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RTPI RESEARCH PAPER APPENDIX

2019

# PLANNING FOR A SMART ENERGY FUTURE

## Appendix C: Case studies

THE Landmark PRACTICE

regen transforming energy

UWE Bristol University of the West of England

Pell Frischmann
Excellence through innovation

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# Introduction

## This appendix and its common themes

In looking at planning's potential to deliver smart, clean energy as a fundamental part of place making, the research has looked to draw ideas and learn lessons from work underway in practice. This appendix provides snapshots from lessons being learnt internationally and, in greater depth, from the new community of Cranbrook in East Devon. The examples do not all uniquely focus on smart energy but they have been included to stimulate thought and draw out wider themes – such as public-private collaboration and technological flexibility – which will be critical if planning is to contribute successfully to delivering smart energy.

A number of themes are common to the examples, including a plan-led approach that is ambitious in delivery. All feature a commitment by local or national government to integrate smart technology with spatial planning in response to environmental, place making and economic development goals.

## CDP Cities

The research team is very grateful to the CDP Cities Team for its help in identifying and informing these international examples, and for providing access to the data disclosed by public authorities and companies to CDP which underpinned them.[1,2]

The CDP Open Data Portal is a live site and further details of activities relevant to this research, including policies, approaches, use of planning tools and details of implementation of smart energy systems are added regularly. Contextual information on the statutory and planning context of the selected case studies was sourced from relevant adopted statutory strategic plans and their evidence base, or equivalent, where available online.

# Heidelberg, Germany

## Background

Heidelberg, a municipality and university town in Baden-Württemberg in southwest Germany, is administered as a unitary authority within the densely populated Rhine-Neckar Metropolitan Region. The city is expanding in response to heavy demand for new residential and service capacity, with significant development of major sites, including land vacated by the departure of the US armed forces, and brownfield land at a former freight yard at Bahnstadt.[3] The development at Barhnstadt remains one of the largest passive house estates in the world.[4,5]

Heidelberg City Council adopted a Climate Protection and Energy Concept, prepared by Heidelberg's energy and environmental institute (IFEU), in 1992, and has since pioneered 'city-citizen collaboration' throughout the energy transition process.[6]

## Planning context

German local governments are required to use their functions to deliver national policy objectives. Compulsory functions include supporting the energy transition through urban land use planning, sewerage disposal, waste disposal, disaster control, and school management. Locally, city authorities can also set ambitious energy management goals through their policies for road transport infrastructure and public transport, and management of city-owned energy utility and building stock. Policy measures, including setting environmental budgets for new development and giving support to local companies and authorities in establishing environmental management systems, are also used to guide other actors towards sustainable action and to discourage unsustainable practices.[7]

The current city Development Plan (2015) carries forward Heidelberg's long-term commitment to UN global sustainable development objectives and in 2016, the city committed to the UN's Sustainable Development Goals. The Development Plan includes dedicated planning policy and standards to promote smart energy use and energy saving in all new building and refurbishment of existing stock. All houses in areas which are sold by the city have to be constructed following a passive design approach, with conformity to passive standards regulated in sale contracts. Sustainable mobility is planned, together with the cities of Mannheim and Ludwigshafen, in accordance with a Green City Masterplan, which includes replacement of the municipal fleet with electric vehicles and expansion of charging infrastructure around the cities.

## Progress

The energy concept adopted by the city in 1992, and subsequently updated, was a commitment by the city administration to pursue climate protection goals within its key areas of activity. The concept identified and analysed obstacles and opportunities for raising stakeholder awareness of the path to energy transition and offered technical solutions for energy management. Subsequent progress was monitored through periodic CO2 emission reports.

Decisions by the local parliament regarding climate protection measures go well beyond national

initiatives and the city-wide approach to the energy transition process has helped to build a collaborative effort with key local players. The Climate Protection and Energy Concept has led directly to the adoption of low energy standards for new municipal buildings that are stricter than national regulations, and to low energy requirements for building plots sold by the municipality. These include setting energy standards for the construction, refurbishment and operation of municipal buildings, in terms of both the building fabric and technical equipment, and for powering the city's energy supply and its urban-development activities. Together these measures have contributed to decreasing energy demand and lower greenhouse gas emissions by the built environment, including a 50% reduction in energy use in municipal buildings.[8] Outside its own properties and estate, the municipality works with external partners to promote energy education in schools, the community and business, and with SMEs to implement environmental management systems.

