Deep Dive: 06
Low Carbon and Environmental Goods and Services

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GMCA

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FINAL REPORT

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Executive Summary

Context

- The Low Carbon and Environmental Goods and Services (LCEGS) sector, also known as green or clean-tech industries, captures economic activity across all sectors and supply chains that deal with environmental issues, ranging from traditional pollution clean-up to renewable energy to complex, emerging low carbon and environmental solutions.
- With over 37,000 jobs and almost 2,000 companies, LCEGS is a growing and important sector for GM, with total sales estimated at £5.4bn. The sector therefore represents a major opportunity to create new employment in an area of expanding global activity.
- Within GM, and the UK, there are opportunities for employment at all skills levels within the sector including potential to create a wide range of innovative activities, which demand high-levels of technical skills, alongside management and consumer product development skills. These will be supported by a growing Advanced Manufacturing subsector and associated services that help to meet domestic and global demands to cut emissions.
- The UK's direct low carbon economy generated £26.2bn in GVA in the UK in 2013, making it five times larger than Aerospace, two and a half times the size of Pharmaceuticals, almost twice as big as Chemicals and equivalent to Food and Drink in GVA terms. According to research by kMatrix Ltd and Gyron LLP, the Low Carbon subsector makes the largest contribution to the overall LCEGS sectors with just under 20,400 employees and sales of £2.9bn in just over 1,000 firms.
- The kMatrix Gyron report does however highlight that the figures for Low Carbon subsector are distorted by a large presence in alternative fuel sub-sector activities and these are generally low value added fuel supply and distribution dominated. If these activities are excluded from their definition then employment in Low Carbon subsector falls to just under 8,800 and sales turnover to £1.3bn[1]. However, this is likely to be an under estimate, as the cross-cutting nature of the sector makes accurate quantification difficult.
- Many of the firms operating in the LCEGS sector operate in several other industry sectors, ranging from traditional energy generation to advanced manufacturing or building services. The kMatrix/ Gyron research identified key strengths for GM including:
    - Low carbon building technologies (prototyping and design of technologies
    - Manufacture, supply, installation of insulation and energy management systems and low carbon lighting)
    - Renewable energy (including wind, geothermal solar-photovoltaics, biomass); recovery and recycling (water supply, waste water treatment, waste management)
- The Northern Powerhouse has identified energy as one of its four "prime" areas of strengths for the northern economy. GM benefits from key assets and significant annual expenditure on energy research.

[1] kMatrix Ltd and Gyron LLP (2013) Greater Manchester LEP LCEGS Report May 2013 from kMatrix Ltd and Gyron LLP. See Technical Annex for further details on the approach used to define the sector

- Manchester Energy at the University of Manchester brings together over 600 researchers from across the University, supporting research and education across the energy spectrum (including nuclear research and in low carbon energy generation, transmission and storage) and Salford University Energy House which has been designed and developed to allow leading academics and researchers to conduct scientific research, to test installed technologies under laboratory conditions and improve the energy efficiency of hard to treat properties, in collaboration with industry.
- Other long-term growth opportunities for the LCEGS sector in GM include:
    - The GM Devolution deal
    - Greater Manchester Climate Change and Low Emission Strategies Joint Implementation Plan (2016 to 2020)
    - The commitment of the Northern Powerhouse to energy
    - The implementation of national and local environmental policy in response to the global carbon reduction commitments set out in the Paris Agreement

The Growth Opportunity

- The Low Carbon and Environmental Goods and Services is both a sector (made up of technical consultancy and advisory companies, manufacturers, and service and installation companies) and various markets over which public policy has a major influence (such as transport systems, decentralised energy generation, urban heat networks and retrofitting buildings in the public, commercial and domestic sectors). As such, the scale of opportunity is currently driven either by incentives/subsidies (which can change or be withdrawn) or regulation leading to increased standards and product and service innovation.
- Major growth within LCEGS is likely to come from the drive for all sectors to be increasingly environmentally responsible. This includes a significant opportunity for businesses in GM with respect to energy efficiency retrofitting in buildings. Alongside specialist support to enable this, there will be a general need for the 'greening of the workforce.' Many of the skills needs therefore are likely to be based on the existing workforce gaining additional qualifications and skills that enable them to adapt quickly to new growth opportunities rather than complete retraining.
- The Smart Cities' agenda creates growth opportunities and key projects include the Triangulum Project at the University of Manchester and City Verve Project amongst others which are testing new and innovative ideas.
- Over the last two decades the label 'Smart City' has been applied to a family of technologies that can speed up the flow of things around the city and reduce the physical frustrations of urban life: free flowing traffic instead of jams, smart flows of energy and less waste and public services better targeted where they are most needed.
- Low Carbon products and services growth opportunities include green building technologies and monitoring, street lighting systems and conversion to LED, advanced

metering infrastructure, heat networks, and new energy generation, management and storage systems.

- The circular economy – where industrial producers re-use and recycle resources – is also an opportunity for the LCEGS market. The circular economy concept places an emphasis on re-design and re-engineering as well as re-cycling the by-products of production processes, and will increase demand for technical support and innovation.
- Demand for low carbon energy will evidently be affected by the policy and regulatory environment. To meet the UK's future energy demand and COP21 International commitments, the UK will need to invest in new energy infrastructure to replace existing assets and increasing demand. Therefore the choice is not if we invest, but how we invest in energy. The requirement for cost effective, low carbon energy is important and supports the sector as the UK strives for security of energy supply.
- The forecast level of economic growth, nationally and in GM, will place a demand on waste water management services for the growing number of businesses. The national importance of increasing new housing development to support population growth will also increase the market for waste water management and municipal waste processing facilities across the North.
- Increased house building will also lead to increased demand for materials and products from building technology firms. The demands placed on the electricity distribution network are likely to change dramatically over the coming years as a result of the drive towards electrification of heat and transport and to ensure delivery of Government targets relating to carbon emissions and air quality.
- Electrification is a major component of national transport strategy and will make a major contribution to reducing carbon emissions. It will also lead to opportunities to create new products and services and, ultimately, create jobs and growth opportunities.

Key Challenges

- The public and private investment pipeline in GM is a huge opportunity for the sector. For example transport investments, such as the Manchester to Leeds Rail Electrification, provide a major opportunity for low carbon construction technology businesses. However, there is a challenge to support GM's firms to take advantage of new commercial opportunities. Many growth firms are micro-size (less than 10 people) and are under-capitalised, which restricts their ability to bid for large contracts.
- Similarly, the construction of new houses that will need to be undertaken to meet the needs of GM's growing population over the next two decades is a significant opportunity that GM LCGES firms can benefit from. The scale of population growth brings additional challenges in providing large sites capable of accommodating waste management and recycling facilities.
- While GM has a significant business base in the LCEGS sector and some notable research strengths in Energy, ensuring that innovations are translated into commercial

opportunities for Advanced Manufacturing companies in GM will also be a key future consideration.

- A number of skills gaps have the potential to restrict growth. Challenges include: low carbon vehicle skills for mechanics; renewable energy and efficiency installation skills and specific technical skills relating to the design of new products.
- The skills required in some of the technology areas will be very specific and the small number of learners in some areas will reduce the ability of providers to accommodate new areas of provision. Continual Professional Development will also be important to support existing professions to 'green the workforce', especially in the areas of energy efficiency, renewable energy, and refurbishment skills for domestic housing.
- Future recruitment difficulties and skills shortages are forecast for the sector. Research by the Institute of Mechanical Engineers found 89% of those working in the sector believe the UK is not producing enough engineers; and just 13% of manufacturers believe government was doing enough to provide adequate Science, Technology, Engineering, , and Mathematics (STEM) skills advice to young people. Both these areas of work are critical to enabling growth in LCEGS.
- Alongside workforce development and skills, the sector faces several other challenges, in particular supporting the sector to translate research into commercial products. The UK Manufacturing Foresight Report identifies that the UK still falls behind its international competitors in terms of R&D investment.

Spatial Considerations

- Given the breadth of sectors which Low Carbon and Environmental Goods and Services cuts across, there are business and employment opportunities in a range of manufacturing and service sector occupations. While there are key clusters of firms in both Manchester and Stockport, employment is fairly evenly distributed across the remaining districts, and employment growth is likely to continue to follow this pattern in future.
- In addition, there is an opportunity to capitalise on new developments including the Western Gateway encompassing Port Salford which has land assets and developer interest that can generate significant growth in the Energy sector, alongside manufacturing, construction and logistics sectors.
- Driven by population growth, there is likely to be demand for a limited number of new environmental facilities to serve local need. Locations right across GM which are well connected to transport infrastructure and can provide sufficient space for large processing plants at an affordable cost to the market will remain attractive to developers.
- For professional and technical consultancy companies, strong locations, such as the regional centre, will continue to be attractive for employment growth. In the case of low carbon Advanced Manufacturing firms, the growth locations will align with those of the manufacturing sector more generally (detailed in an accompanying deep dive report), as the locational requirements are the same.

1 Introduction

1.1 This report is one of a series of sector 'Deep Dive' reports. It was commissioned by the Greater Manchester Combined Authority (GMCA) as part of Greater Manchester's (GM) economic evidence base, and in particular, to inform the development of the Greater Manchester Spatial Framework (GMSF). The report is part of a wide ranging analysis of the economic issues and opportunities across GM. The evidence is at a greater degree of granularity than has ever been done before for any industry sector in GM.

1.2 The Deep Dive research comprises the following reports:

- **Part 1: Summary research:** Providing an overview of the key issues affecting productivity and participation in Gm, including demographic structures and labour market profiles. It also includes an assessment of the key factors that are expected to drive economic change in the global, UK and Gm economies in the coming decades. It summarises the key findings from each of the sector chapters.
- **Part 2: Sector deep dive reports:** Covering the following key sectors: Manufacturing; Business, Finance and Professional Services; Digital & Creative; Health/Social Care and Health Innovation; Low Carbon and Environmental Goods and Services; Logistics; Retail and Wholesale Distribution; Hospitality, Tourism and Sport; and Construction.

