

Semta response to the consultation *Meeting the Low Carbon Skills Challenge*

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Introduction

1. Industry owned and led, Semta aims to increase the impact of skilled people throughout the science, engineering and manufacturing technologies sectors. We work with employers to determine their current and future skills needs and to provide short and long term skills solutions, whether that be training and skills development, or campaigning with government and other organisations to change things for the better. Through our labour market intelligence and insights from employers across our sectors, we identify change needed in education and skills policy and practice, and engage with key industry partners and partners in the education and training sector, to help increase productivity at all levels in the workforce.
2. The sectors we represent are: Aerospace; Automotive; Bioscience; Electrical; Electronics; Maintenance; Marine; Mathematics; Mechanical; Metals and Engineered Metal Products. We are also directly involved in supporting Low Carbon and Composites skills.
3. Semta is part of the UK-wide network of employer-led Sector Skills Councils.

Question 1. What more can employers, schools and Government do to promote the take up of STEM subjects by young people, and encourage them to consider careers in low carbon sectors?

4. The recent ‘Science: So What?’ campaign highlighted an important message for young people, and encouraged them to see the influence of science in everyday life. This message could be refined and expanded to show the impact of STEM across a whole range of industries, and used to emphasise how **STEM study opens doors**, whereas non-STEM study is often restrictive on future choices. Young people often believe they are ‘keeping their options open’ by focusing on non-STEM subjects, because they do not understand how STEM is valued in most sectors and occupations. It is imperative that the career opportunities from STEM subjects (as explained for science by the Futuremorph website) are promoted to and understood by young people and their parents.
5. For young people to have a true sense of the importance of low carbon developments, and to feel enthusiastic about careers, low carbon needs to be **embedded in school practice and activities**. Encouraging schools to involve students in low carbon developments in their buildings and processes will result in student familiarity with the principles of low carbon, and an understanding of the value of it in a whole range of practical contexts.
6. The new **Diplomas** and Extended projects provide an excellent opportunity to raise the profile of STEM subjects, and low carbon knowledge, in 14-19 education. Through access to the ‘STEM’ Diplomas (Engineering, Manufacturing and Product Design, Environmental and Land-Based, IT and Science), young people will have the opportunity to investigate both the theory and practice of STEM principles. Diplomas also enable schools and colleges to embed additional aspects of applied STEM teaching into the curriculum, through the **consortia model of delivery**. By enabling institutions to form consortia, all members benefit from access to a much wider range of teaching skills and facilities.
7. The **Extended Project** is another area where STEM subjects, and low carbon initiatives may benefit. While those studying STEM subjects are likely to choose STEM-related projects, it is

to be hoped that other students will be drawn to STEM or low carbon projects through encouragement of their school and teaching staff.

8. Inevitably, **teachers** across the curriculum will need to improve their understanding of STEM careers, and of the low carbon agenda. This can be communicated by an enthusiasm for the role of STEM in their subject (whatever that might be) and an appreciation for the need for low carbon considerations in its application.

Question 2. What more can universities, working with businesses, do to help stimulate demand for the high level STEM skills required in the low carbon economy?

9. We believe that there is significant scope for universities to work with business in the future to promote low carbon careers and skills. A key component of this is **quality sandwich placements and work experience** for undergraduates. The positive influence of a well-run placement on those in Higher Education cannot be overstated. We hope to see significantly more placements in low carbon industries, and also more placement students working on low carbon projects across all sectors.
10. For those students who do not undertake a placement, it would be worthwhile considering an incentive for universities to stimulate **dissertations and projects** in low carbon areas. There may be scope for employers who are unable to offer full placements to co-operate with HE to provide ideas, projects and support in low carbon subjects, where the HEI does not have specific expertise.
11. In terms of **course design** HEIs can work with industry to incorporate low carbon considerations into the base modules of STEM and other vocational degrees, both as discrete units and also embedded into wider areas. For every principle of STEM learning, there should be an assessment of the impact on pollution production, low carbon processes, and efficient use of resources.
12. As in schools, supporting **teaching staff** to increase their understanding of the opportunities and demands of low carbon industries to work in low carbon and emerging sectors – improve their understanding and you will boost student interest in and demand for skills relevant to a low carbon economy.

Question 3. How can more colleges and universities be encouraged to respond to the need for specialist skills in emerging low carbon sectors?