## Focus on - district heating

The City of Heidelberg has a substantial district heat network, operated in close cooperation with Stadtwerke Heidelberg, a wholly-owned municipal company and the regional energy provider.

City-wide reductions in emissions have already been achieved by investments in a more renewable energy supply (both electricity and heat), and new developments and policy in the buildings sector have led to a decrease in heat demand. Significant reductions in emissions from local government operations have been achieved by investments in a clean energy supply, especially for the district heating systems, which have had a massive impact on greenhouse gas emissions.

The district heating network continues to expand, alongside the construction of combined heat and power plants and photovoltaic systems. In 2017/18 80 percent of the heat distributed by the district network was produced in an ultra-high-efficient hard-coal fired CHP plant, with 20 percent produced in a wood chip fired CHP plant.[9] The aim is to further increase the share of renewables by constructing further CHP plants, a heat storage tank, coupling a waste incineration plant to the grid and using solar thermal power.

# Uppsala, Sweden

## Background

The Municipality of Uppsala includes Sweden's fourth largest city which, as the most rapidly growing region in the country, is expected to more than double in size by 2050. With a fifth of Uppsala's city population comprising students, and a rapidly growing urban centre marked by expanding residential, research and industrial development, the city is experiencing pressure for early and significant growth.

In contrast to the UK nations' approach to spatial planning, there is no national tier of planning in Sweden. Whilst the National Board of Housing, Building and Planning (NBHBP) is an advisory agency, spatial planning is a municipal responsibility and, as a variety of agencies and authorities work separately to implement policies which means coordination can be an issue.[10]

To address the absence of a strategic planning framework, Uppsala has adopted a policy of active engagement with stakeholders, and the harnessing of local skills, knowledge and academic resources. This positive approach to partnership has become a fundamental element of strategic planning for a smart future.

## Planning context

In 2010, the city of Uppsala established the Uppsala Climate Protocol, a local network of public and private sector stakeholders which works collaboratively to deliver ambitious long-term climate goals: a fossil free Uppsala in 2030 and a climate positive Uppsala in 2050. The network has 40 members, comprising companies, public agencies, universities and associations.[11]

The Climate Protocol's organisation and structure currently includes seven working groups which oversee organisation, guidance, process management and coordination of Protocol delivery. Their functions include the selection of building materials, energy, sustainable freight transport, sustainable travel, sustainable urban development, reduction of plastics, and food. The working groups are an important driver of collaboration, inspiration and the exchange of knowledge and experience across the municipality. There is also a Coordination Group, consisting of five members, which supports the process management.

Uppsala City Council adopted its Master Plan for the Municipality in December 2016. The Masterplan was underpinned by an evidence base which demonstrated that development founded on conventional systems would be insufficient to achieve the municipality's ambitious climate change goals. The evidence showed that transformative and system-changing measures were needed to enable massive reductions in greenhouse gas emissions alongside achieving the other place making goals.

The Master Plan period was set to extend beyond the year 2050 in order to accommodate future high population growth and investments, and to allow time for system and technological changes and new ways of thinking and acting, notably about energy and transport use. A key objective of the masterplan was to achieve a major reduction in climate emissions from transport.[12]

**‘In the long term, we must be prepared for changing conditions in the world around us, such as rapid technological development and a change in the division of responsibilities. The master plan addresses this uncertainty by providing a framework for physical development – a costume that the municipality can grow in.’**

Focusing on four key policy areas - buildings, transport infrastructure, green structures and technical systems - the Master Plan considers scenarios for how the municipality might grow in the future, and gives guidelines for adding value to development. Guidelines cover key measures for incorporation of smart energy in development. These include using location and design of buildings to minimise need for transport; specifying use of low energy heating/cooling and lighting systems; and leaving land capacity for the extension of innovative engineering systems where synergies can be used in development, for example, by expansion of local waste heat and cooling networks and new energy conversion plants as opportunities arise in the future.

Plan policy embeds approaches that ensure that the effects of climate change are considered, and opportunities to deliver the transition to clean energy are carefully planned and managed through the development process, from pre-planning to implementation.

