



The Engineering and
Technology Board

2nd Floor, Weston House
246 High Holborn
London WC1V 7EX

t +44(0)20 3206 0400
f +44(0)20 3206 0401
e info@etechb.co.uk

www.etechb.co.uk

Environmental Audit Committee Green jobs and skills inquiry

A joint engineering response from the Engineering and Technology Board (ETB) and the Royal Academy of Engineering (RAEng) with the support of the Institute of Marine Engineering, Science and Technology (IMAREST), the TWI (The Welding Institute), the Chartered Institution of Water and Environmental Management (CIWEM), the Chartered Institute of Plumbing and Heating Engineering (CIHPE), the Institute of Physics (IOP), the Institution of Chemical Engineers (IChemE), the Energy Institute, the Institution of Highways and Transportation (IHT), the Institution of Mechanical Engineers (IMechE), and the Engineering Council UK (ECuk).

June 2009

Contact for further information or discussion:

**Mr Gareth Lyon,
The Engineering and Technology Board (ETB),
Weston House,
246 High Holborn,
London
WC1V 7EX**

glyon@etechb.co.uk

020 3206 0445

1. The Engineering and Technology Board (ETB) and the Royal Academy of Engineering (RAEng) with the support of their partners welcome the opportunity to jointly respond to the Environmental Audit Committee's Green jobs and skills inquiry. In our joint response to the inquiry, we have drawn on our experience and that of our partners as previously outlined.
2. The ETB is an independent organisation that promotes the essential role of engineers, engineering and technology in society. The ETB partners business and industry, Government and the wider STEM community. For more information about the ETB please visit www.etechnology.co.uk
3. The Royal Academy of Engineering (RAEng) brings together the country's most eminent engineers from all disciplines to promote excellence in the science, art and practice of engineering. The Academy's contribution to this response has been formulated from the views of a number of Fellows of the Academy with expertise and experience of relevant fields in both industry and academia. For more information about the RAEng please visit www.raeng.org.uk
4. **Executive Summary**
5. To provide the best prospects for the economy and consequently for green jobs the Government should make it very clear what forms of technology it will support and fund and the incentives that will be in place for businesses that deliver these solutions. Additionally, given the complexity and scale of meeting the climate change challenge, it is crucial that the ultimate goal is clear – namely decarbonisation of the energy system - and that the mechanisms put in place to achieve this goal are as straightforward as possible and consistently adhered to. This will only be achieved through effective dialogue and partnerships between government, professional engineering institutions and industry.
6. Three particular 2009 Budget proposals that could have a significant impact on carbon reduction and environmental protection are the £9 billion efficiency savings target, the £750 million Strategic Investment Fund and potentially part of the £1.7 billion support for job centres.
7. The national and global drive towards low carbon technologies and greener services will undoubtedly result in many opportunities for new industries and jobs. If the UK is to benefit from this, clear, consistent and durable policy frameworks are needed.
8. The aim of the green agenda within Government should not be to maximise employment in the sector but primarily to maximise carbon reductions. Once conditions are in place to achieve this then the contribution of these industries to the economy and the associated employment can be maximised in the long-run.
9. The Government's stated desire, as part of the DIUS's Science and Society programme, to increase societal engagement in science and engineering, particularly with young people, would have widespread social benefits in terms of technological literacy, opportunity, overcoming the digital divide, increasing the supply of engineers and scientists working on the climate change agenda and allowing people to engage in the political process in a more technologically aware manner.