1.3 For each sector, the analysis covers:

- Current make-up of the sector, covering the size, scale and relative importance to GM and geographic footprint, not constrained to administrative boundaries[2];
- Recent growth rates and growth potential (using forecasts by Oxford Economics);
- The location of critical assets and institutions across GM;
- Market opportunities and threats for the sector, including long-term trends which will shape the future scale, needs and location of the sector; and
- The spatial considerations of accelerated levels of growth in the sector.

1.4 The Deep Dive research has been produced by New Economy, with Deloitte supporting at the scoping stage and Ekosgen reviewing the outputs and providing independent quality assurance. The work has been developed drawing on input from both the public and the private sectors. Workshops have been held with Chief Executives and local authority officers in each GM district to check and challenge the evidence presented; to assess how it fits with local plans and to draw out the GM wide implications of the research. Consultation has also been undertaken with experts from a wide range of public and private partners including the Manchester Growth Company, GM's universities, TfGM, GM Chamber, pro-Manchester, Manchester Airport, NHS North West and LEP and Business Leadership Council members to provide further input and challenge to the evidence presented. The work also draws upon and feeds into the findings of the Northern Powerhouse Independent Economic Review.

[2] The data provided in the sector deep dive series of reports is used to support the understanding of the major trends within the sector and to set the context of the sector against the wider economy and UK.

2 Definitions

2.1 The Low Carbon and Environmental Goods and Services (LCEGS) sector captures all economic activity across sectors and supply chains that deal with environmental issues in a range of contexts. For this reason, it is hard to define specifically using Standard Industrial statistics and classification. Therefore, additional work was undertaken to map sub-sectors within GM.[3] It divides the sector into three components detailed below:

Low Carbon	Renewable Energy	Environmental
• Additional Energy Sources • Alternative Fuel/ Vehicle • Alternative Fuels • Building Technologies • Carbon Capture & Storage • Carbon Finance • Energy Management • Nuclear Power	• Biomass • Geothermal • Hydro • Photovoltaic • Wave & Tidal • Wind • Renewable Consulting	• Air Pollution • Contaminated Land • Environmental Consultancy • Environmental Monitoring • Marine Pollution Control • Noise & Vibration Control • Recovery and Recycling • Waste Management • Water Supply & Treatment

2.2 This definition differs from the Department for Business, Innovation and Skills' (BIS) national definition[4] which uses a 'bottom-up' method to define the Low Carbon sector into six sub-sector groupings comprising 24 Low Carbon markets and activities. The BIS definition excludes: Air Pollution, Contaminated Land, Environmental Consultancy, Environmental Monitoring, Marine Pollution Control, Noise & Vibration Control, Waste Management, Water Supply and Waste and Water Treatment.

2.3 Given the level of granularity which the Environmental Sustainability Technical Assistance (ESTA) report provides for GM, the ESTA definition will be used as the basis for this report, with supplementary and contextual evidence from the BIS report. It is also helpful to consider the LCEGS sector in terms of a broad split between innovation and delivery activities which cut across all sub-sectors:

- **Innovation:** This includes the research expertise across the university network as well as R&D within private companies. R&D activities make up a major component of the renewable sector, particularly in Nuclear and Offshore Wind. In many cases the assets associated with these sub-sectors are not co-located with the research taking place.
- **Delivery:** Captures consultancy work, manufacturing, and firms that buy/install physical kit. Delivery activities are captured within the LCEGS definition however they can be difficult to define and are underestimated particularly within industries where it is a smaller part of overall output, such as Architecture Consultancy.

2.4 Major LCGES companies within GM include professional technical services companies such as AECOM, DLA Piper, Jacobs and WSP Group. Many of these companies are

[3] kMatrix Ltd and Gyron LLP (2013): Greater Manchester LEP LCEGS Report (funded by the Environment Agency)
[4] Department for Business Innovation and Skills (2015): The Size and Performance of the UK Low Carbon Economy

active in multiple sectors such as Renewables, Nuclear, Energy Management, Environmental Management and Land Remediation. Within the Renewable Energy sector there are more than 500 accredited former Green Deal or MCS (Microgeneration Certification System) companies, most of which are small firms. However, larger companies within the Renewable Energy sector include, for example, Peel Energy, Siemens, and the Advanced Composites Group.

2.5 Within the Energy Management and Building Technologies sectors there are also many SMEs, including: consultants, assessors, and installers, in addition to large engineering and consultancy businesses such as ENER-G Plc and BD Group Ltd. Finally, Waste Management and allied Recovery and Recycling Sector includes large national waste management companies such as Viridor as well as local companies such as Hadfield Wood Recyclers.

3 Significance

3.1 There are many drivers in the move towards a lower carbon economy, primarily climate change but also energy security including the forecast 'peak' in oil production and resource scarcity. Measures will need to be taken to reduce emissions of greenhouse gases (GHGs) and action will need to be taken to adapt to the climate changes which are already unavoidable. The management of the transition to a low carbon, and eventually zero carbon society, while maintaining and improving living standards, is one of the biggest challenges facing the economy and society.

3.2 The UK Low Carbon sector as a whole is growing rapidly, placing it in a strong position to access the over £3.4 trillion global market opportunity which exists. In the UK, the Low Carbon sector comprises 11,550 firms, and employs 460,600 people. The direct low carbon economy generated £26.2bn in GVA in the UK in 2013, making it five times larger than Aerospace, two and a half times the size of Pharmaceuticals, almost twice as big as Chemicals and equivalent to Food and Drink in GVA terms.[5]

3.3 The LCEGS sector within Gm had an estimated turnover of £5.4bn in 2011/12, and employed 37,054 people in 1,941 firms. Latest GMFM estimates suggest this has risen to over 40,000 in 2015.[6] Exports were £529m in 2011/12, up 2.9% on the previous year, and sales growth has risen from 3.6% per annum in 2008/09 through 4.0% 2011/2012.

3.4 The sector accounts for 5% of total LCEGS turnover sales in England, placing it in third place, ahead of Leeds but behind both the Greater South East and London. London accounts for just over a fifth (22%) of total turnover sales, however it is important to note that the statistics are skewed by size of the Low Carbon Financial sector in London.[7] Furthermore a recent review of LEP performance by Sustainability West Midlands[8] report highly commends Gm for appearing in the top five in each climate change and low carbon economy metric commitment league table. Gm ranks in the top two for LEP commitments to climate adaptation (including flood risk and green infrastructure).

3.5 The Northern Powerhouse Independent Economic Review[9] has identified a number of growth opportunities located throughout the wider Northern Powerhouse area stretching from Liverpool and Gm, via Yorkshire, through to the East Coast.

3.6 The North has specific, distinctive sectoral specialisations in:

- **Nuclear research:** (in Manchester and Sheffield City Regions particularly), nuclear processing (in Cheshire and Warrington), nuclear power (Cumbria), and nuclear de-commissioning and nuclear design-and-construction across a number of LEPs.

[5] Department for Business Innovation and Skills (2015): The Size and Performance of the UK Low Carbon Economy
[6] Oxford Economics (2015): Latest estimates from the Greater Manchester Forecasting Model
[7] Ibid
[8] Sustainability West Midlands (May 2016) Fit for the Future? Local Enterprise Partnerships' Climate Ready and Low Carbon Economy Good Practice
[9] SQW (June 2016) Northern Powerhouse Independent Economic Review

- **Offshore wind energy:** with concentrations off the East and West Coasts, manufacturing and assembly facilities (including in Hull and Humber, Liverpool, North East, Tees Valley).
- **Key technologies:** including Waste to Energy (Tees Valley), Biomass (e.g. Leeds City Region and Tees Valley), Hydrogen production (Liverpool City Region and Tees Valley), small hydro and Onshore Wind, across the North.
- **Smart Systems:** including local heat programmes and smart energy systems (GM) [10]
- **Electricity distribution**: including control apparatus (Leeds City Region).
- **Environmental, energy, engineering consultancy** and business services (Lancashire, Hull and Humber City Region and Leeds City Region).
- **Offshore/Subsea Engineering:** as part of wider supply chain/enabling sectors (Cheshire and Warrington, Tees Valley, Hull and Humber, Liverpool, and North East City Regions).

3.7 Beyond direct and indirect economic contribution, the sector makes a positive contribution to communities and the environment. From a policy perspective, at a UK level, there is a clear commitment to a legally binding target of reducing carbon and other greenhouse gas (GHG) emissions by at least 80% by 2050 on 1990 base year levels.[11] This recognises that the UK cannot continue its dependence on fossil fuels and that climate change brings with it significant and irreversible long term costs that can only be mitigated by prompt action.

3.8 GM is committed, within the Greater Manchester Strategy, to a 48% CO_2 reduction by 2020 from 1990 levels and has signed international commitments to action to limit global temperature increases to under 2^{o}C by 2050. The Greater Manchester Climate Change and Low Emission Strategies Joint Implementation Plan 2016-2020 aims to achieve these objectives, and those within the Low Emission Strategy Action Plan (2015). As such, Greater Manchester's Climate Change and Air Quality Outcomes by 2020 currently include:

- Making a rapid transition to a sustainable low carbon economy
- Reducing collective carbon emissions by 48%
- Being prepared for and actively adapting to a rapidly changing climate
- Low emission behaviours will have become embedded into the culture of the city's organizations and lifestyles
- Supporting the UK Government in meeting all EU thresholds for key air pollutants at the earliest date to reduce ill-health in GM.

3.9 Furthermore, the city region has prioritised the sector in its latest round of bidding for European Structural Investment Funding (ESIF) and the issues of energy security, addressing fuel poverty, climate change and ensuring that wider economic sustainability are all hardwired into GM's growth and reform ambitions.