## Progress

The Climate Protocol has, since its start, aided the continuous reduction in the joint emissions of greenhouse gases. During the last programme period, which covered the period 2015-2018, the target was to reduce emissions by 4.7 % and energy use by 2.7 %. The results show a reduction in emissions by a full 10 % and a reduction in energy use by 3.5%. This was achieved despite both an increase in turnover and a growth in the population of Uppsala during the period.[13]

## Focus on - mobility planning

Principles expressed in the 2016 Master Plan for the Municipality, the Energy Plan, the Mobility and Traffic Strategy and associated city functions, such as the Public Transport Programme, are being actively tested and implemented in development at Ulleraker - a new district to the south of Uppsala city centre, and one of Sweden’s largest urban development projects. By 2030, the district of Ulleraker is planned to be developed with 7000 new homes, businesses, commerce, schools, kindergartens and other services.

A dedicated Mobility Action Plan for the new district is in preparation. It is designed to offer a choice of sustainable travel and embed free movement in all development to encourage cyclists and pedestrians rather than use of private vehicles. All car parking is to be sited in the outskirts of the area and mobility hubs, including a new light railway, are planned to offer a low energy and efficient public transport system. The Mobility Action Plan is key to achieving Uppsala’s development goal of enabling a transformative reduction in the city’s greenhouse gas emissions, and at least 80% of trips in the new Ulleraker district will be by walking, cycling or public transport. To ensure implementation of sustainable mobility from the planning and development phases through to operation, the Mobility Action Plan describes organisation and working methods, and methods for monitoring and evaluating achievement of goals and the effectiveness of work processes.

Uppsala is sharing its experience of using the Mobility Action Plan with major urban construction projects in Sweden and with cities and regions across Europe, offering practical experience of a

planning approach and framework that transforms mobility and transport from reliance on carbon intensive sources.[14]

# Seattle, USA

## Background

Seattle is the main city of the state of Washington, and seat of King county, the largest metropolis of the Pacific Northwest, and one of the most affluent urban centres in the United States. The city is at the centre of a major conurbation around Puget Sound, a deep inland arm of the northern Pacific Ocean, and is a major port of entry and an air and sea gateway to Asia and Alaska. In 2016, Seattle was the fastest growing big city in the USA, with associated intense pressure on infrastructure and land.

In 2011 Seattle City Council adopted a climate protection goal to become carbon neutral by 2050 and directed the creation of a plan to meet the goal. The resulting 2013 Climate Action Plan provided a coordinated strategy aimed at reducing GHG emissions while also supporting other community goals, including building vibrant neighbourhoods, fostering economic prosperity, and enhancing racial and social justice.

## Planning context

Since 1994 the overarching Seattle Comprehensive Plan has provided the strategic planning framework for development, for improvement of the transportation system, and for public capital investments in the city.

The city's current 20-year plan, Seattle 2035 Comprehensive Plan: Managing Growth to Become an Equitable and Sustainable City, was first adopted in 2016, and has since been updated annually.[15] The Seattle 2035 Plan anticipates that the city will grow by at least 70,000 housing units and 115,000 jobs between 2015 and 2035. It sits alongside associated regional policy documents, key among which are the Regional Growth Strategy, which gives specific guidance on how the region's urban and rural areas should plan for additional population and employment growth, and VISION 2040, which identifies energy efficient business practices, new clean technologies, and renewable energy industries as potent drivers to making Seattle a global hub for clean energy services.[16]

## Progress

Seattle's commitment to climate action is underpinned by the dual aim of reducing the region's GHG emissions and promoting clean energy as a major economic driver. Half of the region's greenhouse gas emissions are, however, generated by transport activities, and congestion and road safety issues cause significant and increasing costs to the city. Dealing effectively with these issues is a major priority for city planning, and the strategy for transport is to promote efficient and effective use of local clean energy resources to decarbonise the transport sector.

The city of Seattle has previously implemented fiscal measures, including raising a transportation levy, to fund investment in transit corridors, major maintenance, and improved road safety. Looking forward, the current development plan recognises that although, as a large mature city, Seattle lacks space for major new highway infrastructure, vehicular and freight access to property will

remain important for accommodating growth throughout the city. The development strategy therefore focuses instead on creating opportunities for growth in urban centres, urban villages, and manufacturing/industrial centres, and ensuring that these growth hubs are supported by reliable transport. The plan strategy includes offering a range of travel methods for all trips throughout the day, evenings and at weekends, with improved safe and easy access to public transport, walking and cycling. Policies for reducing pollution encourage cleaner cars, buses, and trucks, cleaner fuels, and placemaking that promotes overall reduction in vehicle miles travelled.