10. Data from a number of sources indicate that there is significant potential for growth in the UK and global renewable energy markets. Additionally we have identified associated careers in photovoltaic power generation, micro wind energy generation, biomass and micro hydro generation systems, as being “electrical trades and installation,” “plumbing,” “heating and ventilation” and “air conditioning and refrigeration.” There is also a rising demand for a skilled workforce for other low carbon technologies such as nuclear, carbon capture and storage, smart grid systems, and low-carbon transport.
11. Given the interim goal of the Climate Change Act is to achieve a 26% reduction in carbon emissions by 2020, we would advise that support be provided as soon as possible. An ideal opportunity for this would be the Pre Budget Report later this year. It should also be noted that it will require constant and considerable innovation to develop the necessary technologies and to keep the UK internationally competitive. This innovation depends upon the continued health of the UK science and engineering base and increased links between that base and UK business.
12. It should be noted that although the term ‘green jobs’ is widely used by the Government, it does not have a common, accepted definition. This poses a problem, not just in responding to this inquiry, but more seriously, in trying to design policies with this as their objective.
13. **Full Response** - arranged by key issue (in bold)
14. **Prospects for green jobs and policies aimed at increasing employment in environmental industries**
15. Before answering the questions posed by this inquiry, it should be noted that although the term ‘green jobs’ is widely used by the Government, it does not have a common, accepted definition. This poses a problem, not just in responding to this inquiry, but more seriously, in trying to design policies with this as their objective. In terms of technologies, ‘green’ covers all renewable forms of generation but also low carbon generation. Energy efficiency must also be included within the term ‘green’ and this can cover both products and services. When it comes to occupations, a job that is entirely ‘green’ is rare. Some jobs may be, but what is more common is a trend in professions to be less ‘brown’. It is beyond the scope of this response to provide a definitive definition of ‘green jobs’ but in general, we will consider any training, occupation or skill concerned with renewable or low carbon energy or energy efficiency to be included in the term.
16. Given the rate of expansion already taking place in the low carbon sector, together with the potential of the global market in low carbon technologies to be worth \$3 trillion by 2050¹ and with the Government’s ambitious proposals for reductions in carbon emissions, there is inevitably going to be a considerable increase in the number of jobs available in this sector, especially in the North East, North West and Scotland in fabrication, engineering and manufacturing. We would however stress that employment in renewable technologies should not be regarded as an end in itself but rather as a beneficial corollary of the necessary

¹ <http://www.number10.gov.uk/Page13791>

expansion and diversification of energy system. If the right conditions are in place to promote research, development and investment in this sector, then more green jobs (of a permanent nature) are likely to result than if the emphasis had been on maximising employment on a short-term basis in this industry.

17. Government policies in this area such as the legal mandating of carbon targets through the Climate Change Act and the related introduction of carbon emissions quotas; the moves towards low carbon technologies and the newly announced Strategic Investment Fund are likely to have beneficial impacts on green business in the UK and consequently on green jobs.
18. The latest data shows significant increases taking place in both applications (8561) and acceptances (1640) for Chemical Engineering in Higher Education with 71% and 74% respective increases since 2001/ 02. These increases correspond to the launch of the Institute of Chemical Engineers' (IChemE) careers campaign *Whynotchemeng?*². It should also be noted that non graduate positions will be equally important and while the situation within Further Education is also improving it is not showing the same rate of growth as Higher Education.
19. Where Government policy is clearest, it is easier for businesses and education providers to plan for their future requirements and to respond effectively. The relatively strong emphasis that has been given to nuclear power as a future source of energy makes it easier for the sector to project future prospects. This, coupled with a clear and consistent regulatory framework, has allowed more advanced planning to occur.
20. As a result, Cogent's Sector Skills Council Skills Report³ has forecast the need for up to 11,500 new entrants into the nuclear industry by 2015, rising to 16,500 depending on early retirements.
21. The type of jobs generated by each form of technology will vary markedly. For example, most of the jobs in the nuclear sector are likely to be highly skilled jobs as will those employed in the installation of offshore wind turbines. However, much of the low tech manufacturing jobs are likely to be based overseas and therefore will not provide much UK based employment. This is also true of the majority of the high end design work. But there will be demand in the UK for mid level technician positions to operate and maintain the various forms of low carbon technology and this is a section of the workforce that should not be neglected.
22. To provide the best prospects for the industry and consequently for green jobs the Government should make it very clear what forms of technology it will support and fund and the incentives that will be in place for businesses that deliver these solutions.
- 23. How can the UK maximise the environmentally positive opportunities arising from changes in public spending intended to help tackle the recession**