[10] Additional work in GM: Energy Systems Catapult (2016): Local Area Energy Planning – Greater Manchester
[11] Climate Change Act 2008

4 Businesses and Employment

4.1 The LCEGS sector within GM had an estimated turnover of £5.4bn in 2011/12, and employed 37,054 people in 1,941 firms. Latest GMFM estimates suggest this has risen to over 40,000 in 2015.[12] Exports were £529m in 2011/12, up 2.9% on the previous year, and sales growth has steadily risen from 3.6% per annum in 2008/09 through to 4.0% in 2011/2012. In contrast, employment has not grown as quickly, suggesting rising productivity.[13]

4.2 The Low Carbon subsector makes the largest contribution with 20,354 employees and sales of £2.9bn in 1,019 firms. Renewable energy employs just under 10,000 people and comprises over 500 businesses. The smallest contribution is from the Environmental subsector with 6,720 employees and just under 400 businesses.

Figure 1: Low Carbon and Environmental Goods and Services Sector, GM 2011/12

	In-year Sales £m	In-year Sales Growth	Employees (FTEs)	Businesses
LCEGS (All Subsectors)	**5,446 (100%)**	**4.0%**	**37,054 (100%)**	**1,941 (100%)**
Low Carbon	2,944 (54%)	4.5%	20,354 (55%)	1,019 (52%)
Renewable Energy	1,521 (28%)	5.6%	9,980 (27%)	524 (27%)
Environmental	981 (18%)	3%	6,720 (18%)	398 (21%)

Source: kMatrix Ltd and Gyron LLP, May 2013 Greater Manchester LEP LCEGS Report

4.3 Figure 2 shows that, at a granular level more, the key strengths in GM are in the following:

- **Low Carbon Building technologies:** Total turnover of just over £700m, making it one of the most important low carbon subsectors in GM. It includes activities such as the prototyping and design of technologies and the manufacture, supply, distribution, installation and development of insulation and energy management systems.
- **Renewable energy (which includes biomass, photovoltaics, energy consulting etc.):** in particular within the subsectors of Wind (£715m sales and just under 5,000 jobs), Geothermal (£372m), Solar-Photovoltaics (£197m), and Biomass (£195m).
- **Recovery and Recycling:** Accounted for £370m of sales and over 2,200 jobs. Much of the activity within this sector is in delivery including both manufacturing and consultancy. Water Supply and Waste Water Treatment is the second most significant with sales of £270m; and Waste Management accounted for sales of £139m in 2011/12.[14]

[12] Oxford Economics (2015): Estimates from the Greater Manchester Forecasting Model
[13] Ibid
[14] kMatrix Ltd and Gyron LLP, May 2013 *Greater Manchester LEP LCEGS Report*

Figure 2: LCEGS – Growth by Subsector (key to colours – 'top 3' in terms of scale within each sub-sector are shown in green)

Level 1 sector	kMatrix 'Level 2 sub-sectors'	Sales £m 2011/12	Employment 2011/12	Businesses 2011/12	Growth % 2011/12	Growth % 2010/11	Growth % 2009/10	Growth % 2008/09
Low Carbon **GM: 20,354 FTEs and £2,944m turnover**	Additional Energy Sources	£91m	717	29	4.3	3.4	3.3	3.4
	Alternative Fuel/Vehicle (see footnote[15])	£726m	5,352	271	3.7	4.0	3.6	3.7
	Alternative Fuels (see footnote)	£953m	6,251	317	5.6	5.0	6.3	5.5
	Low Carbon Building Technologies	£701m	4,641	228	5.4	4.7	5.0	4.7
	Carbon Capture and Storage	£43m	303	15	3.3	3.5	3.3	3.3
	Carbon Finance	£11m	40	<5	6.7	5.8	7.0	6.4
	Energy Management	£134m	994	46	3.4	3.3	3.3	3.2
	Nuclear Power	£286m	2,056	110	1.8	1.7	1.4	1.4
Renewable Energy **GM: 9,980 FTEs and £1,521m turnover**	Biomass	£195m	1,334	58	5.4	5.8	5.3	4.9
	Geothermal	£372m	2,321	115	6.1	5.7	5.5	5.5
	Hydro	£17m	142	<5	3.2	3.2	3.6	2.9
	Photovoltaic	£197m	1,093	67	7.0	6.7	6.4	6.4
	Wave & Tidal	£4m	23	<5	5.9	5.4	5.7	5.3
	Wind	£715m	4,908	270	7.8	7.6	7.8	7.0
	Renewable Energy General Consultancy	£21m	159	8	2.9	3.0	2.7	2.7
Environmental **GM: 6,720 FTEs and £981m turnover**	Air Pollution	£63m	481	53	2.0	2.1	2.0	2.0
	Contaminated Land Reclamation & Remediation	£72m	499	31	2.8	2.5	2.5	2.5
	Environmental Consultancy and Related Services	£45m	329	25	4.1	3.5	3.4	3.4
	Environmental Monitoring, Instrumentation and Analysis	£7m	54	<5	3.3	3.1	3.0	3.0
	Marine Pollution Control	£6m	42	<5	3.7	3.7	3.4	3.4
	Noise & Vibration Control	£8.5m	61	<5	4.2	3.9	3.6	3.7
	Recovery and Recycling	£370m	2,294	142	3.7	3.5	3.6	3.3
	Waste Management	£139m	1,029	52	3.1	2.8	2.9	2.7
	Water Supply and Waste Water Treatment	£270m	1,931	94	1.9	1.8	1.7	1.7
TOTAL		**£5,446m**	**37,054**	**1,941**	-	-	-	-

Source: kMatrix Ltd and Gyron LLP, May 2013 Greater Manchester LEP LCEGS Report

[15] The alternative fuels and alternative fuel vehicles sub-sectors comprise a high proportion of fuel distribution, wholesale and retail of fuels. Building technologies can therefore be considered the most important low carbon sub-sector in Greater Manchester, with nuclear power, energy management and additional energy sources following behind.

Figure 3: LCEGS businesses, GM 2011/12

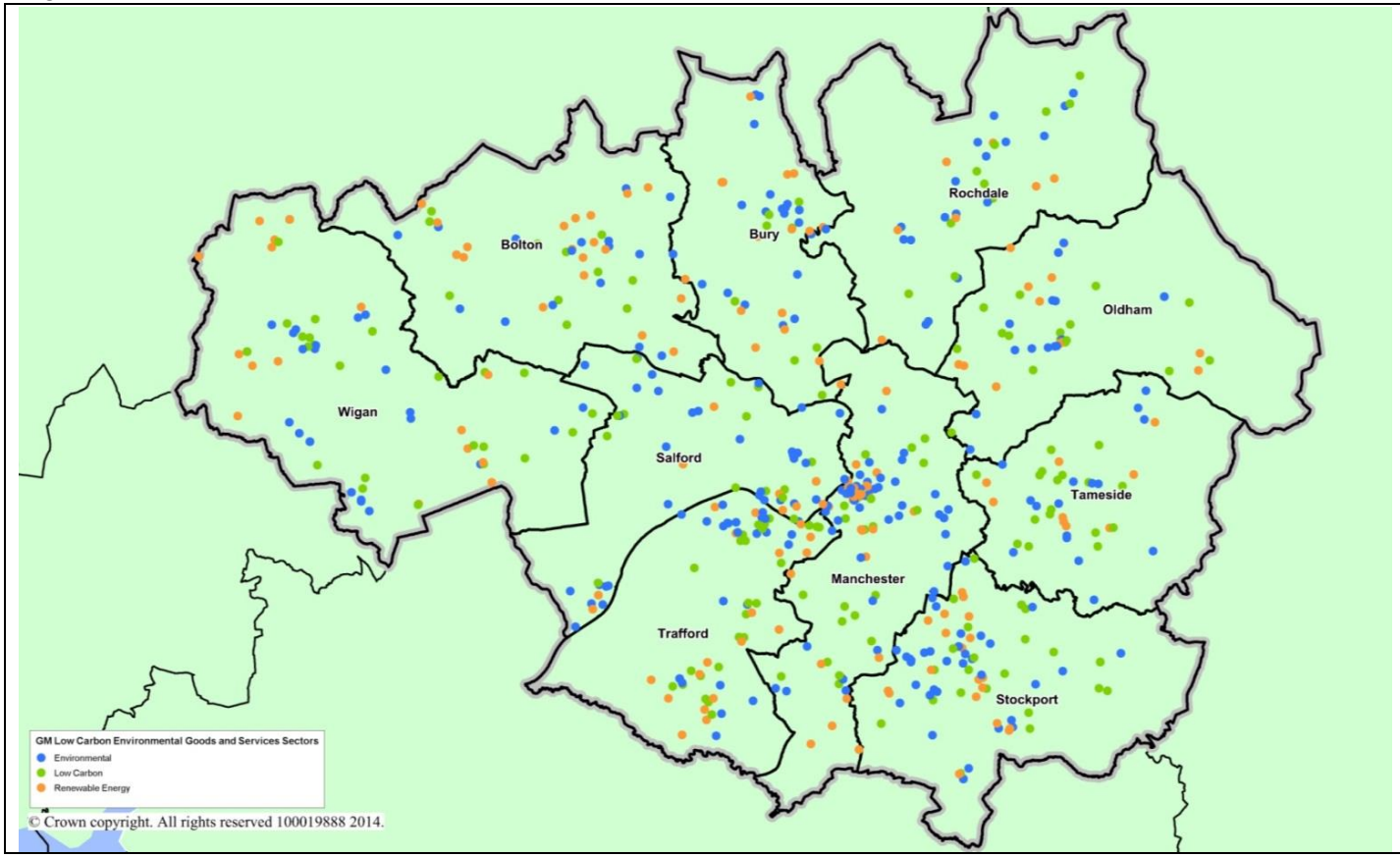


Figure 3 is based on the number of LCEGS firms within GM split by sub-sector, including low carbon and renewable energy and environmental industries.

