RTPI
Royal Town Planning Institute

RTPI RESEARCH PAPER

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PLANNING FOR A SMART ENERGY FUTURE

THE Landmark PRACTICE

regen transforming energy

UWE Bristol University of the West of England

Pell Frischmann
Excellence through innovation

The Royal Town Planning Institute

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Please contact Dr Daniel Slade, RTPI Research Officer, for more information.

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Report authors

- Cheryl Hiles - Project Director, Pell Fischmann
- Hazel Williams - Head of delivery, Regen
- Bernice Roberts - The Landmark Practice
- Nick Smith - Associate Head of Department in Geography and Environmental Management, UWE Bristol

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Acronym list

BEIS	Department of Business, Energy and Industrial Strategy
CCC	The Committee on Climate Change
CHP	Combined Heat and Power
CIBSE	The Chartered Institution of Building Services Engineers
DNO	Distribution Network Operator
ESC	Energy Systems Catapult
ESN	Electricity Storage Network
EV	Electric vehicle
IPCC	Intergovernmental Panel on Climate Change
LDO	Local Development Order
LEP	Local Enterprise Partnership
LPA	Local Planning Authority
MHCLG	Ministry of Housing, Communities and Local Government
NIC	National Infrastructure Commission
NPPF	National Planning Policy Framework
NPPG	National Planning Policy Guidance
NPS	National Policy Statement
NSIP	Nationally Significant Infrastructure Project
REA	Renewable Energy Association
RHI	Renewable Heat Incentive
RTPI	Royal Town Planning Institute
SAP	Standard Assessment Procedure
SSEN	Scottish and Southern Electricity Networks
TCPA	Town and Country Planning Association
UKGBC	UK Green Buildings Council
V2G	Vehicle to Grid
WPD	Western Power Distribution

Contents

Executive summary

Smart energy and a net-zero carbon emissions future…

Smart energy will be integral to the transition to a clean energy future.[1] This research has examined planning's potential to support the delivery of smart, clean energy as a fundamental component of placemaking in England. It draws on a strong evidence base, gathered through academic and policy literature reviews, case studies, a survey of practitioners and a series of workshops and interviews.

The research was commissioned by the South West Region of the RTPI in 2018. There is now a new emissions target for the UK: net-zero greenhouse gases by 2050. The Committee on Climate Change has underlined that the net-zero target can only be delivered with strengthened policy to cut emissions and delivery must progress with far greater urgency.[2] This is the new context for this report, and its recommendations on how planning can support smart energy.

Who should read this report…

This report is of interest to policy-makers, decision-makers and practitioners in planning. Its recommendations will also resonate with other built environment professionals. The focus is England but it has UK-wide relevance.

The research's key findings…

At present, with a few exceptions, planning policy in England and progress on the ground lags behind the opportunities offered by smart energy to support clean growth and mitigate climate change. Notable strides have been taken to cut emissions using existing planning powers and tools. However, based on current progress, the pace of change is not sufficient to harness the ambitions and benefits set out in the Clean Growth Strategy,[3] or to meet the UKs legal commitments to decarbonise. How we plan needs to change to support a smooth transition to the smart energy future now underpinning UK energy policy:

- given the longevity of development, nothing should be planned without having successfully demonstrated it is fit to take its place in a net-zero emissions future. It makes no sense, economically, socially or environmentally, for what is planned and built today to be delivered in a form, or in places, that will require costly retrofitting tomorrow;
- meeting the challenge of a smart energy future will need to be a joint endeavour between all those involved in new development and, because planning is a democratic process, with elected politicians and local communities; and

- making effective use of planning to support transformational change in the built environment requires strong political leadership, locally and nationally. Without this, planners and planning will find it harder to break out of the 'business as usual' mould.

What the research findings mean for planners…

Smart energy cannot be seen as a bolt-on extra to placemaking or the preserve of a few specialists. Every planner should see themselves as having an important role in supporting the transition to a smart energy system. Smart energy should be central to planning: for new homes, jobs, transport and infrastructure, including how people access services:

- an essential step is improving planning skills central to tackling climate change. As a starting point, this report recommends the RTPI updates its Core Continuous Professional Development (CPD) Framework to include smart energy as a CPD requirement, together with refreshed guidance to its members.