² <http://www.whynotchemeng.com>

³ <http://www.cogent-ssc.com/>

24. Amongst the public spending measures announced in the 2009 Budget were three particular proposals that could have a significant impact on carbon reduction and environmental protection - the £9 billion efficiency savings target, the £750 million Strategic Investment Fund and potentially part of the £1.7 billion support for job centres.
25. Amongst the measures that could be adopted to achieve efficiency savings would be the improved insulation and energy efficiency of the public estate and similar measures to increase the fuel efficiency of Government transport vehicles. In order to achieve this, the Government should allow tenders to fulfil these aims, setting ambitious minimum standards without specifying particular technologies that could fulfil them. This would provide an incentive for suppliers to innovate methods and technologies to meet these contracts that could have wider application in energy efficiency in the private sector.
26. In addition, we propose that it is possible to bring forward the environmentally positive progress that is intended to be achieved through major infrastructure projects, such as carbon capture and storage or a modern 'smarter' grid system. Doing so would also provide some part of the supply-side impetus that the economy needs to help recover from the recession.
27. Given the scope that exists within the Government's budget, as a consumer of £175 billion of goods and services per year it is likely that a substantial part of the Government's desired savings could be achieved in this way. As such we would recommend that these forms of savings be given the highest priority in the Government's Pre Budget Review later in the year. In many cases it will be possible to deliver these savings whilst making use of the Government's procurement chain to support nascent green technologies and inject momentum into low carbon markets at a time when other sources of finance are likely to be lacking.
28. The £750 million Strategic Investment Fund has the potential to provide considerable support to parts of the low carbon economy. It remains to be seen how this will be administered in full but we welcome the additional £50 million funding that has been provided to the Technology Strategy Board which has made a key contribution in this sector in recent years.
29. Furthermore, a particular area where the measures announced in the Budget could be used to benefit low carbon industry and employment in the UK would be to follow the proposals set out by the ETB⁴ and apportion a significant part of the £1.7 billion funding for Job Centres to re-training in growth industries in the low carbon economy. As identified above, there is a need to develop the necessary skills throughout the UK and as early as possible to ensure that the carbon emission targets in 2020 and 2050 are met.
30. Apportioning part of the funding in this way would have the additional benefits of increasing interactions between the Job Centre, local businesses and Further Education colleges and of preventing skills being lost during the recession which may be required at a later stage.

⁴ ETB: 22.04.09 Media Release – *Government must prioritise training and re-training to achieve budget goals in low carbon and emerging technologies.*

- 31. The degree to which the Government's long-term policy framework, including environmental regulations, tax changes or new market instruments, will encourage low-carbon investment and increase employment in environmental industries and their associated supply chains.**
32. The prevailing difficult economic situation has made wealth creation and employment two priority issues for the Government, this has resulted in large sums of money being paid in the form of subsidies. This difficult economic situation comes in the midst of the more long-term challenges already facing the UK and the world of climate change and security of energy supplies. It would therefore seem an obvious strategy to attempt to address both these issues simultaneously by expanding the low carbon industrial base and increasing the number of jobs in the sector.
33. The UK is already subject to both European and national long-term policy frameworks intended to reduce emissions of greenhouse gases and increase the proportion of renewable sources of energy. The EU's ambitious 20:20:20 package aims to dramatically reduce its carbon output by 20% over the coming decade. There are several strands to this policy, including the requirement of the UK to supply 15% of its total energy from renewable sources by 2020 – from a level of less than 2% in 2005.
34. This is matched by equally challenging UK legislation. The Climate Change Act, which came into effect in November 2008, was the first to enshrine in law national greenhouse gas emissions reduction targets - 80% by 2050. While the science of climate change indicates strongly that cuts of this level are needed from the world's developed countries, the engineering and socio-economic realities of how they can be achieved are far from being resolved.
35. In order to achieve these long-term policy goals, a number of regulations are already in place. These include European directives and mechanisms such as the EU Emissions Trading Scheme (ETS) which effectively levies a cost on around half of the carbon emissions of the UK, principally from large electricity generators and industry. The ultimate aim of this scheme is to set a price for carbon that would be sufficiently high enough to make low carbon technologies commercially competitive against the more traditional fossil fuel based alternatives.
36. In the UK there is a raft of regulations and mechanisms that either tax carbon emissions or subsidise carbon reductions in various sectors of the economy. There are, amongst others, the Renewables Obligation (RO) scheme which provides subsidises for renewable electricity generation, the Climate Change Levy that taxes non-domestic energy usage and the proposed Carbon Reduction Commitment that will introduce a cap and trade scheme into the business and public sector.
37. The major challenge facing the Government is matching the stated goals of the policy frameworks with the mechanisms designed to achieve them. If the goals are not clear it is likely that mechanisms will miss their mark. The goal of the Climate Change Act is clear enough – to reduce greenhouse gas emissions. But