Firms are distributed across GM with a particular concentration of environmental and low carbon businesses in the centre and to the north of Manchester, and extending to Trafford Park and Salford.

Renewable energy firms are more likely to be distributed in the periphery of GM.

Source: : kMatrix Ltd and Gyron LLP, May 2013 Greater Manchester LEP LCEGS Report

Figure 4: LCEGS – Sales Turnover, Employment and Businesses, GM 2011/12

All LCEGS	Sales (£m)		Employment		Businesses	
	Number	% of GM	Number	% of GM	Number	% of GM
Bolton	£496m	9.1%	3,271	8.8%	162	8.4%
Bury	£336m	6.2%	2,094	5.7%	103	5.3%
Manchester	£1,202m	22.1%	9,924	26.8%	534	27.5%
Oldham	£374m	6.9%	2,237	6.0%	106	5.5%
Rochdale	£285m	5.2%	1,712	4.6%	75	3.9%
Salford	£588m	10.8%	3,757	10.1%	203	10.5%
Stockport	£737m	13.5%	4,982	13.4%	290	14.9%
Tameside	£579m	10.6%	3,924	10.6%	201	10.4%
Trafford	£417m	7.7%	2,569	6.9%	127	6.5%
Wigan	£433m	8.0%	2,583	7.0%	139	7.2%
Greater Manchester	**£5,446m**	**100.0%**	**37,054**	**100.0%**	**1,941**	**100.0%**
Low Carbon Sub-sector	**Sales (£m)**		**Employment**		**Businesses**	
	Number	**% of GM**	Number	**% of GM**	Number	**% of GM**
Bolton	£286m	9.7%	1,929	9.5%	93	9.1%
Bury	£189m	6.4%	1,209	5.9%	58	5.7%
Manchester	£645m	21.9%	5,301	26.0%	259	25.4%
Oldham	£195m	6.6%	1,190	5.8%	55	5.4%
Rochdale	£154m	5.2%	944	4.6%	40	3.9%
Salford	£317m	10.8%	2,064	10.1%	109	10.7%
Stockport	£391m	13.3%	2,724	13.4%	154	15.1%
Tameside	£319m	10.8%	2,219	10.9%	110	10.8%
Trafford	£219m	7.4%	1,380	6.8%	67	6.6%
Wigan	£229m	7.8%	1,393	6.8%	73	7.2%
Greater Manchester	**£2,944m**	**100.0%**	**20,354**	**100.0%**	**1,019**	**100.0%**
Renewable Energy Sub-sector	**Sales (£m)**		**Employment**		**Businesses**	
	Number	**% of GM**	Number	**% of GM**	Number	**% of GM**
Bolton	£119m	7.8%	757	7.6%	34	6.5%
Bury	£90m	5.9%	532	5.3%	24	4.6%
Manchester	£346m	22.7%	2,758	27.6%	182	34.8%
Oldham	£111m	7.3%	639	6.4%	28	5.4%
Rochdale	£78m	5.1%	451	4.5%	18	3.4%
Salford	£166m	10.9%	1,026	10.3%	50	9.6%
Stockport	£210m	13.8%	1,362	13.6%	72	13.8%
Tameside	£152m	10.0%	978	9.8%	46	8.8%
Trafford	£120m	7.9%	719	7.2%	32	6.1%
Wigan	£131m	8.6%	758	7.6%	37	7.1%
Greater Manchester	**£1,521m**	**100.0%**	**9,980**	**100.0%**	**524**	**100.0%**
Environmental Sub-sector	**Sales (£m)**		**Employment**		**Businesses**	
	Number	**% of GM**	Number	**% of GM**	Number	**% of GM**
Bolton	£90m	9.2%	584	8.7%	35	8.8%
Bury	£58m	5.9%	352	5.2%	21	5.3%
Manchester	£211m	21.5%	1,866	27.8%	93	23.4%
Oldham	£68m	7.0%	408	6.1%	23	5.8%
Rochdale	£53m	5.4%	317	4.7%	17	4.3%
Salford	£104m	10.6%	667	9.9%	43	10.8%
Stockport	£136m	13.9%	897	13.3%	64	16.1%
Tameside	£109m	11.1%	727	10.8%	45	11.3%
Trafford	£77m	7.9%	470	7.0%	28	7.0%
Wigan	£74m	7.5%	432	6.4%	29	7.3%
Greater Manchester	**£981m**	**100.0%**	**6,720**	**100.0%**	**398**	**100.0%**

4.4 Figure 4 shows that across all LCEGS businesses, just over a quarter (27.5%) are located in Manchester, corresponding to £1.2bn in sales turnover and 9,900 employees. Of these, 259 businesses are in the Low Carbon sector, corresponding to £645m in sales. Manchester is also an important centre for renewable energy firms, home to over a third of firms in this subsector in GM.

4.5 Stockport has the next highest proportion of businesses with 14.9%, employing nearly 5,000 people and accounting for 13.5% or £737m of GM's total sales in LCEGS. Of these, 154 are Low Carbon businesses accounting for £391m in sales, and 2,724 employees.

4.6 Salford and Tameside each account for just over 10% of LCEGS businesses in GM, highlighting key clusters outside those shown in Manchester and Stockport. The total sales turnover and employment in the sector in Salford is £588m (3,757 employees); and Tameside £579m (3,924 employees).

4.7 The environmental subsector is the smallest LCEGS sub-sector in GM, with 398 firms, 6,720 employees generating £981m sales turnover. Key centres are in Manchester, Stockport, Tameside, Salford, and Bolton.

5 Skills

5.1 The definition of LCEGS cuts across many different areas of industry, both manufacturing and services. The occupations and skill levels required within these sectors varies significantly, from specific expertise within industries such as Nuclear, and Renewables requiring graduate qualifications and technical expertise in management; professional/consultancy, research, development and technician roles to skilled trade occupations linked to delivery and installation of equipment and administrative and sales roles involved in support service jobs across all the sector.

5.2 Given the mix of 'sectors' and occupations, it has not been possible to calculate specific productivity levels of workers in a consistent manner with all other sector deep dive reports. However, it is worthwhile pointing out that the sector definition used here includes many of the higher-value activities in manufacturing and professional services, as well as entry level jobs providing opportunities for employment right across GM.

5.3 Skills investment in LCEGS needs to be considered as a cross-cutting / cross-sectoral issue. The main issues are outlined in the section below, but should be read alongside the Manufacturing, Professional Services, and Construction deep dive reports.

Current trends and skills challenges

5.4 At an aggregated level the current LCEGS workforce is relatively highly skilled. 40% of employees have Level 4+ (undergraduate/graduate qualifications), compared to a third nationally. The main growth areas of future demand will be for employees with low carbon energy efficiency knowledge and skills, and equipment installation jobs (covered in the Construction deep dive report).

Figure 5: Skills Challenges in the LCEGS sector

Sector	Challenge
'Greening' the workforce and development of skills	• There will be a significant amount of CPD required for existing professions especially in the areas of energy efficiency, renewable energy and refurbishment skills for the domestic housing stock. • Management and leadership skills will be a pre-requisite to grow productivity and develop low carbon systems and opportunities for growth.
Labour and skills shortages	• Rapid growth in renewable energy, and re-development of nuclear energy plants in the UK (as well as decommissioning) will continue to drive significant demand for re-skilling. • Building retrofit, an understanding and ability to fit appropriate retrofit technology, e.g. heat pumps, heat exchangers, solid wall insulation, CHP systems will be critical over the next two decades.
Mismatch between employers' skill needs and current learning provision and wider lack of STEM learning	• The skills required in some new technology areas will be specific and the number of learners potentially small. This will make it difficult in some cases to achieve economies of scale for learning provision. • National shortfall in achievement of students with Science Technology Engineering and Maths qualifications and skills will, as in other sectors, hold back the LCEGS full potential, in particular within the renewables and nuclear sub-sectors.

5.5 **'Greening' the workforce and development of skills.** Many of the skills needs that will arise from the low carbon transition will be based on the existing workforce gaining additional qualifications and skills that enable them to adapt quickly to new growth

opportunities rather than complete retraining. Headline areas of demand here are in Construction and Building Services Engineering, reflecting the size of the sector and the potential to reduce carbon emissions that it possesses and Advanced Manufacturing, where there are continuing growth opportunities relating to the circular economy and resource efficiency.[16,17] Specific skills gaps include:

- **Improving leadership and change management skills:** including business development and project management in both the private and public sectors; and third sector activities including the work of the Community Energy sector.
- **Greening construction and building services skills:** ranging from basic installation skills for insulation to the ability of designers and installers to specify and fit carbon management systems.
- **Skills gaps in logistics and transport network management** adapting freight and passenger delivery systems to grow productivity and to minimise emissions.
- **Awareness and skills for public, planners and policy staff** (mainly public sector but also the private sector) raising awareness of low carbon growth and its wider socio-economic impact.
- **Low carbon vehicle skills for mechanics, fuel handlers and green driving skills:** many logistics firms and national retail/wholesalers have already adapted vehicles, and additional driver-skills training will help reduce carbon miles and lower costs.

5.6 **Labour and skills shortages.** The main areas forecast to have skills shortages include:

- **Renewable Energy:** Fast growth in the renewable energy sector will drive skills needs. Of particular importance to the wider Northern Powerhouse (and GM supply chain) will be offshore wind energy (construction, materials, engineering, electronic systems) and tidal power. Production of domestic and building based renewable energy technologies, such as solar thermal and heat pumps, will also be a major area for growth.
- **All Products and Services:** In production, skill needs will emerge around product development and design and manufacture. This will then follow through into services such as marketing, installation, building retrofit, maintenance and support. The main area of skills demand will be for high qualified staff in both product design and engineering.