What the research findings mean for central government…

Nationally, there needs to be political clarity that smart energy and climate change have equal status with the provision of housing, transport and economic growth:

- in England, this clarity could be delivered through a refresh of the National Planning Policy Framework or, with greater immediacy, through a written ministerial statement. Supporting guidance should be reviewed to ensure there is a consistent message.

The effective delivery of smart energy requires close cooperation between the government departments responsible for driving UK industrial strategy and energy policy, and the regulation and management of land use and planning. In England, this cooperation is not always evident:

- a new model of co-operation and drive is required. This report recommends the Department of Business, Energy and Industrial Strategy (BEIS) and Ministry of Housing, Communities and Local Government (MHCLG) establish a Joint National Planning and Energy Support Hub. The hub would deliver streamlined intelligence, guidance and support to planning authorities and stakeholders. It would help to ensure that the current lack of local resources and expertise do not become an increasing barrier to the delivery of smart energy.

The report also recommends the two departments work together on a joint action plan for delivering smart energy. Through this both departments would agree core objectives and actions on smart energy. With an action plan, progress against the objectives and action can be monitored and reported, perhaps to a select committee.

Local Enterprise Partnerships (LEPs) as business-led partnerships with local stakeholders are important drivers of economic growth. Coordination between LEPs and local planning authorities on planning for energy is variable. BEIS and MHCLG should consider better ways to integrate LEP

activities with spatial planning in areas without a metro mayor.

What the research findings mean for local planning authorities…

Local government planning needs more support and resources if it is to fully support smart energy. However, this does not mean things cannot be done differently within current resources through a re-ordering of priorities and with an ambitious vision:

- local planning authorities and combined authorities with plan-making powers should urgently review their approach to ensure their policies and implementation support smart energy. The greatest impact comes from taking a whole systems approach to planning for smart energy.[4] In setting out a clear policy direction, the planning process will need to remain flexible and open to innovative solutions;
- embedding smart energy objectives across a wide variety of functions of a local authority, has proved to be highly effective. Collaboration between local authority departments and with business, communities, and distribution network operators, can unlock important evidence and resources, as well as supporting innovative business models based on smart technology. This enables locally appropriate solutions to be delivered;
- the smart energy industry is keen to engage with local planning authorities to explain the current and emerging technologies, and is a resource to be tapped; and
- declaring a Climate Emergency is a powerful statement of intent, but it is what happens next that will count.

References

[1] The term 'smart energy' is explained in Chapter 2.

[2] Committee on Climate Change (2019) *Net Zero - The UK's Contribution to Stopping Global Warming.* Available at*:* http://bit.ly/2R9i1vZ The Committee on Climate Change is an independent, statutory body established under the Climate Change Act 2008. Its purpose is to advise the UK Government and Devolved Administrations on emissions targets and report to Parliament on progress made in reducing greenhouse gas emissions and preparing for climate change.

[3] HM Government (2018) *The Clean Growth Strategy: Leading the Way to a Low Carbon Future*; Amended April 2018 from the version laid before Parliament in October 2017. Available at: http://bit.ly/2IcXvZX

[4] Energy Systems Catapult (2018) *Local Area Energy Planning: Supporting Clean Growth and Low Carbon Transition*. Available at: http://bit.ly/2IT25tU

1. Introduction

> **"The most efficient and cost-effective way to deliver smart energy solutions that contribute to national objectives for growth and avoid conflict with other planning objectives and local community values, is to ensure that the industry and planning system are aligned and mutually informed of key drivers, constraints and opportunities, and that appropriate regulatory and policy frameworks are in place."**
>
> **Lund et al (2016)[1]; Lund (2014)[2]**

The RTPI's work on climate change

The RTPI considers climate change to be one of the most crucial issues facing our communities today, and the increasing occurrence of severe climate-change related weather events is just a reminder of the urgency of this issue. Climate change, like planning, requires a long-term and spatial view.

The Institute's programme on climate change is framed by the concept of 'climate justice', and focuses on resourcing, skills, and other practical issues planners face at the frontline of planning for climate change. This include a series of short position papers outlining the latest research and an 'RTPI view' on key concepts relating to climate change, as well its Strategic Planning for Climate Resilience project. Through this project the RTPI is working with Liverpool City Region to develop climate resilience policy, while testing and sharing best practice in the field.

Alongside this, the RTPI is supporting and commissioning a series of projects, including this work on planning for a smart energy future, funded by the RTPI South West. The smart energy revolution is of considerable relevance to the South West of England. The region plays a key role in the deployment of renewable technologies, particularly solar PV. Climate emergencies have been declared by local authorities across the region, with many setting targets for their area to be net zero by 2030 or sooner.[3] Smart energy solutions will be key to the success of these ambitions.

