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Energy Planning at the Community Level in England

An Emerging Agenda

Any lingering doubts that climate change is a reality have been systematically discredited over the past few years, the apparent cooling of the lower troposphere being once example. This leaves us with the stark reality of needing to make swift and dramatic cuts in carbon dioxide (CO_2) and other greenhouse gas emissions globally. The world climate talks in Copenhagen in December 2009 will be a critical determinant of whether we have any hope of achieving such reductions.

Each year now tends to be another record breaker. In 2009 greenhouse gas emissions are likely to be the highest ever and their growth shows no sign of slowing, despite the economic downturn. This is also likely to be a year where the effects are felt more than ever before. The recently published UK Climate Projections (UKCP09) are the most sophisticated and robust yet produced anywhere in the world. They offer, therefore, the best available guide to understanding risks and taking effective action in the UK. The projections reiterate the sort of impacts we can expect: warmer, wetter winters; hotter, dryer summers; and a great deal more uncertainty and extreme weather. The extensive wet weather and floods experienced in the UK in 2008, for example, were mirrored by droughts and extreme temperatures in other parts of Europe and the world.

In the UK the Government has been slowly waking up to the scale of the challenge and the responses needed. It has expressed this in the form of three drivers: climate change; the need for low carbon secure energy; and concerns about fuel poverty. The responses at national level have been set out in a range of strategies and Acts of parliament, brought together in the Government's July *UK Low Carbon Transition Plan.* They include:

- A legally binding commitment to reducing CO_2 emissions by 80% against 1990 levels by 2050, delivered through the Climate Change Act, 2008, with an interim target of 34% by 2020.
- A binding commitment to generating 15% of the UK's *total* energy from renewables by 2020. This covers not only electricity but energy used for heat and transport also. The government believes that this will see the share of renewable electricity rising to over 30% from a current base of just 5% (Figure 1).

Building regulations in England to require zero carbon new homes by 2016 and zero carbon non-domestic buildings by 2019. Interim targets are expected to require a 25% reduction on 2006 dwelling emission rates in the 2010 revision to the regulations and a 44% reduction by 2013. These targets are guided by the emission rates in the energy element of the national voluntary Code for Sustainable Homes.

This is arguably the most challenging 'to do' list imaginable and requires action to be taken by Government, industry, communities and the organisations that represent them, including local authorities, and of course individuals. It is at the local level that some of the biggest and most exciting opportunities present themselves.

Planning for Energy

Many of the necessary responses to the cli-

mate change and energy challenges require a spatial approach. The UK is fortunate to have a well established spatial planning system that provides us with a framework for guiding the activities of key delivery bodies from the national down to local levels. The difficulty comes with ensuring that it is fit for purpose, since until recently planners have had little to do with energy and little need to understand the complexities of the subject.

This has now changed dramatically. In December 2007 the Government published PPS1: Planning and Climate Change[1] (PPS1 Supplement), applicable to England. This requires planners to identify decentralised renewable and low carbon energy opportunities across regions and local authority areas and to design policies and targets to deliver these.

AECOM worked with the Department of Communities and Local Government (CLG) to develop the energy methodology for accompanying Practice Guide that is now used by planners to prepare regional and local policies and targets. We have subsequently worked with planners and master planners across England to develop energy opportunities plans, policies, targets and strategies. In this paper we explore what we have learned.

Figure 2 describes three types of energy opportunity of interest to planners setting policies and targets and their deliver partners.

- The first, stand alone generation, includes wind turbines or biomass power stations. Planning has a key role to play here in identifying opportunities spatially and developing policies, criteria and targets to support their delivery. Typically, delivery will be via proposals from specialist energy developers or community owned co-operatives.
- The second type of energy opportunity refers to what the PPS1 Supplement calls decentralised energy, such as district heating and combined heat and power (CHP). Essentially we are talking not just about renewable and low carbon generation, but also infrastructure. Planning again has a key role in identifying appropriate locations. For example, planning policies could require new developments to connect to existing district heating networks or to contribute (financially or physically) to expansion of a network.
- The third energy opportunity relates to on-site renewable and low carbon energy generation. In England these have become known as the 'Merton Rule' after the London Borough that pioneered them. However, the proposed changes to the building regulations described earlier means that planning will have only a limited role in terms of the building or development integrated generation element. This role will diminish over time as the requirement for CO_2 reduction through the regulations increases. Planning should seek to support developers in meeting their regulatory obligations by using viability assessments to test whether or not there is any opportunity to set energy performance standards ahead of building regulations through planning. The remaining role for planning at the building scale post 2016 (when all new homes will need to be zero carbon) and 2019 for buildings would be to require developments, subject to tests of viability, to achieve elements of the Code not included as part of the building regulations, such as ecology or adaptation to climate change.