5.7 **Mismatch between employers' skill needs and current learning provision.** A major challenge for education and training providers will be to ensure that the content of courses provides students with the necessary skills in order to undertake work within a rapidly changing sector.

5.8 **Shortage of workers with STEM** is holding back growth.[18] Projections of university STEM graduates suggest a significant shortfall in availability, both nationally and in GM. There is also an important role for the GM University Technical College and Green Technology Centre for training the low carbon workforce across GM.

[16] UKCES (2010): Strategic Skills Needs in the Low Carbon Energy Generation Sector – Executive Summary
[17] NWDA (2009): Assessment of the Skills Need and Provision for a Low Carbon North West – Final Report
[18] Houses of Parliament (2013): Briefing on STEM education for 14 to 19 year olds

6 Key Assets

6.1 The following section highlights relevant assets for the LCEGS sector, shown in Figure 6 below. Sector assets have been identified based on their role in supporting jobs and/or GVA growth for GM now and in the future. These include business clusters, industrial assets and research institutions. However, the list of assets is not intended to be definitive.

6.2 This section should be read in conjunction with the Business, Financial and Professional Services, Construction and Manufacturing sector Deep Dives, given the cross cutting nature of LCEGS, which includes firms from each of these sectors.

6.3 The R&D assets for the sector are predominantly located around the regional centre, particularly within the Manchester Corridor. This includes a critical cluster around the University of Manchester and Manchester Metropolitan University and Salford University, representing the largest and most connected community of low carbon academics and researchers in the UK.

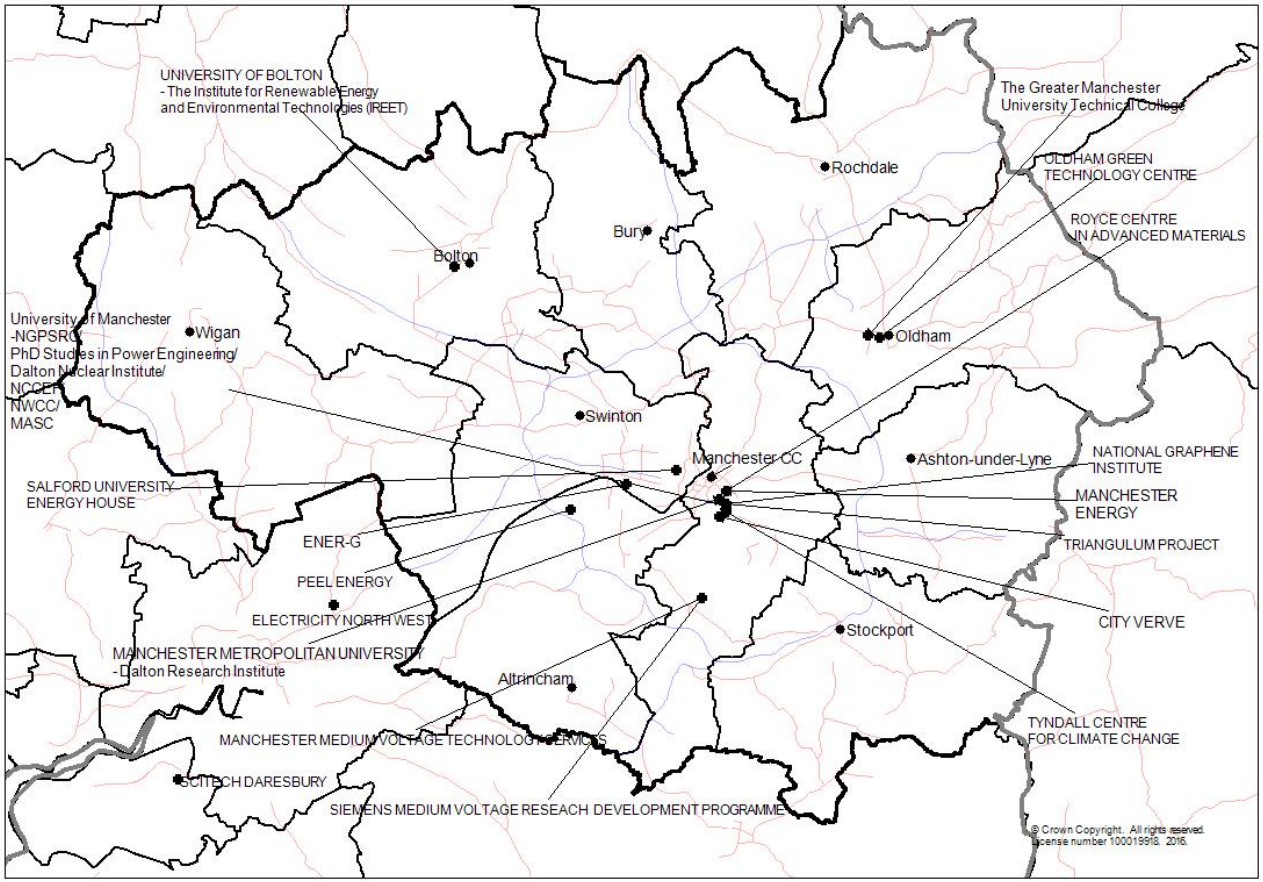
6.4 Assets extend further south and beyond the conurbation to research facilities such as Sci-Tech Daresbury. In terms of employment and firms, these are located right across the conurbation reflecting again the broad base of firms included in the LCEGS sector.

6.5 Note that further detail is included within the Science Innovation Audit of Greater Manchester and East Cheshire exploring collective Energy innovation assets for the functional geography in more detail and the synergies that exist between them and other sectors.

Figure 6: Greater Manchester - Key LCEGS related assets

- National Graphene Institute
- ROYCE Centre in Advanced Materials
- Sci-tech Daresbury: Innovation Technology Access Centre (I-TAC) (Outside GM administrative boundary but significant for growth of GM businesses)
- Nuclear Advanced Manufacturing Research Centre (collaboration between The University of Manchester and The University of Sheffield with the main centre in Sheffield)
- NEDO Smart Communities Demonstrator Project (New Energy and Industrial Technology Development Organisation of Japan)
- The Triangulum Project
- City Verve
- Manchester Energy, University of Manchester
- National Grid Power System Research Centre Facilities (NGPSRC)
- National CoE for postdoctoral studies in Power Engineering
- Dalton Nuclear Institute (University of Manchester)
- Dalton Research Institute (Manchester Metropolitan)
- Tyndall Centre for Climate Change Manchester
- Salford University Energy House
- Siemens Medium Voltage Research Development Programme, Manchester
- Manchester Medium Voltage Technology Services (Siemens)
- National Composites Certification & Evaluation Facility (NCCEF)
- University of Manchester – The Northwest Composites Centre (NWCC
- University of Manchester – Modelling and Simulation Centre (MASC)
- Ener-G (role as a catalyst business)
- University of Bolton – The Institute for Renewable Energy and Environmental Technologies (IREET)
- Peel Energy (role as a catalyst business)
- Electricity North West (role as a catalyst business)
- The Oldham College Green Technology Centre
- The Greater Manchester University Technical College.

Figure 7: Low Carbon Environmental Goods and Services assets in Greater Manchester and surrounding areas



As Figure 7 shows, there is a concentration of R&D assets for LCEGS are in the Corridor Manchester and within Salford and Trafford.

Employment within the sector which includes Construction, Manufacturing and Business, Professional and Financial Services firms is distributed more evenly across GM with particular concentrations within the regional centre particularly for the Professional Service related activities.

It should be noted that there are assets that sit outside GM which also have an impact on firms within GM through supply chain links, for example:

- Sci-Tech Daresbury campus
- National Nuclear Laboratories
- 'Warrington Nuclear Cluster'

6.6 **National Graphene Institute (NGI):** The £61m National Graphene Institute, which opened in March 2015, will enable academics and their industrial partners to work on new applications, accelerating translation and commercialisation of research. NGI will link several research groups alongside academic research & development, including: Condensed Matter Physics Group, Manchester Centre for Meso-science & Nanotechnology, Nano-Engineering and Storage Technology Group, Nanomedicine Lab, Photon Science Institute, Graphene Nanostructured Materials, and Microwave & Communication Systems Group. [19]

6.7 **ROYCE National Research and Innovation Centre in Advanced Materials:** The Sir Henry Royce Institute for Materials Research and Innovation – opening in 2019 – will have its £235m research centre in Manchester. The Manchester centre will be supported by satellite centres or 'spokes' at the founding partners, comprising the universities of Sheffield, Leeds, Liverpool, Cambridge, Oxford and Imperial College London. The nuclear materials component of the centre, one of 14 such components, will be supported by facilities at the National Nuclear Laboratory in Cumbria and the Culham Centre for Fusion Energy.

6.8 **Sci-Tech Daresbury: Innovation Technology Access Centre (I-TAC):** Sci-Tech Daresbury is home to a cluster of organisations and networks. It brings together both business-to-business networks and major scientific research facilities and researchers, focusing on new technologies in photovoltaics, hydrogen storage, anaerobic digestion and bio-sustainability.[20] Nuclear physics is also a core strength of the research base at Sci-Tech Daresbury with the STFC Council Nuclear Physics Group there supporting nuclear physics.

6.9 **Nuclear Advanced Manufacturing Research Centre:** A collaboration between The University of Manchester and The University of Sheffield, the Nuclear Advanced Manufacturing Research Centre helps UK manufacturers win work in the civil nuclear sector. Combining industry expertise and university innovation, the Nuclear AMRC works with companies to improve manufacturing capabilities and performance for civil, nuclear, and innovative energy sectors.

6.10 **NEDO Smart Communities Project (New Energy and Industrial Technology Development Organisation):** The NEDO project is a smart heat pump and energy aggregation ICT platform. It will install 550 air source heat pumps in residential properties and combine them on an ICT aggregation platform to trial demand response at the local level. It is expected that residential demand for this type of heat will become widespread in the future and that this project allows GM to be at the forefront of this trend. The project is a partnership between the New Energy and Industrial Technology Development Organization of Japan (NEDO), the UK Government and the Greater Manchester Combined Authority.