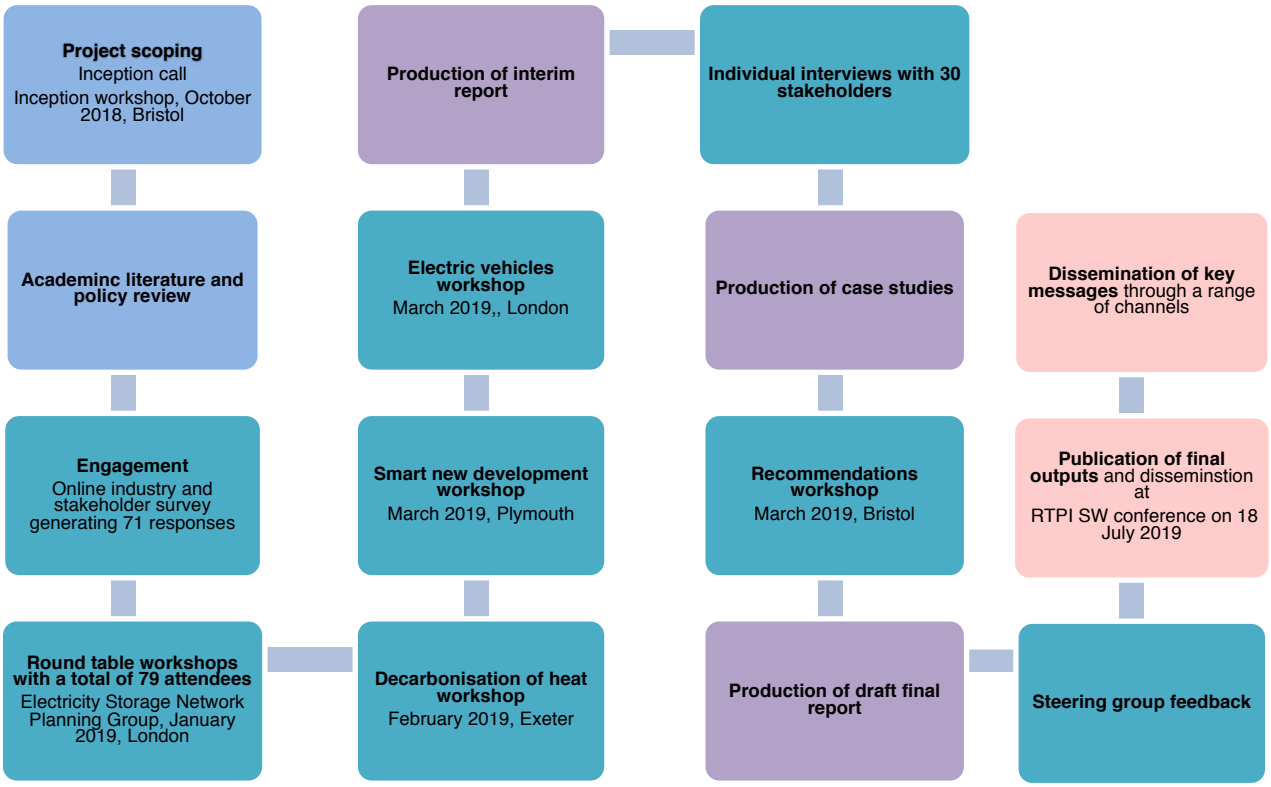
Research aims and design

This research explores some of the key issues and opportunities that smart energy will raise for the planning system between now and 2030**.** This timeline was set in order to ground the findings in the realm of predictable technological development. Beyond 2030, likely technological and market changes are less clear. So too are the specific challenges associated with tackling the toughest decarbonisation issues.

This report was produced by a team of practitioners from Regen, Pell Frischmann, The Landmark Practice and The University of the West of England, working with the RTPI and RTPI South West.

The research draws on a strong evidence base, gathered thorough academic and policy literature reviews, case studies, a survey of practitioners and a series of workshops and interviews, as set out in the research approach (Figure 1, below). The full suite of research documents, including the literature review and write up of case studies is available via the RTPI website.