Evidence Based Planning

Understanding what types of policies are appropriate for a particular local authority area or site and what targets are technically feasible or financially viable requires us to develop a robust evidence base. Government dictates that planning policy in England be evidence based and AECOM has gained valuable experience of what this entails.

There are a number of broad elements to an evidence base:

Setting the baseline

We need to start by developing an under-

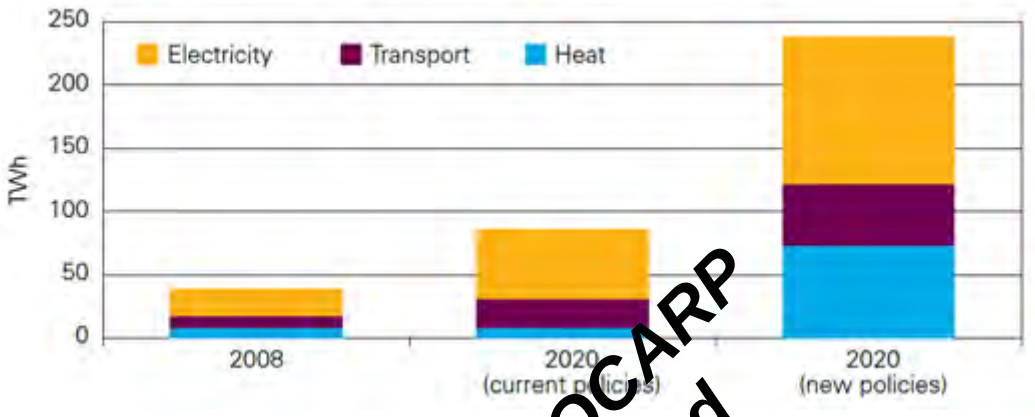
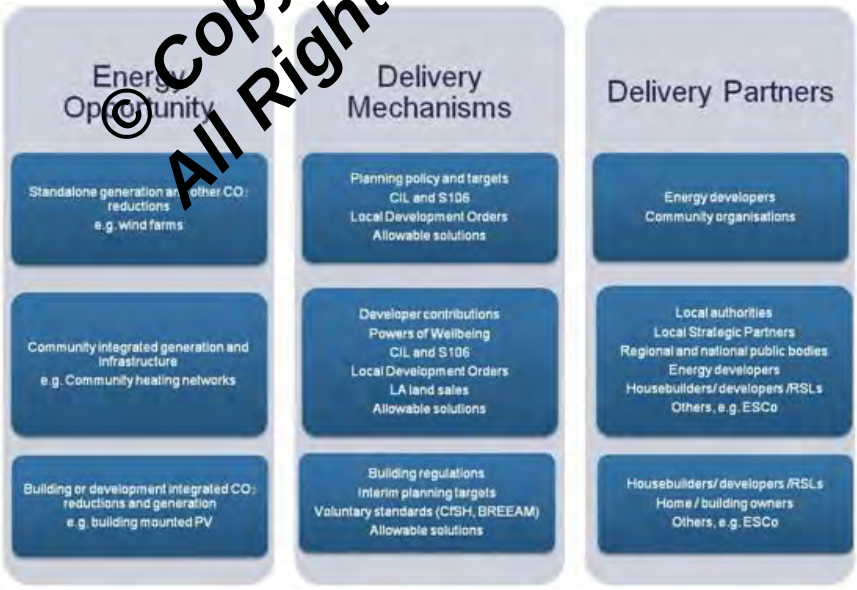


Figure 1 | potential scenario for reaching 15% renewable energy by 2020

Figure 2 | types of energy opportunity



standing of the energy use and corresponding CO_2 emissions of existing buildings and proposed future development within a given area:

- Using publicly available national data we can produce a dataset of existing development and corresponding energy demands and CO_2 emissions. Data sets include the English House Condition Survey, the Building Research Establishment Domestic Energy Factfile, Home Energy Conservation Act (HECA) reports and data from local initiatives. This allows us to understand any progress that has been made towards reducing energy demand and likely efficiency trends. At this stage we should identify existing energy generation facilities and infrastructure, such as power stations, gas and electricity networks, district heating, wastewater and municipal waste treatment plants and major industrial users or producers of heat.
- Future energy demands from proposed residential and non-residential development can also be predicted. This is based on dwelling numbers and floor areas taken from growth scenarios – PPS3 requires local authorities to assess strategic housing land availability. When making predictions for future energy use and CO_2 emissions it is important that we consider national and regional reduction targets alongside the potential effects of climate change, particularly the impact of increasing temperatures on energy demands for cooling.
- Energy demand and likely CO_2 reductions can then be mapped using GIS to reveal existing and future areas of high heat and power demand. This will allow us to identify opportunities for supplying renewable and low carbon energy to new sites, for example by linking them to heat networks which serve existing buildings with high year-round heat demands that act as "anchor loads".