13. When asking educational institutions to prepare for emerging skill requirements, the issues for FE and HE are well known. **Skilled staff** need to be developed and recruited, while **capital equipment** is often a key expense, which rapidly depreciates in modern technology-based sectors. One solution is always **close links with employers** who have access to such skills and technologies, and who can give an insight into how the new skills requirements are developing. Knowledge Transfer activities in this area should be supported.

Question 4. Is our overall analysis of the skills challenges, as outlined in this document, correct?

14. The skills challenges of any new or emerging area for the economy need to be constantly reviewed to ensure attention is paid to all aspects. Examples of the aspects involved in creating skills for a low carbon economy include:
 - Training **individuals** – not just training in specific skills which low carbon industries will require, but also broadening the understanding of all in the workforce of the importance of a low carbon approach.
 - Training **businesses** – giving businesses as complete units the skills to plan for low carbon solutions and understand the drivers for the expansion of low carbon activities.
 - Changing **processes** – a skill such as Business-Improvement Techniques enables the wholesale reworking of key processes to reduce waste and environmental impact.
15. The emerging technologies, including low carbon, were the focus of a recent Semta workshop, attended by leading industrialists from the Advanced Manufacturing sectors, senior sector experts from the Department of Business Innovation and Skills (BIS) and the Technology Strategy Board (TSB).
16. The conclusion of the workshop was that emerging technologies such as low carbon will impact on all Semta’s sectors and the changes in design, technology and manufacturing technologies will demand higher level skills. The updated priorities are:-
 - a. **High level skills and knowledge** – at levels 4 & 5 are now critically important if the UK economy is to compete and acquire share in New Technology markets. These skills will be by outputs on a range of programmes including higher level apprenticeships, Foundation degrees, degrees, relevant MSc modules, PhDs and support for Continued Professional Development (CPD).
 - b. **Leadership & Management** – remains a priority across all management levels in all sizes of company.
 - c. **World Class Provision** – education and training must be fit for purpose to ensure ‘through life’ Skills development is available to employers through the National Skills Academy for Manufacture (NSA-M).
 - d. **Productivity** – supply chain, lean techniques, New Product Process Design and Implementation (NPPDI).

Question 5. What are the best ways to replicate the examples of good practice provided throughout this document quickly and effectively?

17. We believe that **the sector-led approach**, with Sector Skills Councils working together, is the best way to ‘sell’ low carbon skills. While employers may vaguely recognise the benefits of a low carbon focus, SSC expertise and credibility in applying low carbon principles to their particular discipline will give employers the confidence to take action. SSCs can also link together to show how principles applied in one specialism can be scaled and evolve for others. Finally, we are able to communicate directly with employers through our marketing and employer engagement activities, to promote, test, and feed back on good practice.

Question 6. Is stimulating innovation in skills development and delivery the best way forward?

18. There is also a need to raise demand from employers through better understanding of the drivers on their business, and how low carbon will be a key influence in the future, whatever their sector. Where employers understand the link between future prosperity and immediate action, they are significantly more likely to engage. Semta has had considerable success in improving training engagement and impact through its employer engagement activity, which is based on **a structured analysis of the drivers on the business**. Once this is established and agreed with a company, informed decisions regarding training (which in turn changes company behaviour) can be made, and are far more successful in helping the company prepare for its future. Since low carbon will be a key driver on all business in the future, more of this kind of activity will enable employers to engage with low carbon processes.
19. Need for campaign to convince employees – work with trade unions mentioned. Many company-wide initiatives fail due to lack of buy-in from technical and craft staff (they are the ones who make new processes work on daily basis).

Question 7. How should employers and Government plan for the future re-deployment of skilled workers from high carbon industries to low carbon industries, and ensure a just transition?

20. We strongly believe that there is a critical role for qualifications and subjects such as Business-Improvement Techniques, which prepare individuals by **changing their mindset** about their whole way of working. This mindset which is applicable in all companies, and creates a focus on minimising waste, maximising resources, etc. SSCs are already clustering to share standards and qualification criteria, which will help individuals move between sectors and transfer their skills to new technologies.
21. It is imperative that public funding is available for reskilling – including **second qualifications** at levels 3 and 4 in key low carbon technical areas. Where training and qualifications have been identified by the SSC and government as key to economic growth and business productivity (as low carbon-related skills surely are), these should be funded to the highest levels for all capable of completion, regardless of prior attainment.
22. We hope that the Qualifications and Credit Framework in England will provide and incentivise **unit funding** for those qualifications and units related to generic low carbon skills (sustainable procurement; carbon accounting; performance reporting; environmental management systems; risk management; whole life costing; cost benefit analysis and commercialisation skills). It will be imperative that individuals can top up their existing skills in these areas with the low carbon application.