[19] Whilst it is recognised that NGI is a leading centre for advanced materials research – it is included within LCEGS sector in recognition that research will translate into products relevant to the sector. Same note for ROYCE.

[20] Note: These are outside GM administrative boundary but they are significant for the growth of GM businesses

6.11 **The GM Smart Systems and Heat Demonstration Project**: De-carbonising heat to domestic properties is also a key priority for longer term carbon target achievement (80% by 2050). GM is one of three pilot cities (others are Newcastle and Bridgend) working with the Energy Systems Catapult (ESC) on the developing a route map for the de-carbonisation of residential heat. The project is twofold:

- **Phase 1** is the development of an detailed area based (local authority wide) energy evidence base and Master-planning in 1 GM District which will determine what is the most appropriate route for decarbonisation depending on existing and future growth projections (i.e. a property moves from a gas boiler to a heat pump and, in time, connect to a heat network).
- **Phase 2** will be a significant sized demonstrator (possibly up to £30m) to test the business cases and methods of delivery to encourage householders to switch to new ways of thinking about heating and energy use (i.e. the introduction of smart appliances, moving to paying for 'comfort' instead of heat, combined fixed monthly utility billing etc).

6.12 Project partners include DBEIS, Hitachi, EDF, Innovate UK, Energy Systems Catapult, Welsh Government. The Energy Catapult is supporting us in developing a high level heat and energy map for GM prior to the commencement of the Phase 1 Masterplan at the end of 2016. Phase 2 is currently in development (BEIS have approved development costs) and is due to commence 2018 – 2020.

6.13 **Manchester Energy:** Manchester Energy brings together over 600 researchers from across the University of Manchester, supporting research and education across the energy spectrum. A wide variety of research areas are covered including bioenergy, cities and urban energy use, climate change, energy networks, energy storage, multi energy systems, nuclear, offshore renewables, oil and gas and solar.

6.14 **National Grid Power System Research Centre Facilities (NGPSRC):** The National Grid Power System Research Centre (University of Manchester and the Cockcroft Laboratory) has six experimental laboratories. Three are associated with high voltage engineering, one for dielectric materials, one for protection and control and one for measurements and instrumentation. The Centre also undertakes research in areas of operation, planning and analysis of power systems in the energy marketplace.

6.15 **The Dalton Institute – University of Manchester[21]:** The Dalton Institute is a state of the art research base of the University of Manchester based in Cumbria. It is a joint investment by the UK's Nuclear Decommissioning Authority and the University of Manchester and opened in September 2013. With over 300 researchers and 250 civil nuclear supply chain companies in the region.[22] Research at the DCF focuses primarily on radiation science and nuclear engineering decommissioning.

[21] Asset is outside the GM administrative boundary, but is an important research asset for the UoM

[22] MIDAS (2014): Manchester - At the heart of the UK's civil nuclear industry

6.16 **Manchester Metropolitan University Dalton Research Institute:** The Dalton Research Institute (DRI) is based in the Faculty of Science and Engineering at Manchester Metropolitan University and is comprised of several research groups including the Environmental Science Research Centre, the Centre for Aviation, Transport and the Environment, Informatics Research Centre, Engineering and Materials Research Centre and the Healthcare Science Research Centre.

6.17 **Triangulum Project, University of Manchester:** Triangulum is one of three European Smart Cities and Communities Lighthouse Projects, set to demonstrate, disseminate and replicate solutions and frameworks for Europe's future smart cites. The Triangulum flagships cities, Eindhoven (NL), Manchester (UK) and Stavanger (NO) combines interdisciplinary experience and the expertise of 22 partners from industry and research.

6.18 **CityVerve:** An innovative project in Manchester aimed at improving the services for its residents has been chosen as the winner of a £10m Government-led technology competition. The CityVerve Project aims to test better services using the Internet of Things (IoT) technology, including improvements to the built environment including, for example, plans for talking bus stops, which let bus operators know when commuters are waiting, and a network of sensors in parks and along commuter routes to encourage people to do more physical activity. It already has 22 multi-sector partners, and will demonstrate a smart city at scale, aiming to provide a replicable model for other cities in the UK and beyond.

6.19 **Tyndall Centre for Climate Change Manchester:** Established in 2000 with funding from the UK Research Councils, The Tyndall Centre for Climate Change's work covers the whole spectrum of geographical, time and human scales, linking research efforts across disciplines through an integrated approach. Tyndall Centre Manchester – part of a Consortium of 9 Universities – is primarily based in the School of Mechanical, Aerospace and Civil Engineering.

6.20 **Applied Buildings and Energy Research Group (ABERG):** The Applied Buildings and Energy Research Group at the University of Salford was established to address concerns surrounding energy use in buildings. ABERG is also the home to Salford Energy House – a full sized two-bedroom terraced house built inside an environmental chamber that can replicate almost any weather conditions and is used to test energy use, management and resilience of buildings.

6.21 **Siemens Medium Voltage Research Development Programme:** Siemens medium voltage research development programme has facilities at Sir William Siemens House, Princess Road. The programme is based on Siemens' energy system – Totally Integrated Power. Smart interfaces allow linking to industrial or building automation, making it possible to fully exploit all the optimization potential of an integrated solution.

6.22 **University of Manchester – Modelling and Simulation Centre (MASC):** MASC is based in the School of Mechanical, Aerospace and Civil Engineering and forms part of the Dalton Nuclear Institute, as well as having strong links with the Materials Performance Centre, UMARI, the Tyndall Centre (for climate change) and the Laser Processing Centre. It is jointly funded by the School and Electricité de France (EDF) and supports a range of industries.

6.23 **University of Manchester – The Northwest Composites Centre (NWCC):** The Northwest Composites Centre (NWCC) acts as a centre of expertise in supporting, evaluating and introducing innovation in manufacture, design and testing of advanced composites. Key Research Areas and activities include composites design, modelling and testing, materials for wind generation, 3D fibre/weaving/braiding architectures, and the robotic forming of multi-material preforms.

6.24 **National Composites Certification & Evaluation Facility (NCCEF):** The National Composites Certification and Evaluation Facility aims to support the supply chain across all sectors in the transition from metallic to advanced composite manufacturing. The facility focuses on the testing and evaluation of sub-components and small full-scale components. The centre is an important test partner for the National Composites Centre and supports the UK advanced materials/light-weighting engineering eco-system.

6.25 **ENER-G (role as a catalyst business):** Provides global businesses with a wide range of energy services and sustainable technologies to help them generate, buy and manage their energy. ENER-G finances, designs and delivers a range of low carbon, energy efficient technologies. Their on-site generation technologies, including combined heat and power, heat pumps and anaerobic digestion systems, provide sustainable, cost effective sources of energy. Their building energy management controls help improve building efficiency and lower operational costs.

6.26 **University of Bolton – The Institute for Renewable Energy and Environmental Technologies (IREET):** IREET focusses on innovative research and industrial collaboration aimed at advanced and sustainable solutions for renewable energy generation and clean/hygienic environments. The research activities of IREET cover various renewable energy systems, novel materials with designer formulation and functionalities (with particular interest in nano-materials and functional thin films), and applied technologies for innovative industrial exploitation.

6.27 **Peel Energy (role as a catalyst business):** Peel Energy – a part of Peel Group – operates in generation or development of low carbon technologies including wind, tidal and hydro power, and biomass. Within the wider North West region, Peel Environmental is leading the development of Ince Resource Recovery Park (PROTOS) in Cheshire.

By 2019, the recovery park aims to include an energy-from-waste plant near Ellesmere Port, which will combust approximately 600,000 of refuse derived fuel from both municipal and commercial and industrial sectors. Around 3,000 jobs will be created once the park is complete and the £500m park will produce 95 megawatts of electricity, enough to power around 142,000 homes.

6.28 **Electricity North West (role as a catalyst business):** Electricity North West owns, operates and maintains the North West's electricity distribution network, connecting 2.4m properties, and more than 5m people in the region to the National Grid. The network covers a diverse range of terrain, from isolated farms in rural areas such as Cumbria, to areas of heavy industry and urban populations including Manchester.

6.29 **The Oldham College Green Technology Centre:** The Centre offers courses and training in environmental technologies. The college has been appointed as the North Manchester hub for the National Skills Academy for Environmental Technologies. The centre has been developed in conjunction with leading green technology companies and students will be taught the latest skills in the design, installation and maintenance of cutting edge green technology.

6.30 Courses offered by the centre include Renewable Energy Awareness, Solar Photovoltaic Systems, Ground and Air Source Heat Pump Systems, Solar Domestic Hot Water and Rainwater and Greywater harvesting and recycling. Students likely to attend these short courses include experienced building service engineers, plumbers and construction workers looking to enhance their knowledge of renewable energy technologies and develop their skills in this developing area of construction. The Renewable Energy Awareness Course is also suitable for policy makers, town planners, sales staff and building control officers.

6.31 **The Greater Manchester University Technical College:** The GM UTC specialises in sustainable engineering. The UTC is located in a new £9m development in the centre of Oldham which includes all the latest sustainable technology in its design, engineering and construction. The main building has been designed to include all the latest sustainable technologies including its energy, heating and cooling systems. It hosts 11 specialist science and engineering workshops which include commercial scale equipment so students are already familiar with industry-grade equipment.