Opportunities for reducing energy demand

We then need to identify a local strategy for CO_2 reduction which considers the potential for increased energy efficiency in the existing stock as well as in new development. We will need to explore the extent to which energy demands could be reduced through design, for example, through orientation, passive façade design, improvements in wall, floor, roof and glazing fabric performance and more efficient heating systems and fuel types. At the same time, we can look to identify opportunities for adaptation to the impacts of climate change, particularly looking at measures with mutual benefits such as shading or planting to reduce the urban heat island effect or passive cooling strategies such as night time ventilation which will act to reduce future energy demands for mechanical cooling (figure 3).

Potential for decentralised renewable and low carbon energy generation

Once we have an understanding of baseline energy demands for existing and proposed new development, we can look at scenarios for generating renewable and low carbon energy. This entails assessing energy resources, taking into account the constraints and opportunities presented by the local environment, development characteristics and infrastructure. The principal options (figures 4 and 5) are likely to be:

- District heating and combined heat and power (CHP) in locations identified using a heat map as having sufficient heat density (above 3MW per km2 is considered necessary in viability terms).
- Biomass heating.
- Energy from waste.
- Wind power.
- Hydro power.
- Emerging technologies, such as fuel cells.
- Small scale, decentralised and renewable or low carbon technologies. These could be photovoltaic cells, solar thermal, small scale wind, and heat pumps (air and ground sourced).

Character areas and energy opportunities plans

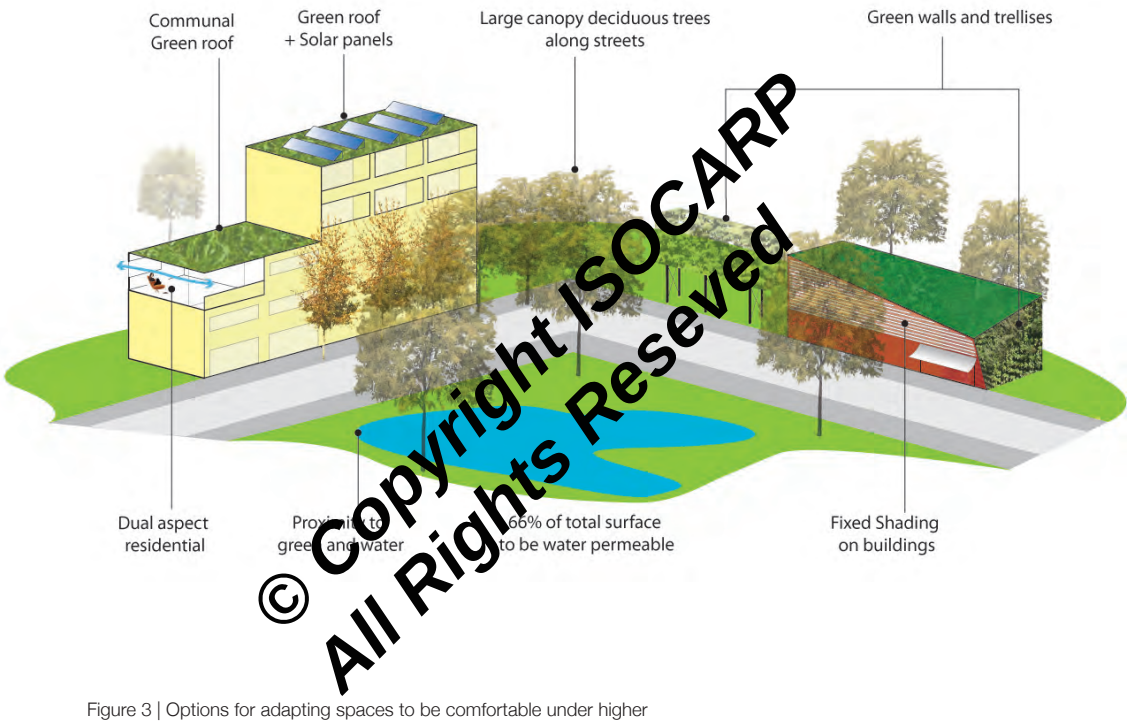


Figure 3 | Options for adapting spaces to be comfortable under higher temperatures scenarios also help to reduce energy demand.

A further question is how best to co-ordinate the evidence so as to develop meaningful conclusions that fully reflect the range of opportunities which exist at different spatial scales and locations. Two approaches can be helpful and can work well in combination:

- Energy opportunities can be mapped using GIS and together with the understanding of energy demands and CO_2 emissions this forms an 'energy opportunities plan' (figure 6). The plan can be used as a visual guide to advise on policy making, target setting and delivery strategies.
- The approach developed in Community Energy: Urban Planning for a Low Carbon Future uses a series of 'character areas' based on distinctive locational characteristics including land use mix, density, age of stock and tenure. For larger studies (regions, sub-regions or local authorities particularly) character areas can support an energy opportunities plan by helping to define the likely technology mix. For example, a mixed use town centre will have different opportunities to those in a large residential suburb or rural village. Policy approaches and targets can be tailored to each if necessary.