when this is considered alongside the EU targets to increase the proportion of renewable energy the ultimate target becomes less clear. Low carbon and renewable are not equivalent and a policy designed to increase the amount of renewable energy such as wind or solar electricity on the system may be at the expense of low carbon forms of generation such as nuclear or carbon capture and storage. Given the complexity and scale of the challenge, it is crucial that the ultimate goal is clear – namely decarbonisation of the energy system - and the mechanisms put in place to achieve this goal must be as straightforward as possible and consistently adhered to.

38. This clarity and consistency is of the utmost importance in terms of investment in low carbon industries and services. Moving into new areas of business or developing new technologies is fraught with risk, especially financial risk. In making decisions about the future direction a company may take or which small businesses deserve to be lent money, the more certainty there is in the durability of the tax and regulation regime it will operate under the easier it is to make a proper assessment of the risk and potential return on investment and to create the confidence to commit. As it is, several current factors, such as the increase in business rates from 5% to 20% for wind farms and the long delay in the decision on round 3 licenses for offshore wind farms, are having the opposite effect and are adversely impacting on both confidence and stability in the industry.
39. The current economic recession has highlighted the level of financial uncertainty business must contend with. In the course of less than a year the price of oil dropped from over \$140 per barrel to less the \$40 per barrel, before rebounding to \$70 today⁵. This volatility has had a disastrous effect on low carbon technologies which had been reaching a point were they were becoming commercially competitive. Investment in low carbon technologies such as wind turbines has suffered as a result. Fuel prices will continue to fluctuate and credit and investment will remain difficult to obtain. A clear policy such as the 80% greenhouse gas reduction in the Climate Change Act will keep the Government's focus on supporting such technologies. This is crucial if businesses are to survive through a period of increased uncertainty and provide the continued expansion in low carbon industries necessary to reach the designated targets.
40. The specific form of the mechanisms is also clearly important and many existing regulations are in urgent need of review. An example of this is the regulations governing biogas production by anaerobic digestion. Current legislation governing biogas production by anaerobic digestion is out of line with those European states that are the most innovative in this technology such as Norway, Denmark and Sweden. This technology presents a clear opportunity to convert some wastes into bio-fertilisers and also into biogas (renewable, low emission, energy). The water industry already has digesters and the expertise to operate them. The industry also has the expertise to use digestate to good agronomic effect whilst protecting the environment from adverse effects. The digesters have the potential to be "turbo-charged" by simple retrofit to treat twice or three-times as much material in compliance with Animal By-Products Regulations to "enhanced treated" status. Unfortunately, as a result of legislation, the use on land of digestate from sewage sludge and digestate from food waste are regulated differently so water companies are inhibited from co-digestion. As a consequence the waste loses some of its biogas potential before it gets to the

⁵ 4pm 29th May 2009

digesters and energy is squandered in treating disposed material. There is no difference in the environmental impact or function of these different digestates but UK policy remains wedded to the distinction. This presents a clear opportunity to reform regulation and improve environmental outcomes.

41. In other cases, the way in which the mechanism is managed is of greater importance than the specific form of the mechanism. For example, there are a number of alternative methods of subsidising renewable energy such as the RO scheme or feed-in tariffs. Adopting the right one is obviously pertinent and requires continued scrutiny to ensure it is functioning correctly and achieving the desired results. However, if a better mechanism is identified, switching from one framework to another too quickly, without giving industry and business time to adapt, is likely to cause as much damage as staying with the inferior scheme. A similar situation exists where necessary step-changes in performance, such as investment in renewable energy, require step-changes in financial incentives and market regulation. In that case, such radical changes need to be planned and implemented in a way that gives investors the maximum amount of information on which to base their investment decisions.
42. The national and global drive towards low carbon technologies and greener services will undoubtedly result in many opportunities for new industries and jobs. If the UK is to benefit from this, clear, consistent and durable policy frameworks are what are needed most.