Please see the Alliance of Sector Skills Councils' response for the specialist SSC views relating to questions 8 to 15.

Question 16. What are the key technical disciplines involved in the transition to ultra-low carbon vehicles? How can we ensure the new skills required are met?

23. Semta's work with companies at the cutting edge of vehicle production and design suggests that the initial significant skills demand will be in **design**, and implementation of design skills in ultra-low carbon technologies. This means that **high level manufacturing skills** will be required, specifically including electric management, electric battery skill, electrical safety and containment, composite technology and a wider need for advanced manufacturing skills.
24. This is a relatively new area of manufacture and therefore the skills landscape is still being developed and identified. However, the challenges facing this sector and discipline can be witnessed in other areas, where composites and advanced manufacturing are emerging as key skills.
25. Semta is currently working with the Society of Motor Manufacturers and Traders and the Institute of the Motor Industry to provide training programmes in electric vehicles. These will establish consistent technical competency levels, focusing on maintenance and repair. Sectors Skills Councils, working together with trade bodies and professional institutions, can provide the necessary expertise and dissemination structures to ensure **standards in new automotive skills** are relevant, workable, and rigorous. This will safeguard the future of new industries by providing a flexible set of standards, which will evolve with the new technologies, but provide consistency to enable individuals to develop their skills from a solid base.

Question 17. What more do we need to do to ensure that UK companies have the skills they need to capitalise on the transition to lower carbon aviation?

26. Skills and the Future of Advanced Manufacturing was produced by the Advanced Manufacturing cluster of SSCs, led by Semta and including COGENT SSC, Improve SSC, Proskills SSC, Skillfast UK. This report drew out a number of key pressure on skills for advanced manufacturing in the aviation sector, which will include low carbon 'drivers':
 - **Social:** public awareness of environmental impact is increasing, and pressure is on manufacturers to reduce this in both the manufacturing process, and in the operation of aircraft.
 - **Technological:** critical technologies related to low carbon in aerospace are the development of lightweight composite materials and structure configuration to optimise vehicle performance; the technologies associated with the systems issues of life-cycle-cost, operation, and maintenance, control of pollution and reduction of noise.
 - **Legal and environmental:** both in the UK and EU, pressure is on the aerospace industry to reduce emissions and impact on the environment at every stage.
27. The report identifies the following technologies related to low carbon as requiring skills in the UK Aerospace sector: aerodynamics and propulsion systems, advanced materials such as composites and advanced electric drives; fluid dynamics modelling and applications, new materials, propulsion, systems engineering and autonomous operation; new aircraft design such as the Blended Wing Body.

28. As a result, there will be increased demand for skills in all occupations, particularly highly skilled managers, professionals and technicians to address innovation and emerging technologies. For low carbon, and aviation as a whole, this means:
- **Management** - to operate successfully in complex global aerospace markets, a range of leadership and management skills at global standards will be required including: change management, business modelling, risk management, supply chain management, value chain management, knowledge management and strategic workforce development.
 - **Professionals** - will need a mix of technical and business skills to meet future requirements for developing and designing commercially viable technology and products while communicating and managing projects effectively across supply chains.
29. Technical skills - demand for high level general engineering skills, mechanical, electrical, electronics and specific aerospace skills due to new product development that cuts across different engineering disciplines. Systems skills (design, modelling and integration) for high integrity systems, software (systems, modelling and simulation), mathematics, advanced materials engineering (lightweight, smart, electric and magnetic), diagnostic and prognostic skills, skills to support emerging technologies, exploitation of new product development, process excellence, research skills.
- **Technicians** – will require a range of technical and management/business skills as they interface between design and production, optimising processes.
 - **Technical skills** - lean manufacturing, process excellence, whole product life cycle, design skills, composites, MRO licensed engineers (Part 66, Category B and above).
 - **Business skills** – costing, project management, teamworking, problem solving and communication skills to facilitate Integrated Product Teams, marketing.
30. All these should be considerations when **public funding** decisions are being made. SSCs will continue to highlight qualifications and standards which provide good value for money, and funding should follow these recommendations.
31. As the consultation notes, many of these skills could be brought across from other sectors, but this means some retraining and ‘additionality’ of qualifications at higher levels. **Second qualifications** to support these skills should be included in funding considerations, as well as appropriate levels of funding for comprehensive programmes such as apprenticeships and high level technical NVQs.