In 2017 the city council launched the New Mobility Playbook, which sets out a programme for practical actions to support placemaking. The overarching thrust of the Playbook is that future transportation investment should encourage and guide innovation in clean transportation technology, support collaboration between the city and stakeholders, and encourage private suppliers to expand options for travel.[17] Planning for alternatives to fossil fuels anticipates new transportation technologies, such as smart parking and driverless vehicles, and more alternatives to driving alone. Future investment in the transportation system is also directed to building capacity in low-income neighbourhoods by ensuring that smart travel opportunities are fairly distributed to all.

Meanwhile, using, in part, congestion pricing to fund investment, Seattle Transportation Department is developing a dense network of shared mobility hubs throughout the city, co-located with major transit facilities and in places where frequent transit services intersect. The hubs offer aggregated transportation connections, travel information, and other mobility amenities, delivered as a coordinated, accessible and on-demand travel service. A key objective for shared mobility hubs is to advance the use of electric car share and ride hail vehicles by accommodating fast charging at or very near hub locations.

## Focus on - electrifying the local transportation system

Delivering clean transport is fundamental to Seattle's commitment to reach carbon neutrality by 2050. It is underpinned by the city's Drive Clean Seattle initiative, which has a primary policy to 'leverage technology to advance the goals of a shared, clean and equitable transportation system'.

The city is using its influence as a public authority to promote change in the transport sector to use of carbon-neutral electricity. As a first step, and to demonstrate best practice, it is working to electrify the city's municipal fleet and monitor associated emissions reduction, with the targets to reduce GHG emissions by 50 percent by 2025 and use only fossil-fuel-free fuel by 2030.[18]

In the wider community, the city promotes public/private partnerships and pilots innovative projects using locally generated clean electricity to power innovation in clean transport technologies.[19] It recognises that decarbonisation of the transport sector and continuing improvement in electric vehicle technology will rely heavily on locally generated hydroelectric power. The Drive Clean Seattle initiative therefore identifies significant infrastructure investment as a key priority for Seattle City Light, the local public electricity utility. Progress against aims and objectives of Drive Clean Seattle are monitored and reported annually, with responsibility for delivery of every measure assigned to relevant public and private agencies.

The New Mobility Playbook identifies the danger of planning strategies and policy getting locked into technologies that may become inappropriate to future conditions. It therefore makes clear that emerging policy must maintain flexibility to anticipate new, potentially disruptive clean

technologies, and offers analysis and guidelines to address emerging technologies and prepare for changes that are yet to come.[20] Seattle's emerging transportation and planning policy will therefore be framed to keep track of changes within the automated mobility industry, and develop a set of principles to guide ongoing regulatory and legislative efforts (including a protocol for updates). is important. New skills are needed, to understand and administer the energy transition, actively engage with communities and suppliers to support the cultural shift to electric mobility, and develop tools, technologies and subsidy programmes to support shared mobility across all income groups.

The Playbook commits the city to taking forward new opportunities in electric mobility and other clean fuels, and collaborating with other cities, experts, and global leaders to share successful policy and technological innovations. Moving forward, the city is inviting collaboration from innovators and creative thinkers in fields like technology, transportation and government to help to implement the Playbook. Partners are invited to collaborate on solutions to equity challenges, work for change in the community, launch or prototype new products or services, advise on technology, and contribute to policies and proposals.

# Denver, Colorado, USA

## Background

Denver, the capital of Colorado State, lies at the centre of the continent of North America within the foothills of the Rocky Mountain Range. The city is a transport hub and serves as the financial and distribution centre for the region. In addition to established mining, energy, aerospace and tourism sectors, the city supports significant and growing investment by scientific research and high-technology industries. The vibrant economy and pressure for growth generates characteristic urban planning challenges, including traffic congestion, air quality issues and affordable housing shortages in and around the city.

## Planning Context

Denver released its first Climate Action Plan in 2007, subsequently making significant progress toward meeting plan commitments. Its 2014 Climate Adaptation Plan and 2015 updated Climate Action Plan established the long-term goal to reduce greenhouse gas (GHG) emissions by 80 percent by 2050 using a 2005 baseline.[21, 22] In 2018 the city published the 80 x 50 Climate Action Plan, following extensive consultation with local stakeholders and community groups.[23] The plan lays out strategies to transform the city into a leader in use of clean and local energy, transform the built environment to sustainable smart energy performance, inspire community action to support transition to carbon-free energy, and drive forward adoption of smart transport using innovative partnerships, policies, programmes, and technology.