Information on design issues, cost, viability and deliverability and potential land take can be undertaken for each technology. An assessment of the potential contribution from renewable and low carbon technologies should also take into account current and projected assumptions relating to future grid CO_2 intensity (i.e. the average carbon content of grid supplied energy), which will influence the potential for total CO_2 savings as well as renewable resource availability. The long term availability of fuel and air quality concerns relating to the use of biomass is a particularly important consideration for these studies.

Assessing feasibility and viability

In developing policies and setting targets it is important to understand the impact on and of the technical feasibility and financial viability of achieving targets for a range of development types. In other words, do the constraints of a site make it physically impossible to meet the proposed targets and what will the affect of the target be on the site's financial viability? Indicative energy strategies for different development types can be a helpful way of assessing this. These should be based on likely dwelling numbers and floor areas and assumptions about other proposed development characteristics, such as massing and street layouts.

Assessing technical feasibility of a range of energy efficiency, generation, and energy supply measures involves identifying site-specific opportunities. A constrained site is unlikely to be able to deliver very high energy standards within the development itself. Therefore, there may be potential to link up with energy infrastructure proposed as part of other major regeneration projects in neighbouring areas. The UK Green Building Council suggests that meeting the proposed building regulations zero carbon requirement in 2016 through on-site measures alone will not be possible on up to 80% of developments. This has led to the Government's new proposed definition of zero carbon whereby only a 70% reduction in CO_2 emissions regulated by building regulations needs to be achieved on-site. The remaining 30% along with the unregulated emissions (from appliances and some cooking) can be achieved through 'allowable solutions'. Allowable solutions are likely to include, amongst other things, connection to a district heating or CHP system: local planning is ideally placed to identify these.

The financial viability of development is sensitive to a number of variables, including land value, construction costs, market conditions, affordable housing provision and other planning obligations. Modelling the marginal cost implications of achieving energy or CO_2 reduction targets (cost per m^2) on a district-wide basis (including community infrastructure) and for the outline energy strategies enables us to compare the viability of options.