Figure 1: Research approach



The report's structure

Chapter 2 considers the concept of smart energy and explains how it is now a fundamental strand of government energy policy and the envisaged pathway to decarbonisation. This provides the context for exploring the implications of the smart energy revolution for planning and planners. As part of this contextual exploration, the report provides a broad overview of the potential role of planning in facilitating a 'Smart Energy 2030'.

The deployment of smart energy will, in practice, have a wide range of interfaces with planning, from retrofitting energy efficiency measures in existing places, to new placemaking, to how homes and places of work are heated and powered, to sustainable transport. This research has focused on four areas of technological innovation, drawing significantly from experience in the South West

of England, to examine whether the regulatory and policy framework for planning, and current practice, can support the delivery of smart energy systems or whether they will act as barriers. These areas of technological innovation are considered in Chapters 3 to 6. These chapters explore the technologies and their implications for planning. Where appropriate, barriers are highlighted and recommendations are made to address those barriers. Each chapter, as good practice learning points, highlights the opportunities for positive planning to support smart energy.

Whilst there are lessons to be learned that are specific to each technology, the research has uncovered broad strands of concern that apply across the smart energy / planning interface, irrespective of technology. These issues are brought together and discussed in Chapters 7 and 8. Chapter 7 distils the good practice learning points from the investigation of the four areas of technological innovation. Chapter 8 sets out the report's conclusions and a number of overarching recommendations for change, identifying as appropriate where ownership for securing that change lies.

2. Smart energy and its interaction with the planning system

This chapter sets out what is understood by 'smart energy', what the components mean in practice and how they relate to spatial planning.

What is smart energy?

A smart energy system is multifaceted and can be seen as a golden thread running through the Government's Industrial Strategy, the National Infrastructure Assessment produced by the National Infrastructure Commission (NIC) and into Ofgem's business planning. For the purposes of this research, smart energy has been interpreted as:

Keeping energy costs to the consumer low

by

keeping the cost of 'energy' infrastructure investment down

by

ensuring better use of existing assets through smarter management and integration, enabled

by

using innovative smart technology, putting the UK at the forefront of the global market

whilst

meeting our decarbonisation obligations.

Keeping energy costs to the consumer low

Since the 2015 general election, consumer price protection has been central to UK energy policy and a driver of a 'smarter' approach as, for example, argued, by the NIC in its Smart Power report:

> **"…the three innovations of interconnection, storage, and demand flexibility could save consumers up to £8 billion a year by 2030, help the UK meet its 2050 carbon targets, and secure the UK's energy supply for generations."**
>
> NIC (2016)[4]

Although all future energy scenarios demonstrate that significantly more new flexible generation (generation that is responsive to demand) will be required to meet our energy needs, the NIC has argued that 'renewables with smart flexibility' is the most cost-effective response. Flexibility is seen as a 'low regrets' investment option, which the NIC has estimated will reduce total energy system costs by between £1-7 billion per year on average between 2030 and 2050. Being 'flexible' includes energy storage, interconnections with the continent and changes to energy use patterns in response to signals from the network operator. The Government accepted in the 2016 Budget the recommendations from the Smart Power report and, following consultation, published in 2017 Upgrading our Energy System: Smart Systems and Flexibility.[5]

The transition to a smart *electricity grid* requires improved information about the way the grid is used, through digital communications technology. However, the transition to a smart *energy system* is more complex, and requires the creation of an integrated system, linking electricity, heat and transport systems together. This requires a much deeper understanding of system interactions from a spatial perspective.

Keeping the cost of 'energy' infrastructure investment down

The trend towards the electrification of both transport and heat in a bid to decarbonise has created significant concern over the need for large scale investment in the electrical grid and network infrastructure, alongside potential redundancy of assets such as the gas network.

In response to this, evidence from the NIC suggests that a rapid uptake of electric vehicles (EVs) in the 2020s cannot only be accommodated, but also that the batteries in EVs could be a valuable and low-cost source of flexibility for the electricity system in the future. For this flexibility to be effectively harnessed, smart charging and potentially vehicle to grid (V2G) technology would need to be deployed. It is therefore vital that planning, as the regulatory system at the forefront of development, is thoroughly equipped to deal with such developments.

The solution to decarbonising heat without requiring significant new infrastructure investment is particularly challenging. Although there is expert consensus on the key technologies that will play a role, there is disagreement, both nationally and internationally, about the potential scale of each. In the current absence of a clear market for decarbonised heat, there is an important role for local planning in developing an understanding of local need and opportunities and instigating mechanisms, for example local development orders, to support the delivery of locally appropriate solutions. There is also a wider role for local authorities and enterprise partnerships in addressing market failure and stimulating investment in appropriate local heat solutions.