The 80 x 50 Climate Action Plan sets ambitious sector target dates for buildings, electricity supply and transportation sectors, framed to deliver incremental reductions in GHG emissions, year on year, up to 2050. Action is prioritised to maximise impact, particularly by optimising energy efficiency in buildings, decarbonising the electricity grid, and facilitating innovative approaches to clean mobility.

Denver adopted a new development plan, the Comprehensive Plan 2040, in May 2019.[24] The plan sets the overarching 20-year vision for Denver, to be delivered via a suite of detailed city plans, city wide policies and recommendations around land use, transport, design and growth. Fundamental to the city's transition to smart energy use are Blueprint Denver, the citywide land use and transportation plan, and the 80x50 Climate Action Plan, which identifies interim carbon reduction goals, new targets for buildings, transportation, and electricity generation, and robust strategies for achieving deep decarbonisation in each of these key sectors.[25,26]

## Progress

Denver's citywide carbon emissions have been falling since 2015, despite population growth.[27] This trend results, in part, from action by the city council, using transport, waste, and planning strategies to promote emissions reduction, and partly from actions by partner agencies, notably the local investor-owned energy supplier, Xcel Energy, which is actively decarbonising the electricity grid by converting generation to renewables and lower-carbon power sources.

Denver's partnership with Xcel Energy is set out in a Memorandum of Understanding, the Energy Future Collaboration, which details respective visions, values, and principles, and a framework to achieve joint goals. This includes measures such as the city investing in bringing forward energy efficient development, aiming for all new buildings to achieve net zero energy by 2035, benchmarking for all buildings over 25,000 square feet to annually assess and report their energy, and working with Xcel Energy to allow microgrids, increase energy storage, expand renewable energy choices and promote incentives to use smart energy in development.

There is widespread public support in Denver for delivering the renewable electricity goal. 81 percent of survey respondents to the community-wide 80x50 survey felt that Denver should set a goal to reach 100 percent renewable electricity.[28] In response the city is working with multiple partners across all of its functions, including pursuing additional renewable energy on new construction, residential rooftops and community solar gardens, and modernizing the grid.

## Focus on – microgrids

Peña Station NEXT is an emerging new community located at a site of some 160 hectares immediately adjacent to the rail line that connects the city of Denver to its international airport. Described as a 'new vision for place making that synthesizes clean energy, smart technology, mobility and living lab principles together' the scheme was initiated under electronic corporation Panasonic's CityNow initiative, which is trialling public-private partnerships to deliver intelligent cities by integrating city planning with technology.[29]

The long-range vision and guiding principles for the development and future of the Peña Station area were set out in the 61st and Peña Station Area Plan (2014) as part of the 2014 Blueprint Denver Plan, and in 2016 Denver established a partnership with Panasonic, to develop the site under the Smart City Initiative. The 2014 Plan was replaced by the Far Northeast Area Plan in June 2019. [30]

Planning for the scheme is led by a team that includes the city of Denver, Panasonic, local utility Xcel Energy, and the US National Renewable Energy Laboratory. With a delivery programme to create the new smart community by 2026, the project is trialling installation of microgrids that combine solar panels and energy storage. A microgrid to supply Pena Station is already providing energy for a transit station built as a connector between Denver city and the Denver International Airport. It is intended to support smart LED street lights with video analytics features for safety and parking applications, community wireless services, electric vehicle charging stations and self-driving shuttles. The microgrid can power supply for up to 72 hours in the event of an outage. Generation and storage capacity are provided by a 1.6-megawatt solar array on the roof of the airport carpark, 259 kilowatts of rooftop solar capacity on Panasonic's operational site, and a 1-megawatt-capacity lithium-ion battery storage system, managed by intelligent software and control systems. The storage supports "solar time shifting," which stores excess energy when solar energy generation is high, and dispatches the energy later, when generation slows. [31]