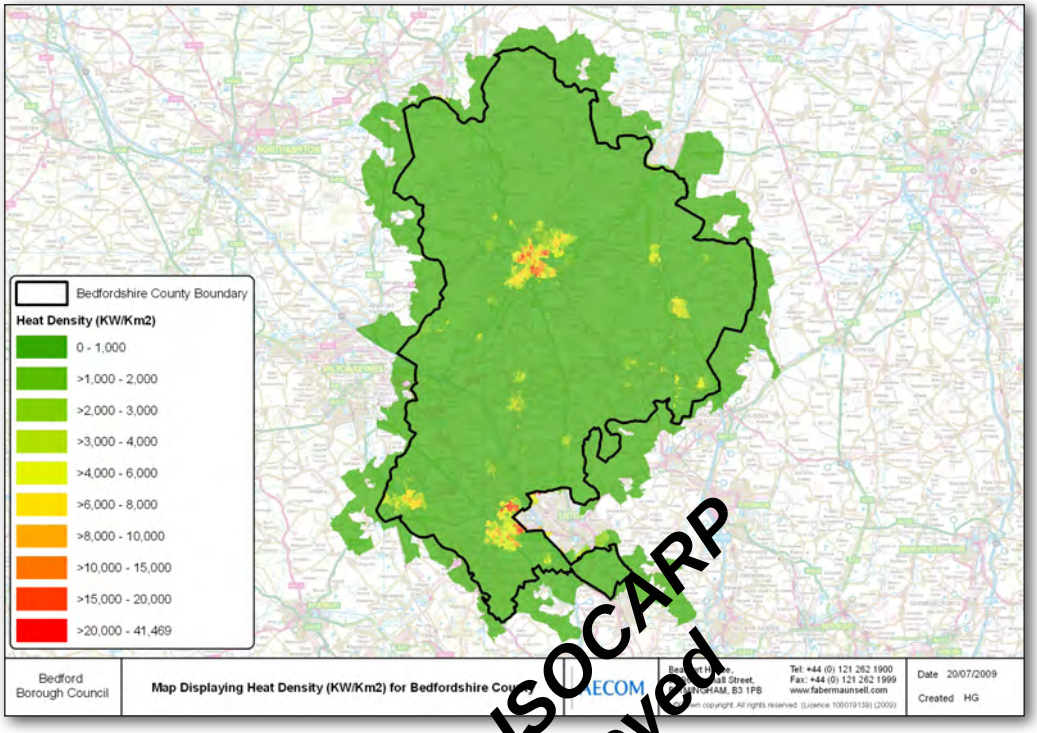


Figure 4 | Heat density map for Bedfordshire

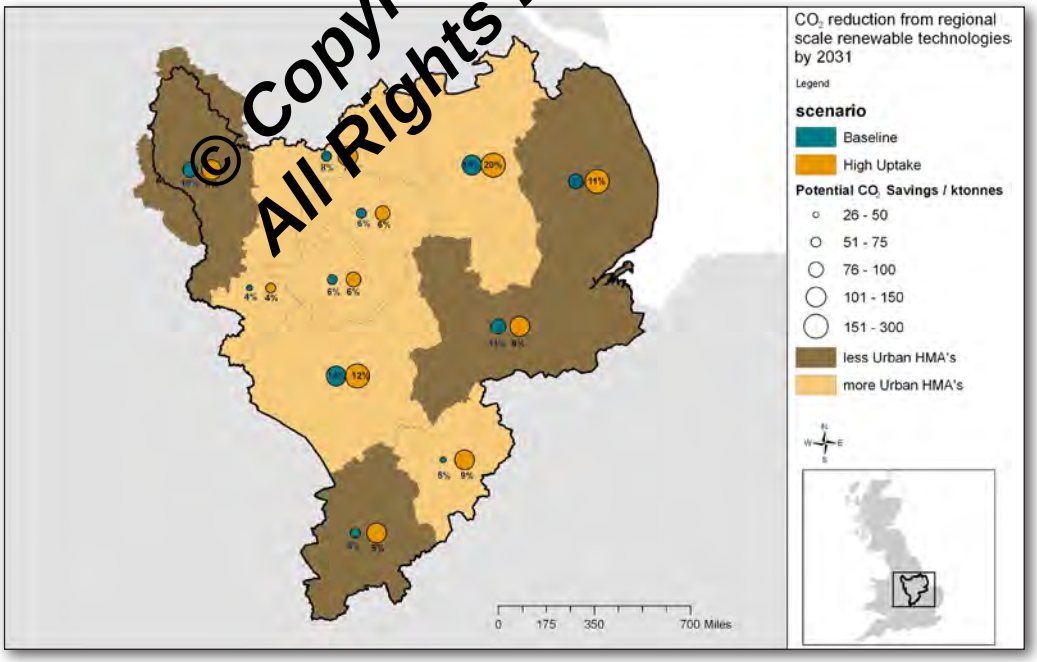


Figure 5 | Mapped CO_2 reductions from regional scale renewable energy technologies for the East Midlands region.

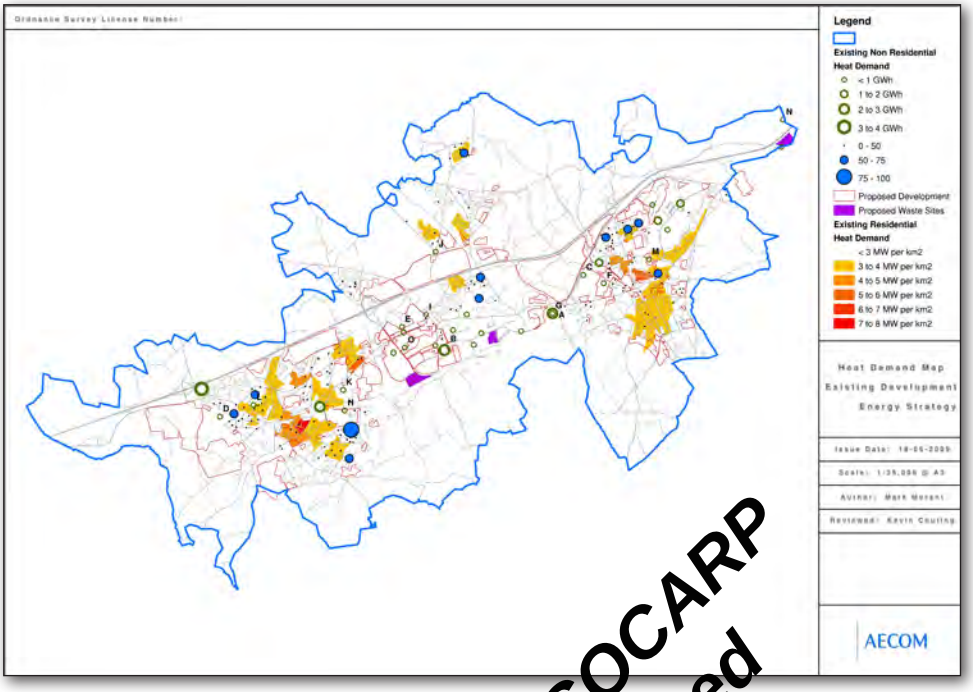


Figure 6 | an 'energy opportunities plan' maps development sites against energy opportunities and can form the basis of energy policies, targets and delivery plans

It is important that policies and targets are flexible enough to accommodate differences in viability across a given area. We might want to allow targets for some sites to be relaxed or increased where justified on feasibility or viability grounds.