Ensuring better use of existing assets through smarter management and integration

Actions to make better use of existing assets through smarter management are set out in BEIS and Ofgem policies. These include:

- changes to the way we manage our electricity network.[6] This will require improved data and information, derived for example from smart meters and real time monitoring, to enable better operational efficiencies at the same time as enabling more distributed and intermittent generation to connect to the networks at a lower overall cost to the system; and
- a regulatory framework that encourages network companies to make the most of technological solutions which can save consumers money by delaying or reducing the need for expensive upgrades and grid reinforcements.[7]

The planning system is likely to have a role to play in identifying how new development can integrate with existing assets, such as ensuring new developments connect to district heat systems or that electricity storage can be co-located with existing generation assets.

Innovative smart technology, putting the UK at the forefront of the global market

'Smart technology' is a broad term for any new solution which relies on information flow through signals from digital and communications technologies. This rapidly evolving area is being driven by innovation and the development of new business models for improving the efficiency of the way energy is consumed and managed. A wide and growing range of technologies is involved, including smart appliances, smart heating controls, smart lighting systems, building energy management systems, smart meters, smart grids/ demand-side response, smart charging, battery technology, vehicle to grid (V2G) technologies and connected and autonomous vehicles.

Investment is being channelled through the Clean Growth Strategy and Clean Growth Grand Challenges, with missions to 'at least halve the energy use of new buildings by 2030', 'establish the world's first net-zero carbon industrial cluster by 2040' and 'put the UK at the forefront of the design and manufacturing of zero emission vehicles, with all new cars and vans effectively zero emission by 2040'.[8]

The pace of technological innovation suggests planning strategies should avoid prescribing technologies, so as to avoid limiting the use of emerging and future technologies that best fit local need, opportunity and economic viability.