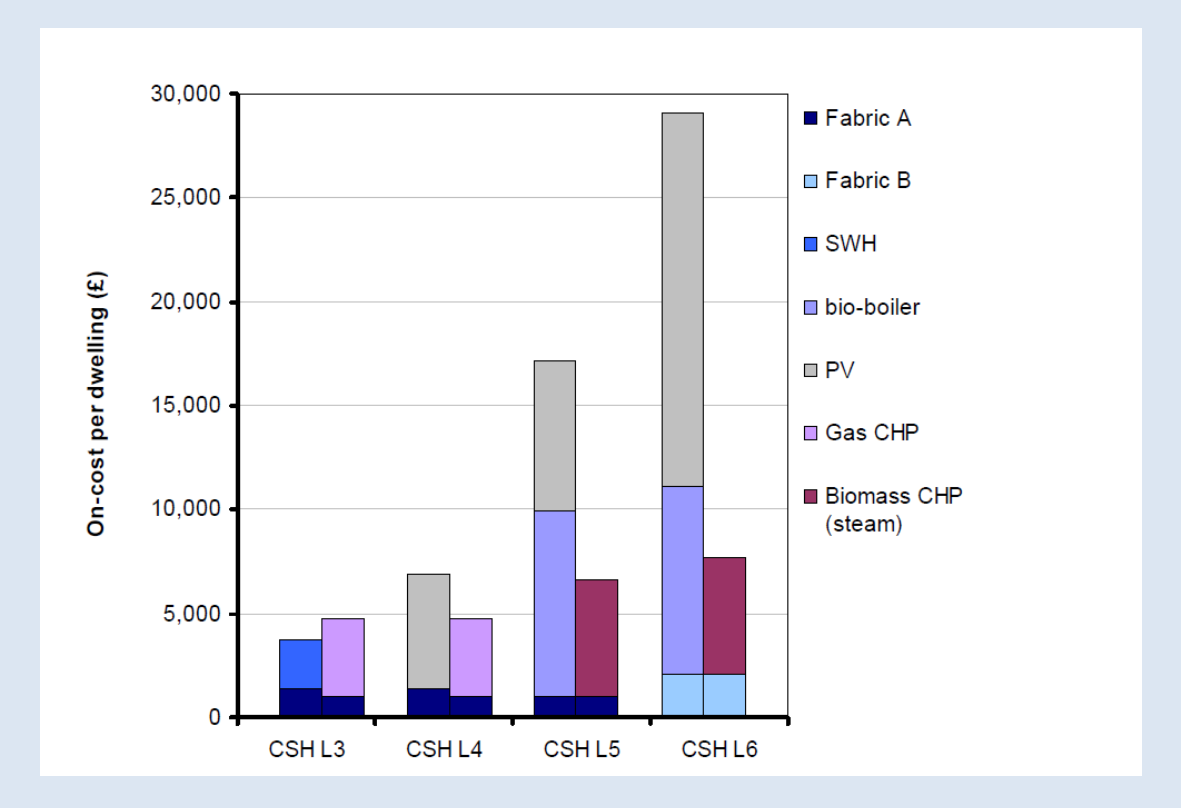
Going forwards, future operation of the Peña Station NEXT development will rely heavily on a reliable and fully functioning microgrid. The project partners are now investigating and testing technical and business models capable of delivering the wider microgrid infrastructure needed to support the range of residential, commercial and other uses in the planned community.

# Cranbrook/Skypark district heat network, East Devon, UK

## Introduction

Cranbrook is a new community in East Devon, the first standalone new settlement in Devon since the Middle Ages and the first strategic scale development on a greenfield site in the country to be served by a newly developed district heating network. District heating served by a Combined Heat and Power (CHP) plant was a key part of the vision for Cranbrook to create a trailblazing zero carbon eco-town development. This zero carbon vision was underpinned by a 2008 report by Element Energy,[32] which considered the options to achieve the greatest carbon reductions from new developments within the Exeter and East Devon Growth Point.

**Box 1: Comparison of the capital on-cost per dwelling of achieving various Code for Sustainable Homes levels by individual building measures (Left columns) and side-wide systems (Right columns).** [33]



The report summarised the options as being either a “building by building” approach as defined by levels 3, 4, 5 and 6 of the Code for Sustainable Homes,[i] or a ’site-wide’ approach. As shown in Box 1 on the previous page, the report identified that a site-wide approach would enable zero carbon homes (equivalent to Level 6 of the Code for Sustainable Homes) to be achieved at a fraction of the cost of the building-by-building approach.

However, with development commencing well before the, then, planned requirement for zero carbon homes in 2016, it was not economically viable to pursue a site-wide approach at the outset without additional financial support. This provided a basis for a successful application for a Homes and Communities Agency’s (HCA) Low Carbon Infrastructure grant, which was supplemented by contributions from the local authorities to a total of £4.1m. With this funding in place other significant regional infrastructure funding for Cranbrook was also made conditional on the installation of a biomass fuelled district heating network.