43. Economic and social benefits of planned green investments

44. As outlined above, the expansion of the green technology sector will have the beneficial consequence of creating significant numbers of green jobs, especially in those sectors where the Government has clearly set out its intention to permit, support and incentivise the operation and development of a particular technology, such as nuclear power. This will of itself provide significant economic and social benefits. The location of many likely sites for developments in those sectors of the UK suffering from a lack of inward investment would also deliver further social and economic benefits in those areas. Further to this is the fact that the green agenda is something that provides significant motivation to young people, and has been shown to increase their interest in science and engineering and potentially thereby increase societal engagement with wider scientific issues.
45. Given the strong geographical spread of engineers and technicians throughout the UK, with over 95% of engineers working outside Central London, it is possible for some of the areas that the Government is considering, such as sites in the North-West, South-West and Wales to benefit substantially from these kind of investments without being at a disadvantage in terms of skills. The ETB's Engineers Make It Happen programme⁶, which works with education providers and businesses in Wales to increase the supply of engineers, has found a strong willingness to engage and develop engineering and technology skills amongst Further Education students and lecturers in Wales.
46. The Government has stated a desire, as part of the DIUS's Science and Society programme, to increase societal engagement in science and engineering,

⁶ <http://www.engineersmakeithappen.co.uk/home.cfm>

particularly with young people. This would have widespread social benefits in terms of technological literacy, opportunity, overcoming the digital divide, increasing the supply of engineers and scientists and allowing people to engage in the political process in a more technologically aware manner. The Power Sector Skill Strategy Group's⁷ study cited in Engineering UK 2008 found that amongst 15 year olds, genuine green work by businesses (rather than cosmetic "green washing") had a significant impact in motivating and encouraging young people in this way.

47. The proposed investments could therefore have significant advantages in motivating young people throughout the country to increase their scientific engagement and to pursue careers in the engineering sector. This would in turn deliver significant economic advantages to the UK through resultant contributions to the science, engineering and manufacturing base and workforce.

48. The nature of the jobs that might be created in green industries as a result of the green fiscal stimulus

49. Data from a number of sources indicates that there is significant potential for growth in the UK and global renewable energy markets.

50. In order to meet the EU 2020 renewable energy target⁸ the Government, in its Renewable Energy Strategy, expects a third or more of the UK's electricity to come from renewable sources by 2020. This would represent an increase from around 5 GW capacity at present to around 35 – 40 GW. The majority of this increase is expected to come from wind, both on and offshore, with a significant contribution from biomass and waste. For example, the Government's Renewables Advisory Board envisions an additional 13 GW of onshore wind, 18 GW of offshore wind and 4 GW of biomass with solid recovered fuels (waste) on the system by 2020. While it must be noted that the engineering realities of achieving such targets are extremely challenging, the aspirations in themselves will drive considerable investment in these technologies.

51. Increases in other renewable technologies are also expected over the coming decade. The UK already holds a leading position in the development of wave and tidal stream power and although the total installed capacity is only estimated to be around 1 GW by 2020 the potential for continued investment both in the UK and abroad is clear. In the case of tidal range power, much depends on what decision is taken concerning the Severn tidal power projects. Any of the proposed schemes would involve massive investment and result in a large number of jobs, however, there is less potential for this technology to be deployed around the globe.

52. This gives a strong indication that the jobs associated with these energy sources are likely to be the greatest growth areas for green technology in coming years, both to supply UK energy needs and ideally, as part of an export orientated UK industry in these fields.