Please see the Alliance of Sector Skills Councils’ response for the specialist SSC views relating to questions 18 to 21.

Question 22. Is our understanding of the skills needs in advanced manufacturing correct? How can these needs best be met in the short, medium and longer terms?

32. The skills listed are undoubtedly central to advanced manufacturing, and it is worth highlighting the list of skills mentioned under the aviation industry question above, as Aerospace forms a key element of advanced manufacturing.

33. Skills and the Future of Advanced Manufacturing came to seven conclusions in its analysis of the skills requirements of Aerospace, Plastic Electronics, Silicon Electronics, Industrial Biotechnology, Composites, and Nanotechnology as a whole. The conclusions, with their application to low carbon, are listed below:
34. Key common conclusions from the seven summary analyses:
- a. **High-level technical skills** represent the most important element of specific skills demand in relation to Advanced Manufacturing. In low carbon, this includes product design, materials, systems and process design, waste management, etc.
 - b. **Inter-disciplinary expertise** is needed, in particular in smaller companies and teams, where the cost of bringing together a representative from all the relevant disciplines might be prohibitive. Low carbon considerations spread across disciplines, and mean that in the long term, all STEM disciplines will need to collaborate around this.
 - c. An accelerated supply of **capable and competent technical support staff** is required. For low carbon, this means:
 - i) promotion to raise the image of technical support work in low carbon areas,
 - ii) public funding for initial formation frameworks, in particular apprenticeships, probably at both advanced (NVQ Level 3) and higher (NVQ/QCF L4) levels, and
 - iii) a new attitude among employers (not just large employers) to the investment for the future involved in mentoring young people, both in relation to work placement for undergraduate students and formal apprenticeship programmes for the technicians. Low carbon must form a cornerstone of this experience for young people, showing them how it is intrinsic to the processes of a wide range of industries.
 - d. Effective and fast commercialisation of applications of new technologies requires expertise beyond an adequate supply of technical skills. For low carbon, key areas include , this must **New Product and Process Development and Implementation (NPPDI)**, and **Production and Manufacturing Engineering**.
 - e. Skills in **understanding and managing risk** - the deployment of new technologies (an inevitable component low carbon developments) brings with it a number of risks.
 - f. Adoption and exploitation of new technologies will always be more of a challenge for smaller established companies than for larger ones. Competitive pressures inevitably mean that small companies have little spare time or capacity for absorbing or adopting new approaches, and even where they do, many struggle to procure the finance to cover additional investment for the longer term. Thus a key element of skills policy needs to find ways to **overcome barriers to innovation** within SMEs.
 - g. Probably the greatest specific implication for public learning provision in this area relates to the **Knowledge Transfer (KT) process from HEIs to enterprises**. SMEs in particular, could benefit particularly strongly from the provision by HEIs of short-courses, focused on specific technical areas such as low carbon , and timed for company convenience. While many university staff would like to increase the amount of such provision, the funding realities of universities do not always make this easy, and improved mechanisms and funding arrangements for this would be welcomed by industry.

- h. Where the adoption of new technologies by existing sectors is concerned (e.g. aerospace, electronics) the supply of R&D skills needs to be augmented with knowledge and understanding of how things work in existing industries. Thus graduate and postgraduate flows in the enabling technologies need to be supplemented by graduates with more **general engineering knowledge**.
35. Because the areas in advanced manufacturing have generally not yet matured into their own sector, there is little corresponding established sectoral institutional activity (trade associations, etc.) to provide **information on the exciting careers** currently available and in prospect. In this situation, it is presumably appropriate for public policy to coordinate promotional activity for these strategically important areas (as identified in Question 1).

Please see the Alliance of Sector Skills Councils' response for the specialist SSC views relating to questions 23 and 24.