The inclusion of the adjacent Skypark commercial development in the scheme was also important. Skypark lies some 800m from the western edge of Cranbrook. The Skypark site is owned by Devon County Council (DCC) and has high sustainability standards. The Skypark developer, St Modwen, had previous experience of CHP and recognised that a joint Cranbrook / Skypark scheme could meet its sustainability needs, give a larger and more even heat load and provide appropriate land for the energy centre. The Cranbrook consortium also saw the benefits of the energy centre being connected to but not located on residential land.

The housebuilder consortium’s early selection of a preferred energy provider (E.ON) enabled a single solution to be worked on. The proposed biomass CHP solution at a Skypark energy centre provided a scheme with sufficient scale to be viable for all parties. The South West Regional Development Agency played a key role in facilitating the negotiations.

Work started on-site at Cranbrook in 2011, with the first new homes completed in May 2012. A temporary energy centre served homes until the main energy centre was completed in 2013 with an initial 0.5 MWe gas CHP unit supplemented by back-up/peak gas boilers. The energy centre Section 106 Agreement (S106) requires the installation of 2 MWe/2.4 MWth wood fuelled biomass CHP from 2,000 connections (the construction of 2,000 homes and their subsequent connection to the district heat network).

## Issues which have arisen during the build out phase to 2019

The original requirements for Cranbrook were set at a time when government policy supported the Code for Sustainable Homes and had set a trajectory to achieve zero carbon buildings from 2016. However, the Code and national zero carbon targets were scrapped in 2014; a regulatory reversal that severely undermined the value of zero carbon heat provision at Cranbrook and which reduced the connection fee which zero carbon heat would otherwise have attracted. In addition, the

[i] The Code for Sustainable Homes was a national standard method for rating and certifying the sustainable design, construction and performance of new homes, an element of which was focused on reducing energy use and carbon emissions amongst other things. The Code was adopted by Government, and progressively moved towards zero carbon emissions (Code Level 6). The Government Zero Carbon Homes policy was due to bring in a requirement for zero carbon homes (i.e. Code Level 6) from 2016, but this was scrapped in 2015 along with the Code for Sustainable Homes.

pyrolysis technology which the original biomass proposals were based on has not developed as had been hoped when the S106 was signed. These factors, combined with increasing national demand for, and rising costs of biomass fuel, has led to a situation where the original 2 MWe biomass proposals are not currently considered to be viable by E.ON despite the corresponding rise in the price of electricity.

In 2015 electricity grid constraints imposed by Western Power Distribution suggested that the installation of additional CHP (biomass or gas) at the energy centre would not be possible until at least 2020. However, this constraint has been overcome by a private wire connection to the newly constructed Lidl distribution warehouse, which enabled an additional 2 MWe of gas CHP to be installed in 2018.

The reduction in the carbon intensity of the electricity grid due to the phasing out of coal power stationsm and increased renewable capacity nationally means that, over time, the carbon reduction benefits of generating electricity and heat with gas CHP reduces correspondingly, and all-electric heating options potentially become lower carbon solutions. It is therefore important that gas CHP heat networks transition to lower carbon heat sources. Evidence from mainland Europe shows that increasing the scale of heat networks allows for a more diverse range of heat sources to contribute.

The originally proposed scale of Cranbrook (2,900 homes) has since been expanded, initially to 3,500 homes (which now all benefit from at least outline permission), then to 6,000 homes through Local Plan allocations. The emerging Cranbrook Plan DPD[34] will take the town to a total of approximately 8,000 homes. Approximately 4,500 of these homes do not yet have planning permission. The capacity of the existing energy centre will not be sufficient to meet the heat demand of 8,000 homes.

## Emerging opportunities

The evidence generated for Cranbrook enabled Exeter City Council to develop local energy policies in its Core Strategy (adopted 2012) including the requirement for homes to be built to CSH4 and the requirement to connect to district heating.[35] Developments straddling the Exeter and East Devon border around Monkerton, Blackhorse and Pinhoe (adding up to approximately 4,000 homes) are now also being served by a (separate and commercially funded) heat network and 0.5 MWe gas CHP energy centre. The energy centre is under construction and due to be commissioned in 2019. The nearby Met Office Supercomputer at Exeter Science Park provides an opportunity to supply private wire electricity from the Monkerton energy centre and to off-take waste heat into the heat network. The ‘Monkerton Story’ sets out the history behind the Monkerton project and the challenges faced along the way to delivering a subsidy-free heat network.[36]

The France-Alderney-Britain electricity interconnector (FAB Link) is due to “land” near Budleigh Salterton and cabling will run to a converter station due to be constructed to the east of Exeter International Airport, around 1km from the proposed southern expansion of Cranbrook. Provision has been made within the planning permissions for the potential off-take of up to 7 MWth of low-grade waste heat from this conversion process. This waste heat could be brought up to the appropriate temperature to feed into the Cranbrook heat network through a heat pump or could be used directly in a low temperature heat network.

