV								
- Domestic	*No of Installations*	*100*	*400*	*700*	*1,000*	*1,300*	*1,600*	*1,900*
	Installer	4	15	26	37	48	59	71
- Commercial	*No of Installations*	*10*	*19*	*27*	*36*	*45*	*53*	*62*
	Engineer	3	5	8	10	13	15	18
	Installer	1	1	2	2	3	3	4
TOTAL JOBS		7	21	36	50	64	78	92
Wind								
- Large	*No of Installations*	*0*	*0*	*1*	*1*	*1*	*1*	*2*
	Admin/Design	0	0	0	0	1	1	1
	Installer	0	0	0	0	0	0	0
Maintenance	Engineer	0	0	0	0	0	0	0
					22			
- Private or public buildings	*No of Installations*	*5*	*27*	*49*	*71*	*94*	*116*	*138*
	Engineer	2	12	21	31	41	50	60
	Installer/electrician	1	5	9	13	17	21	26
Maintenance	Engineer	0	0	1	1	1	2	2
TOTAL JOBS		3	17	32	46	60	74	88
Solar water heating								
- Domestic	*No of Installations*	*500*	*1,524*	*2,547*	*3,571*	*4,595*	*5,618*	*6,642*
	Installer	19	57	95	133	170	208	246
					94			
- Pools	*No of Installations*	*3*	*97*	*192*	*286*	*380*	*475*	*569*
	Installer	0	2	3	4	6	7	9
	Engineer	0	1	1	2	3	3	4
TOTAL JOBS		19	59	99	139	179	219	259
JOB POTENTIAL IN ALL THREE TECHNOLOGIES		29	98	166	235	303	372	440
Source: Brook Lyndhurst								

APPENDIX 3

We would like to thank the organisations listed below for providing a valuable insight on skills issues, recruitment and training practices in the Renewable Energy sector.

1 List of Business Interviewees

Technology	Organisation
Heat Pumps	Eastern Heat Pumps Ltd
Heat Pumps	Ice Energy
Photovoltaics	Solar Century
Photovoltaics	Solargen
Photovoltaics	Ecosol (JH Gabb Ltd)
Photovoltaics and Wind	Chelwell Energy Systems
Photovoltaics and Wind	Magrec Ltd
Photovoltaics and Wind	Wind & Sun
Wind	2V Microsystems Ltd
Wind	Gazelle Wind Turbines Ltd
Solar water heating	Future Heating Ltd
Solar water heating	Solar UK
Solar water heating	Themba Technology
Biomass-fuelled combined heat and power	Ecoenergy Ltd
Biomass-fuelled combined heat and power	Access Energy
Anaerobic Digestion	Environmental Biotechnology Ltd

2 List of Other Interviewees

Organisation
CIBSE
CIBSE CHP Group
CIRIA
CITB
Clear Skies
EdF
Energy Conservation and Solar Centre
Green Dragon Energy
Solar for London
IT Power
College of North West London

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