⁷ <http://www.euskills.co.uk>

⁸ <http://www.publications.parliament.uk/pa/ld200708/ldselect/ldeducom/175/175.pdf>

53. Engineering UK 2008 identifies associated careers in photovoltaic power generation, micro wind energy generation, biomass and micro hydro generation systems, as being “electrical trades and installation,” “plumbing,” “heating and ventilation” and “air conditioning and refrigeration.” There is also a rising demand for a skilled workforce in other low carbon technologies such as nuclear, carbon capture and storage, smart grid systems, and low-carbon transport.
54. In addition to these, welding and fabrication jobs from operator through supervisor to engineer level, are necessary to support growth in green industries. Additional supporting roles in inspection, quality assurance/control, and health and safety will also be generated. Offshore installations will require surface and air transport operations, and specialised operators for both topside and subsea construction, inspection and maintenance activities.
55. All of these specialised roles require accredited training and certification to assure staff competence in delivering the product to required levels of safety and quality. The role of the Government in this sector should be to ensure that there is no financial disincentive to train in advance of the emerging need by providing tax allowances to employers who provide such training to their workforces.
- 56. The Low Carbon Industrial Strategy, what it needs to deliver, how, and by when.**
57. The Low Carbon Industrial Strategy aims to meet the requirements of the Climate Change Act and reduce carbon emissions by 80% by 2050. As the strategy notes, this will require that by that date every unit of output in Britain will have to be produced with a fraction of the carbon used today
58. In addition to this, the strategy calls for a much greater contribution by the low carbon economy to the UK’s economic growth as a whole, seeking to put the UK amongst those countries which are researching and developing the technologies that the global economy will depend on in future. To achieve these goals it is necessary for the Government to work in concert with industry experts and the third sector. A good example of an initiative that the Government could replicate or support is the Chartered Institute of Plumbing and Heating Engineering’s (CIPHE) GreenPlumb initiative⁹. The scheme is a voluntary scheme for CIPHE members (fully qualified plumbing and heating professionals), requiring certification in renewables technologies and a mandatory commitment to Continuing Professional Development.
59. Some of this reduction in carbon intensity will be achieved if the EU Directive target of 15% of energy being generated by renewables by 2020 is met. This will in turn require a well trained and specialised workforce. Engineering UK 2008¹⁰ sets out the need for a massive expansion of the workforce in renewables, based on the Government’s most recent Energy White Paper. With amongst others, 147,193 workers needed in combined heat and power projects, 74,479 workers needed in micro wind energy and 110,046 needed in ground source heat pump technology.

⁹ <http://www.ciphe.org.uk/GreenPlumb/>

¹⁰ Engineering UK 2008, p121; the Engineering and Technology Board.

60. On a wider level, these requirements, as well as the other ambitions of the strategy, including carbon capture, low carbon vehicles and energy efficiency will require constant and considerable innovation to develop the necessary technologies and to keep the UK internationally competitive. This innovation depends upon the continued health of the UK science and engineering base and increased links between that base and UK business.
61. The UK is both geographically well placed and technically capable of implementing the Low Carbon Industrial Strategy and gaining a world-leading understanding of the related technologies. Early implementation of pilot plant projects in the USA and Germany is affording those countries technical and commercial advantage. With demographic trends retiring more competent engineers, especially metallurgists, out of the UK energy, oil, gas and chemical sectors each year than Higher Education can replace, carbon capture and storage projects must be accelerated to capitalise on existing expertise.
62. In addition, the ETB has in the past called for tax allowances for those businesses that invest in research and development or scientific enrichment programmes, to incentivise businesses to undertake such research in the UK and to invest in our science base. This could be augmented by further tax allowances for companies that are researching or developing green technologies in the UK.
63. The Government could also provide support to third sector attempts to reduce total UK emissions, thereby taking advantage of existing expertise in the field. The CIPHE's GreenPlumb initiative is an excellent working example of the sort of scheme the Government could support in this regard.
64. Increased protection for patents for small businesses through a "Green Patent Protection Scheme," whereby the costs of retaining patents for green technologies are supported by the Government would provide further incentive for research and development in this sector and provide the UK with a significant competitive advantage.
65. Given the interim goal of the Climate Change Act is to achieve a 26% reduction in carbon emissions by 2020, we would advise that this support be provided as soon as possible. An ideal opportunity for this would be the Pre Budget Report later this year.