7 Growth Potential

Opportunities

Opportunity	Activity
Policy, legislation, financial instruments	• Global through to local policy and legislation will have a major impact on the sector and cutting across the activities of all sectors within the economy. • Financial instruments such as the European Structural Investment Funds – funding present significant opportunities to unlock activities right across the LCEGS sector.
Role of LCEGS in Smart cities agenda	• Existing activities to promote sustainability and 'smart cities' agenda which can form the catalyst for activity particularly for smart energy systems.
Electrification of Transport and Electrification of Heat and District Heat Networks / Community Energy Sector	• Transport Strategy, low carbon emissions and Air Quality legislation will particularly support these opportunities. • LED street lighting. • District Heat Networks – capitalising on a National Demonstrator in Manchester, rolling out new opportunities across GM. • Growth of the Community Energy Sector
Opportunities within building technologies	• Policy driven opportunities e.g. retrofitting of GM public estate • Opportunities within residential and commercial development. • Promoting the growth in low carbon lighting sources (LED) in commercial and domestic buildings. • Supporting the GM cluster of wind-technology construction firms, through the new-build and maintenance of existing wind-farms.
Public Sector procurement	• The use of progressive local procurement to drive wider economic, social and environmental benefit throughout the supply chain.
Significant opportunities within materials and reprocessing and waste management	• Significant growth opportunities within waste and recycling right across the conurbation and particularly within highly accessible and networked sites. • Strong population growth within the city region will place increasing pressure on waste water facilities. • New housing development will require adequate waste facilities. • Forecast economic growth will place a demand on waste water management services for the growing number of businesses.
Innovation opportunities	• Opportunities to capitalise further on innovation activities within Offshore Wind, Nuclear, Low Carbon Lighting (LED) and application of Graphene. • Greater need to capitalise on innovation activities such as the commercialisation of research and its retention within GM.
Population Growth	• Scale of house building required to house a growing population provides opportunities for the LCEGs sector

7.1 **Policy and legislation:** Everything from global to local policy and legislation will have a major impact on the sector and cutting across the activities of all sectors within the economy. There will be global drivers for eco-innovation driven by energy security and resource scarcity, for example fuels, metals, water and air quality, alongside local drivers which will by driven by this international and national policy, as well as firms responding directly – and indirectly through their supply chains – to the development of new products, services, and processes which improve resource efficiency, raise productivity, and grow business.

7.2 The Annual Conference of Parties (COP) 21 in November 2015 negotiated the Paris Agreement, a global agreement on the reduction of climate change by all the nations of the world. Nationally the UK Government has signed up to a legally binding Climate Change Act and GM, within its strategy, has set a stringent carbon reduction target setting the context for a strong focus on the sector.

7.3 The GM Devolution deal; Greater Manchester Climate Change and Low Emission Strategies Joint Implementation Plan for 2016 to 2020 currently out for consultation; the commitment of the Northern Powerhouse to energy and; the implementation of national and local environmental policy in response to the global carbon reduction commitments set out in the Paris Agreement, will provide long-term growth opportunities for the LCEGS sector.

7.4 Research undertaken in GM in 2014 and additional work in 2016 on Local Area Energy Planning in GM identified additional opportunities for growth in: [23, 24]

- Increasing the rate of deployment of low carbon and decentralised energy, particularly heat, across GM; and supporting increases in energy efficiency in firms and homes, including the use of smart energy management systems.
- Finding ways of making sure that businesses and all parts of the community are involved and can therefore benefit from renewable and low carbon energy developments.
- Ensuring that the economic impact of local jobs and growth is maximised as a result of the investments made to develop decentralised renewable energy.

7.5 The policy and legislation which comes into force will to a large extent set the scope and drive the opportunities within the sector. Given the global through to local policy agenda outlined, it is likely that this will present more, rather than fewer, opportunities over the coming decades, particularly given the clear challenges which have been laid down regarding climate change. Dependent on the detail of these policies and the extent of funding, certain subsectors could potentially fare better than others.

7.6 **Role of LCEGS in Smart Cities agenda:** The activities of projects such as the Triangulum Project and Project Verve and wider `Smart Cities' agenda further brings to the fore the economic opportunities that the sustainability agenda brings. Innovative use of new technologies and materials is facilitating this and providing a commercial rationale for smarter and more connected cities. Tech is cross-cutting across all sectors and there is a strong opportunity for LCEGS within this agenda. This also presents growth opportunities linked to facilities management, as well as encouraging the use of technology to support a more joined-up approach to local supply chains.

7.7 **Electrification of transport, electrification of heat:** The demands placed on the electricity distribution network are likely to change dramatically over the coming years as a result of the drive towards electrification of heat and transport and to ensure delivery of Government targets relating to carbon emissions and air quality. Electrification is a

[23] New Economy (2014): Working Paper: Greater Manchester - How will we fuel our future
[24] Energy Systems Catapult (2016): Local Area Energy Planning – Greater Manchester

growing component of national and GM transport strategies and will make a major contribution to reducing carbon emissions. The delivery of initiatives such as the Manchester to Leeds Rail Electrification, a £38bn upgrade to the rail network for the North that is now back on Network Rail's five-year plan, present an opportunity for growth within the LCEGS sector.

7.8 Electrification of heating is an important factor in supporting the achievement of the Renewable Electricity Target which is aiming to achieve 15% of final energy consumption from renewable sources by 2020. The £20m NEDO funded Smart Communities Project aims to trial energy demand aggregation and demand response. It aligns with the 'smart city' agenda with the roll-out of smart meters and smart grids. Opening up energy data and digital systems can support smart grid development and allow for a more bottom-up innovation and participation in local energy systems and this presents great opportunities for energy providers and firms – including tech firms – to rise to the challenge of delivering this service.

7.9 **District heat networks:** A number of local authorities in GM have undertaken feasibility studies to demonstrate the long term financial and carbon savings from District Heat Networks. A Manchester City Centre Heat Network, for example, serving existing and planned developments throughout the city centre, the Corridor and across a regenerated New East Manchester has the potential to be a national demonstrator, supporting other heat network proposals across GM.[25]

7.10 **Low Carbon and Renewable Energy Potential:** There is potential for further deployment of low carbon energy – to support GM carbon targets. The technologies with the highest technical potential include district heating, individual electric heat pumps, bio-fuels, and solar technologies for both hot water and electricity.

7.11 **Community energy generation:** Community energy covers aspects of collective action to reduce, purchase, manage and generate energy. Community energy projects have an emphasis on local engagement, local leadership and control and the local community benefiting collectively from the outcomes. Community-led action can often tackle challenging issues around energy, with community groups well placed to understand their local areas. There are a number of Community Energy projects in GM including, for example, Oldham Community Power.

7.12 **Building technologies:** The sub-sector is a key component of the LCEGS sector within GM and there are opportunities driven by the policy agenda as well as commercial opportunities focused around energy efficiency. From a public sector perspective, GM has a considerable public estate, with a wide variety of building types and spatial distribution and the future retrofitting of these buildings could stimulate the local market and skills base, encouraging the development of innovative solutions which could have wider community benefits, such as district heating. In addition there are opportunities for GM firms to contribute to the build and maintenance of wind generation sites.

[25] AGMA and GM Environment Commission (2013): Greater Manchester District Heat Networks: http://media.ontheplatform.org.uk/sites/default/files/district_heat_spreads_0.pdf

7.13 **Materials and reprocessing / waste water management and facilities:** Waste and resource management makes a significant contribution to the economy. It is estimated that the core waste sector in the UK generated £6.8bn in gross value added (GVA) and supported 103,000 jobs in 2013.[26] It does so directly by capturing value from waste, and indirectly by generating sales for companies that supply goods and services that support resource management.

7.14 There will be significant opportunities for businesses as we transition to a more circular economy where the UK increasingly re-uses and recycles the resources it already has. Within GM, Recovery and Recycling is an important component of the LCEGS market and the conurbation already has a growing employment and business base within this subsector. The R&D assets within GM are contributing to the strength of the sector, bringing forward innovative product and service solutions.

7.15 Firms within this sector will require large facilities for processing which are highly networked and accessible. As GM's population grows, Waste Water Management and Facilities, and Energy Distribution, will be major growth opportunities. The increased demand for housing and employment land will bring with it a need for adequate waste and processing facilities, low energy lighting, as well as new energy distribution infrastructure, and these will need to be spread across GM.

7.16 **Innovation opportunities:** GM and the North of England (and the Irish Sea Energy Rim) are home to a significant cluster of research and innovation activities, in particular within Offshore Wind and the Nuclear Sector, and also in hydro, biomass, solar and several other renewable technologies. In addition, there is advanced research into wave and tidal systems (the UK has one of the largest tidal ranges in the world). Supporting this opportunity there are over 20 universities located around the Irish Sea in Ireland, Scotland, Wales, England and Northern Ireland. In addition, there are established initiatives such as Britain's Energy Coast (BEC), Solway Energy Gateway, Northwest Energy Gateway, Mersey Gateway Bridge and the Energy Island (EI) of Anglesey along with others around the Irish Sea Rim.[27]

7.17 Aligning with the existing strength of the city region within Offshore Wind there is an opportunity for GM to play a role, particularly within an innovation context in the delivery of the UK's largest development pipeline of new windfarms in the world up to 2020.[28] Not only will this build on existing R&D expertise aligned to GM's assets, but it also presents new 'delivery activity' opportunities e.g. in the construction, operation and maintenance of the new windfarms as well as jobs across the supply chain, including materials, engineering, construction, cabling and electrical management systems.

7.18 Within Nuclear, the investment programme at Sellafield, West Cumbria to decommission the existing nuclear reactors, and re-commission a new nuclear power plant has the potential to create significant opportunities for the innovation activities within nuclear

[26] DEFRA (2015): Resource management: a catalyst for growth and productivity'
[27] Irish Sea Energy Rim: http://www.irishsearim.org
[28] HM Government (2013): Offshore Wind Industrial Strategy

particularly focused around the research asset of the Dalton Institute. There are further opportunities within nuclear firms to tap into the new build market worth an estimated £930bn globally.