Delivering the Vision

What is clear is that planning cannot deliver the energy generation and infrastructure capacity alone. Planning operates within a wider system, which at the local level involves politicians, Local Strategic Partnerships (LSP) and other local authority departments. A good and co-ordinated relationship between these parties is key to effective delivery.

The two central documents for co-ordinating delivery of renewable and low carbon energy projects at the local level are the Sustainable Community Strategy, prepared by the LSP and supplemented by a specific energy strategy if need be, and Local Development Frameworks (LDF) prepared by partners. The strategies should not be prepared in isolation and ideally planners should be seconded to the LSP during the Sustainable Community Strategy preparation process and vice versa to ensure compatibility. Both need to set out a clear delivery plan for policies and targets.

The use of character areas and an energy opportunities plan can help us to define suitable delivery mechanisms across LDF Development Plan Documents and the Sustainable Community Strategy. A town centre district heating scheme, for example, could well be funded, delivered and managed by a public private partnership energy service company (ESCo) supported by financial contributions from developers. Energy efficiency improvements or microgeneration technologies in a suburban district on the other hand might be better funded through local authority loans or grants to householders. The Salix fund can be accessed by local authorities to provide a revolving fund for such purposes. Further opportunities

are discussed in the Government's recently launched Heat and Energy Saving Strategy consultation.

Key to delivering effective area-based renewable and low carbon energy strategies is successfully drawing on the opportunities presented by the Comprehensive Area Assessment (CAA) process. CAA provide a snapshot of how effectively local partnerships are working together to deliver local priorities and improve quality of life. This is in recognition of the fact that no single organisation can be responsible for meeting local needs. The framework analyses performance against up to 35 targets chosen from the National Indicator Set and agreed as part of a Local Area Agreement (LAA) between central and local government. The LAA acts as a short term delivery mechanism for the Sustainable Community Strategy. Currently there is no specific National Indicator for renewable energy, although the recent Renewable Energy Strategy[3] proposes to introduce one shortly. Until this time, several can currently be used to deliver energy projects:

- NI 185 – Percentage CO_2 reduction from local authority operations.
- NI 186 – Per capita CO_2 emissions in the local authority area – Some two thirds of local authorities have adopted this indicator.
- NI 187 – Tackling fuel poverty – percentage of people receiving income based benefits living in homes with a low and high energy efficiency rating.
- NI 188 – Planning to adapt to climate change.

The local authority is the statutory body responsible for the LAA which is overseen by the LSP. A multi-area agreement is effectively a cross-boundary LAA, which can be set up to address issues such as energy, which cross administrational boundaries and may be better addressed in partnership, at a regional and sub-regional scale.

But local authorities have a wide range of other powers and tools that they can draw on. These include:

- The Community Infrastructure Levy (CIL) – CIL is expected to be introduced in 2010 and will empower local authorities in England and Wales to levy a charge on new development. It will be a useful tool for pooling developer contributions to fund community energy infrastructure. This could be supported by a Regional Infrastructure Fund, such as that set up by the RDA in the South West, to enable forward funding of infrastructure. Money could be recouped through the CIL or Section 106 once development comes forward.
- Local Development Orders (LDO) – LDOs remove the need for a planning application to be made for a specific technology or site. Interestingly, they could be used to designate areas where particular opportunities have been identified for energy technologies or infrastructure or to promote green industries in particular locations. A pilot LDO has recently been designated for the Barking district heating network in East London.
- Powers of Wellbeing, introduced by the Local Government Act 2000 – allow public sector participation in special purpose vehicles. The powers could be used by local authorities to establish public private partnership ESCo to deliver renewable and low carbon energy services and co-ordinate investment and property investment. Despite their potential, Wellbeing powers have not yet be extensively used.
- Local authorities can agree lower land receipts from developers in return for improved energy standards. The local authority in Wolverhampton used this right to require energy performance standards in the Showell Park development.
- Procurement decisions. Local authorities have significant influence through their own spending.
- Local authority initiatives such as affordable warmth programmes and those aimed at influencing behaviour.
- Corporate strategies for development and investment by local strategic partners, including in health and education.

Figure 7 | Ancoats Mills, Manchester (source: Manchester Public Library)

Can Local Government Rise to the Challenge?