A 2016 report by the University of Exeter’s Centre for Energy and the Environment sets out how these and other opportunities could be used to develop a wider heat network with greater

economies of scale.[37] This report explored the opportunities relating to the FAB Link and the Met Office Supercomputer mentioned above, but also suggested the potential for large-scale biomass CHP delivered in modular 5 MW stages.

A 2018 report by WSP highlighted further opportunities for alternative low carbon heat and power sources and areas that could benefit from connection to expanded networks.[38]

Additional opportunities also exist, or could potentially exist, in the form of:

- The network's close proximity to the Exeter National Grid sub-station at Broadclyst;
- Associated PV arrays;
- Significant levels of distribution and warehousing floorspace (which could enable electrification of smart logistics as well as useful electricity loads to further circumvent local electricity grid constraints); and
- Exeter International Airport (in relation to the transition to low/zero carbon aviation).

This means the opportunity is wider than just heat, but turning these potential opportunities into deliverable projects is difficult and lacks certainty.

The Greater Exeter Strategic Plan (GESP) is currently being developed in partnership by East Devon, Exeter, Mid Devon and Teignbridge councils, with the support of Devon County Council. The GESP presents an opportunity to set a vision and aspiration in relation to transition to a low carbon economy, develop policies to help enable the area to meet its decarbonisation targets, and allocate land for strategic housing, employment and related infrastructure. The ability to deliver low or zero carbon development will be an important consideration in determining site allocation options. Furthermore this has the potential to underpin the delivery of clean growth in the area.

These opportunities are not just fortuitous. Rather, they are the product of a proactive policy choice to take carbon reduction seriously through the development of heat networks in the area, alongside a bold vision for economic transformation. Without this positive environment, such opportunities would not have occurred. It is important, therefore, that this environment continues to evolve and adapt.

## Where next?

The Submission Draft of the Cranbrook Plan DPD[39] sets a new policy framework for the continued rollout of district heating into the town's expansion areas as part of a renewed vision to deliver a truly zero carbon town. This also includes safeguarding land for energy uses that can help to deliver decarbonisation of the heat network. There is only so much that setting a positive and permissive planning environment can do. Delivering on many of these opportunities will require much more detailed and proactive engagement between the local authorities and potential stakeholders. A coherent strategy is required to ensure that all of these opportunities are considered holistically and to ensure that significant investments into particular types of energy infrastructure form part of a clear pathway towards the achievement of large scale zero carbon development.

The GESP represents an opportunity to bring forward policies that can help to decarbonise the existing and proposed heat networks and beyond, and utilise the opportunities highlighted above.

Devon, East Devon and Exeter councils have a history of embracing the low carbon challenge through policy and delivery, and it is important to ensure that this remains high on the agenda with

members and officers. In the context of declared climate emergencies there is an important opportunity to complete the journey started over 10 years ago and to fulfil the vision of delivering large scale zero carbon development.

**Box 2: Links for more information on Cranbrook/Skypark**

Information about project funding, from Exeter and East Devon Growth Point: https://www.exeterandeastdevon.gov.uk/low-carbon-cranbrook/News-Article/

Information about key partners involved in Cranbrook/Skypark, from Exeter and East Devon Growth Point: https://www.exeterandeastdevon.gov.uk/green-light-for-energy-centre/News-Article/

Background on Exeter and East Devon Growth Point's aims and objectives, from the Local Government Association: https://www.local.gov.uk/local-growth-local-people

Lessons learned from Regen SW's low carbon development programme, by Regen SW: https://www.regen.co.uk/wp-content/uploads/Low_carbon_development_lessons_paper_310311.pdf

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**For more information and materials relating to the RTPI's work on smart energy systems, please see: www.rtpi.org.uk/smartenergy.**

**For more information about the RTPI's wider climate change research programme, please see :www.rtpi.org.uk/climatechange.**

**Alternatively, you can contact the RTPI research team at: Research@RTPI.org.uk.**

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