7.19 GM and the wider North West is home to major international companies, which provide the platform to realise the nuclear opportunity including: Sellafield Limited, Capenhurst Nuclear Services (Cheshire), Cavendish Nuclear Ltd (Cheshire and Warrington), URENCO Ltd (Chester), NIS Ltd (Chorley), Hargreaves Ductwork Ltd, M+W Group (Bury), Jacobs Ltd, Morgan Sindall, THALES UK (Cheadle), AECOM (regional), Balfour Beatty Engineering Services Ltd (regional), MWH Treatment Ltd (Heywood), ARUP (regional), Westlakes Engineering Ltd (Manchester and regional), International Nuclear Services Ltd (Warrington), GE Hitachi Nuclear Services (Lancashire).[29] More broadly there is a greater need to build on the strength of the region's R&D assets particularly focused around the research expertise that exists in the city region's universities.

7.20 In terms of industrial and domestic product opportunities, the global demand for lighting fixtures, specifically LED products, is predicted to grow 20% year-on-year through to 2025. Currently, the UK supply chain supports 1,700 companies across a diverse lighting sector and is worth £2.3bn to the economy. The UK is home to more than 140 lighting design practices that specify lighting for mainly overseas projects and these present a unique opportunity for lighting manufacturers to access global markets. The cost of energy-efficient lighting is falling and will continue to do so for years to come, presenting a significant opportunity for UK and GM based firms to meet rising demand. Example firms in GM involved in lighting include Bri-Tek Technologies (Bolton), Waveguide Lighting Ltd (Atherton Wigan), Tagra LED Lighting Systems (Manchester), Lumenal (Middleton, Rochdale), and Display Lighting Ltd (Manchester).

7.21 **Public Sector Procurement:** Local Authorities purchase substantial goods and services, and their procurement decisions can therefore substantially create and expand local LCEGS markets. Under the principles of the Social Value (Public Services) Act, local authorities in GM are using their procurement strategies, tender documentation and contract management processes to stimulate growth in environmental management, local supply chains, as well as the creation of apprenticeships.[30]

7.22 **Population Growth:** GM is anticipating significant growth in population over the next two decades. Option 2 of the Greater Manchester Spatial Framework Winter 2015/16 consultation, which is based on a housing needs assessment, estimates that an additional 220,000 homes will be needed to accommodate this growth, which will result in increased demand for skilled labour to deliver a step-change in house building.

7.23 Housing growth offers opportunities for the construction sector and consultancies within the LCEGS sector to design and develop innovative solutions for delivering low carbon homes effectively, alongside retrofitting existing buildings in the public, commercial and

[29] For more companies in the UK Nuclear supply chain, see: http://www.niauk.org.uk/nia-industry-maps

[30] GMCA has an agreed Social Value Procurement framework in place to cover the ten Local Authorities

domestic sectors. Not only will it support GM in meeting its housing need, but also in contributing to GM's commitment to carbon reduction.

7.24 Strong population growth within the city region is also likely to place increasing pressure on waste and waste water facilities and new housing developments will require adequate waste facilities as well as new energy distribution infrastructure creating opportunities for firms within Waste Water Management and Facilities, and Energy Distribution.

Threats

Threat	Activity
High dependency on policy and fiscal interventions	• Market price for technologies higher than 'high carbon' alternatives over the last decade but advances in key enabling technologies has led to falling prices and potential for market parity in the next decade.
Energy capacity constraints	• A national issue across the Energy sector. Ofgem reports that the outlook in terms of grid capacity for the next three winters is' uncertain'.
Investment costs	• Costs of technology in Renewable Energy are set to be uncertain, and high levels of investment will be needed to meet Government targets. • Energy systems (low carbon or otherwise) will need significant investment as existing generation capacity come to the end of its life-cycle
Translating research into commercial products	• UK performs poorly in terms of R&D spend and investment in equipment compared to their international peers, although it must be noted that this threat is not equal across all sub-sectors.
Company scale and Micro-size firms' role in supply chains	• The average Manufacturing business in GM now has 18 employees - companies which are small may be more entrepreneurial, however they are not always able to be strategic players in supply chains and make large-scale investment in R&D.
Building a skilled workforce and perception of manufacturing careers	• Engineering skills board SEMTA states that based on current/short-term forecast demand there is a shortfall of 80,000 workers over next 2 years. • More needs to be done in developing Science, Technology, Engineering, Arts, and Mathematics (STEAM) skills.

7.25 **High dependency on policy and fiscal interventions:** One of the key challenges the LCEGS sector faces is that the market price for its products are higher than "high carbon" incumbent technologies, which are under-priced by a market which does not take into the cost of environmental degradation, pollution, and impacts on health. As such the LCEGS market needs clear investment grade policy[31] if it is to attract the investment (skills and finance) it needs.

7.26 It is important to note though that, in addition to GM's low carbon ambition, the UK will need to invest in new energy infrastructure to replace existing assets and increasing demand and therefore the choice is not if we invest but how we invest. This is an important difference and supports the sector as it is about marginal cost and benefit (cost, carbon and security of supply).[32]

7.27 While it is possible to have a strong LCEGS sector which does not have a local market for its goods and services, it is more likely to grow and export from a strong and stable local base. As such local action which creates a local market will strengthen the sector

[31] IIGCC (2011): Investment-Grade Climate Change Policy: Financing the Transition to a Low-Carbon Economy

[32] https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/305860/DECC_Energy_investment_report_Web_Final.pdf

and make GM look more attractive to inward investors. The broad based nature of GM's LCEGS sector means that it is not overly vulnerable to the success of a single sub sector, and its manufacturing strengths mean that it is well placed to diversify as the market evolves.

7.28 **Energy capacity constraints:** Energy capacity constraints are an issue across the Energy sector nationally. Ofgem reports that the outlook in terms of grid capacity for the next three winters is uncertain, however there is a chance for the market to respond positively to the challenge.[33] Increases in energy storage can help with any possible shortages by storing excess energy for times of high need but investment is required for this.[34] Current barriers to investment in energy storage include the significant upfront cost required and regulatory challenges.[35]

7.29 **Investment costs:** Investment costs in the renewables sector are set to increase by 2020. According to research by PwC, £42bn will be needed to meet 2020 targets for renewable electricity generation, and £5.9bn to meet heat requirements across the UK.[36] Technology costs are the most uncertain variable in terms of investment costs, but encouragingly costs are decreasing in certain sectors, such as photovoltaic.

7.30 **Translating research into commercial products:** From the perspective of the manufacturing element of LCEGS, the UK Manufacturing Foresight Report[37] identified that the UK is performing poorly compared to its international competitors in terms of R&D expenditure. Investment in equipment is also low. GM has a significant wealth of assets to facilitate the development of products using Advanced Materials.

7.31 Ensuring that the innovations are translated into Advanced Manufacturing companies and that these companies are retained within GM is a major challenge. National policy has gone on to set out a number of strategies and initiatives to help revitalise Manufacturing and help to drive employment in the sector. This includes the development of Catapults and 'Collaborative Manufacturing Centres.' Research suggests that the most successful Manufacturing research takes place at collaborative centres, with the most prominent example of international good practice provided by the German Fraunhofer Institutes.

7.32 **Building a skilled workforce and perception of LCEGS:** SEMTA has warned that the UK faces a shortfall of 80,000 Manufacturing workers over the next two years and in GM in particular Oxford Economics forecasts have identified significant replacement demand within the GM manufacturing sector equating to just over 10,000 jobs per annum up to 2035.

[33] Ofgem (2015): Electricity Security of Supply - Commentary on National Grid's Future Energy Scenarios Report
[34] Houses of Parliament Parliamentary Office of Science and Technology (2015): Energy Storage Note
[35] Ibid.
[36] PwC (2015): State of the renewable industry Investment in renewable electricity, heat and transport
[37] Foresight (2013): The Future of Manufacturing: A new era of opportunity and challenge for the UK

8 Spatial Considerations

8.1 Given the breadth of sectors which Low Carbon and Environmental Goods and Services cuts across, there are business and employment opportunities in a range of manufacturing and service sector occupations. While there are key clusters of firms in both Manchester and Stockport, employment is fairly evenly distributed across the remaining districts, and employment growth is likely to continue to follow this pattern in future. There is an opportunity to capitalise on new developments including the Western Gateway encompassing Port Salford which has land assets and developer interest that can generate significant growth in the Energy sector, alongside manufacturing, construction and logistics sectors.

8.2 Driven by population growth, there is likely to be demand for a limited number of new environmental facilities to serve local need. Locations right across GM which are well connected to transport infrastructure and can provide space for large processing plants at an affordable cost to the market will remain attractive to developers. For professional and technical consultancy companies, strong locations, such as the regional centre, will continue to be attractive for employment growth. In the case of low carbon Advanced Manufacturing firms, the growth locations will align with those of the manufacturing sector (see Manufacturing deep dive), as the locational requirements are the same.

9 Technical Annex

Greater Manchester LEP LCEGS Report May 2013, kMatrix Ltd and Gyron LLP

The analysis presented in this report focusses on key measures, these are:

- **Sales** is an estimate (in £m) of economic activity by identified companies in a defined region with the supply/ value chain for market products and services. The kMatrix estimate is based upon where sales activity takes place rather than where it is reported.
- **Companies** is a measure of the total number of companies in a defined region that match (or fit within) the market activity headings.
- **Employment** is a measure of the estimated employment numbers across all aspects of the supply/ value chain. National, regional and other economic data sources have been used to estimate current employment levels for each market activity.
- **Sales Growth** is a multi-year measure that includes historical *and* forecast growth. The growth measure is derived from live, rapidly changing and multi-sourced data links and is specifically based upon growth in Sales. Growth is generally a measure of increased market opportunity and can be used for trend analysis, comparison across different markets or as a moving indicator of market confidence (growth time series).
- **Exports** is a measure of products and services sold overseas from a defined region and is calculated using in-country/ out-of-country data and additional data from the logistics and freight forwarding industry.