There is no doubt that planning and delivering renewable and low carbon energy presents a huge challenge to us all. The discussion above makes it clear that local authorities are or will be at the front line of co-ordinating this delivery and many people question whether they have the capacity to do so. However, history tells a different story. As part of a study carried out for the ten Greater Manchester Authorities, AECOM and URBED looked into the development of Manchester's first gas and electricity networks. The study tells us that local authorities have been here before and have proved themselves more than capable.

The world's first gas networks were developed by mill operators at the turn of the 19th century to supply the cotton mills with gas for lighting from the new gas factories. The small networks expanded as private undertakings, supplying the emerging market in Greater Manchester's expanding town centres for street, retail and office lighting, but, seeing an opportunity to expand supply and to make money, Manchester City Council established a precedent as first area to set up its own municipal gas company. Manchester established a precedent as the first area to establish its own municipal gas company. Upon being granted its Charter it invested to expand the network by buying up the private gas undertakings from industrialists so that they too could generate revenue to fund public works.

Figure 7

As the 19th century progressed, electricity became more widespread. Early Acts of Parliament created the necessary licensing regime and a range of private enterprise began supplying buildings and factories. Buoyed by its success with gas networks, the local authorities again took an interest. The 1882 Electricity Lighting Act enabled them to establish their own undertakings, in-

Figure 8 - Laying pipes in Manchester

cluding the right to break open highways. Partly again to ensure that the growth in electricity supported the huge population growth that Manchester was experiencing but also out of self interest, authorities were even known to oppose private sector network applications.

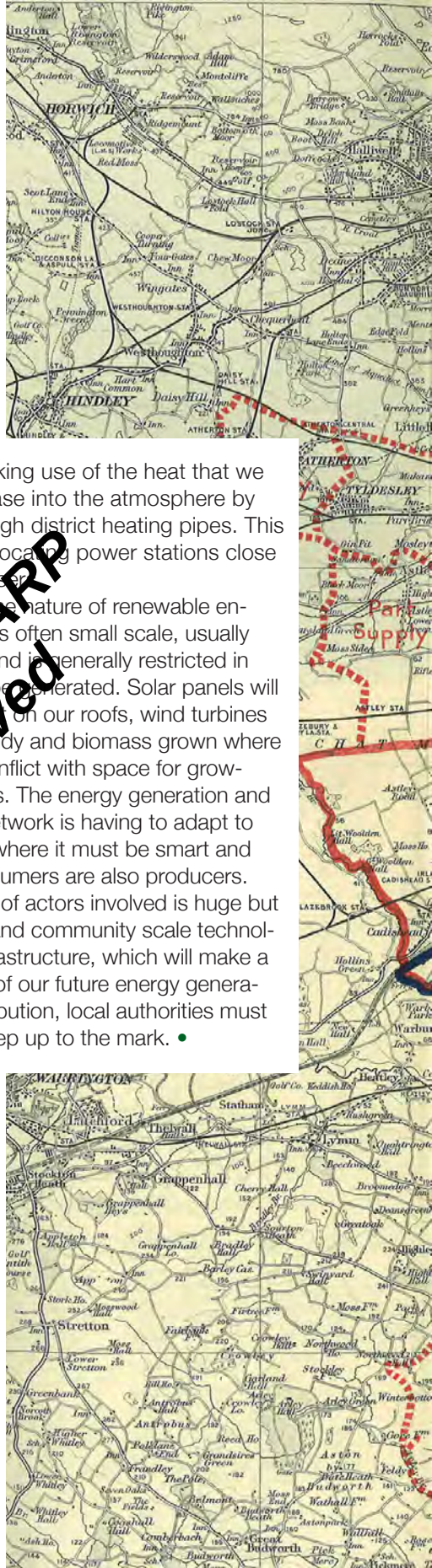
1880 to 1890 saw massive growth in scale and capacity, based on state-of-the-art technology. Bloom Street became the world's first CHP plant. The public and private undertakings that invested in infrastructure were critical to Manchester's growth. Figure 8

Manchester saw further exponential growth between 1900 and 1920, driven by expansion of the electric tram network, demand for new electrical supply and the conversion of mills to electricity. Supply therefore became a critical issue with many plant running flat out. Around this time longer distance transmission was becoming possible which enabled a regional grid to develop between larger power stations, such as Barton, Chadderton and Agecroft. Figure 9

In today's world of very large centralised power stations we would call these decentralised networks. With the current drivers of climate change and the need for low carbon secure energy we are coming full circle. We will no longer be able to rely on centralised fossil fuelled power generation. As fossil fuel use becomes more constrained we will have to burn it more efficiently by making use of the heat that we currently release into the atmosphere by piping it through district heating pipes. This necessitates locating power stations close to their end users.

Similarly, the nature of renewable energy is that it is often small scale, usually intermittent and is generally restricted in where it can be generated. Solar panels will need to be put on our roofs, wind turbines where it is windy and biomass grown where it does not conflict with space for growing food crops. The energy generation and distribution network is having to adapt to a new reality where it must be smart and whereby consumers are also producers.

The range of actors involved is huge but for the small and community scale technologies and infrastructure, which will make a up large part of our future energy generation and distribution, local authorities must once again step up to the mark. •



1 Communities and Local Government (2007) 'Planning Policy Statement: Planning and Climate Change: Supplement to Planning Policy Statement 1'. TSO: London.

2 TCPA and CHPA (2008) 'Community Energy: Urban Planning for a Low Carbon Future'. TCPA and CHPA: London

3 HM Government (2009) 'The UK Renewable Energy Strategy'. The Stationary Office: Norwich.

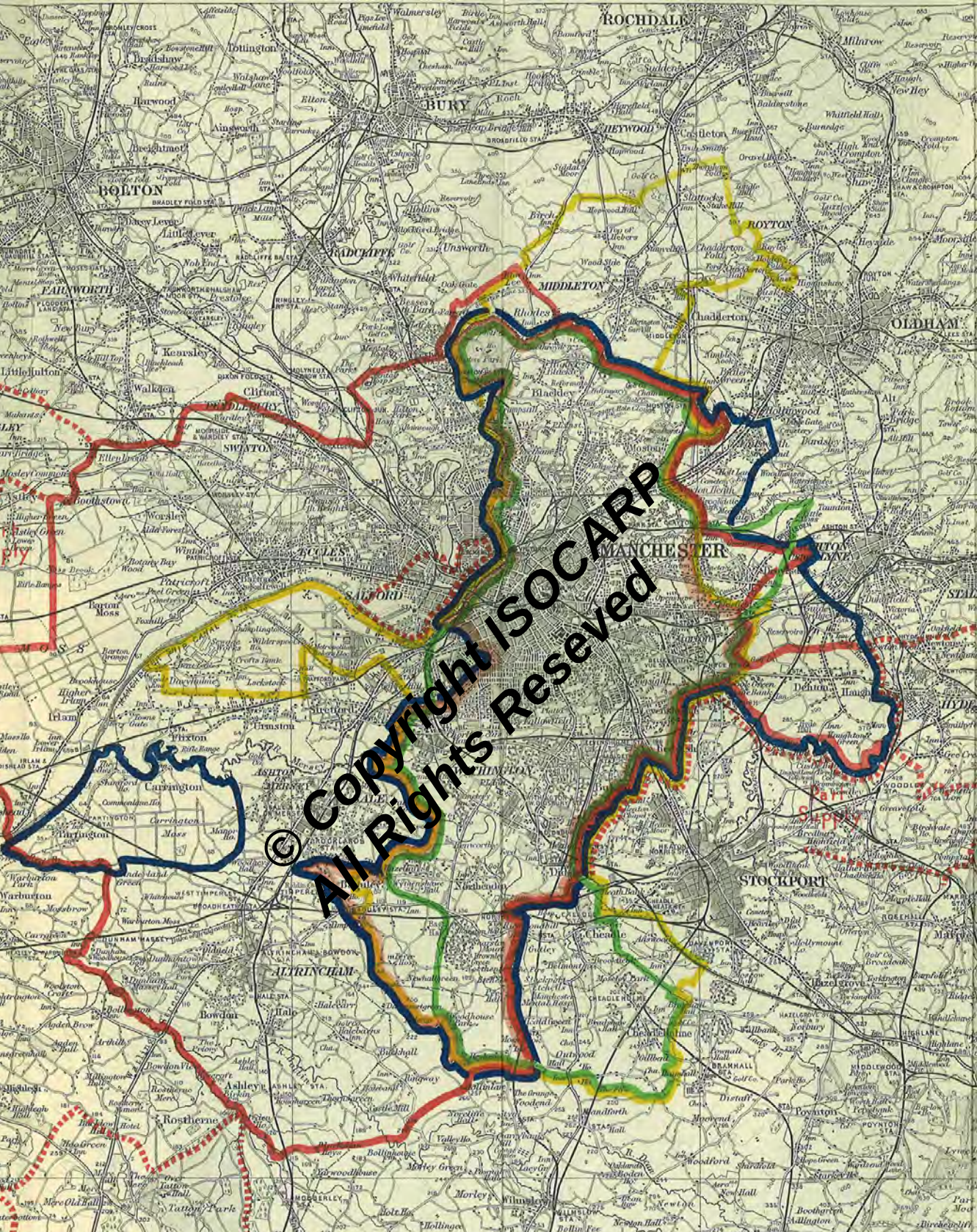


Figure 9 – the early 20th century saw the first regional energy networks emerging across Manchester.