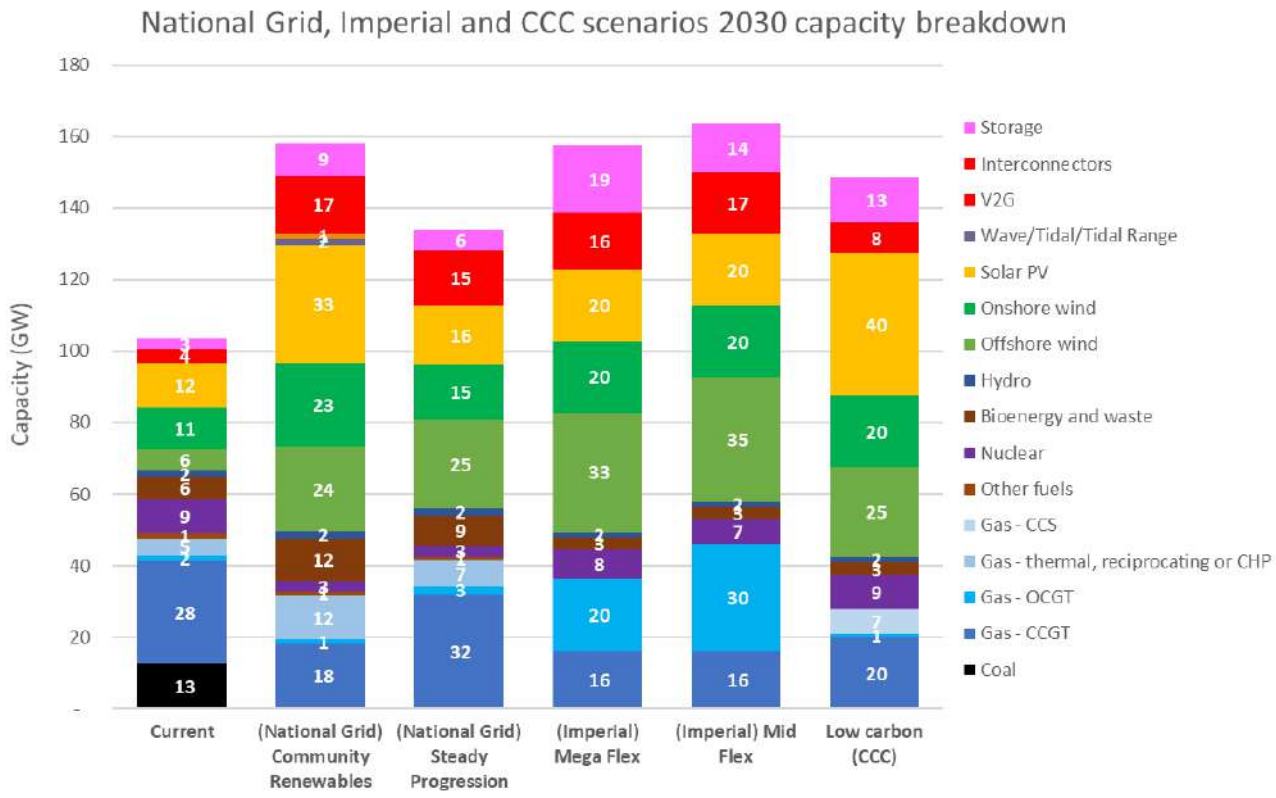
Meeting our decarbonisation obligations

The recent amendment to the Climate Change Act 2008 requires the UK to bring all greenhouse gas emissions to net zero by 2050, compared with the previous target of at least 80% reduction from 1990 levels. This follows advice from the CCC in the Net Zero report which concluded that:

> **"…net-zero is necessary, feasible and cost-effective. Necessary – to respond to the overwhelming evidence of the role of greenhouse gases in driving global climate change, and to meet the UK's commitments as a signatory of the 2015 Paris Agreement."[9]**

Figure 2, below, shows that the amount of new clean energy generation capacity that will be required should not be underestimated and much of it will require consenting through the planning system. Maximising the use of existing assets and the integration of low carbon energy sources with smart technology could significantly reduce the need for new infrastructure, and avoid contentious proposals being hard-fought through the planning system, as well as offering the most cost-efficient solution.

Figure 2: A range of 2030 energy generation scenarios which meet the 2050 decarbonisation objective analysed by Regen



The role of the planning system in facilitating a 'Smart Energy 2030'

In a 'smart energy 2030' the following are likely to be key components of the energy system:

- **Smart new developments** that incorporate ultra-high energy efficiency, smart controls, onsite renewables and storage, low carbon district heat or individual low carbon heat provision and flexibility, potentially through microgrids;
- **Smart electric vehicle charging**, potentially with V2G technology, as part of a wider low carbon mobility system;

- **Reduced heat demand through energy efficiency measures** in existing buildings, including whole building retrofits;
- **The roll-out of low carbon heat technologies**, focussed in off-gas homes, including heat pumps and biomass, and low carbon heat networks and hybrid heat pumps in urban locations – plus some greening of the gas grid; and
- **A significant increase in low carbon and renewable electricity generation** capacity alongside increased energy storage capacity to provide flexibility across the energy system and greater penetration of technologies such as CHP, thermal storage and V2G.

Many of the building blocks for a 'smart energy 2030' will pass through the planning system. How we plan places, the standards of development required and the location of what is consented, will all affect emissions and the pace of decarbonisation. For example, the extent to which heat, cooling and power are required by buildings can be influenced by their design, through orientation, shading, onsite technologies and fabric requirements; the extent to which local sustainable energy sources are harnessed will affect levels of reliance on national networks, and, how movement is managed and transport systems are planned will affect emissions from that sector.

Planning can enable a place-based approach to development, which is well informed about local circumstances, to meet the needs of communities, whilst working towards a zero-emissions future. It also has the regulatory power to prevent unsustainable development, even if it is not always successful in doing so.[10]

Planning can also be a powerful proactive force for bringing together the diverse range of stakeholders who are needed to make change happen, including local communities, businesses and investors. It is within this context that the 'smart' elements of the energy transition now present significant opportunities to overcome historic planning barriers to the decarbonisation of energy.

New business models for smart energy are emerging which could, in time, drive down current concerns about the viability of low carbon new developments.[11] Supported by appropriate regulation and incentives, smart energy technology controlled by an energy services company could become a standard approach in new developments, transferring the cost of installing smart infrastructure, storage capacity and renewable energy systems in buildings away from the developer. Some energy companies, such as ENGIE, have already recognised the opportunity in the UK for a new energy-centred approach to housing development, using their energy expertise as the lead developer on selected property development sites (see Box 1, below).

Box 1: ENGIE's proposed development at Rugeley, Staffordshire[12]

In May 2019, ENGIE submitted an outline planning application for 2,300 homes on the site of the former coal-fired power station, Rugeley B, in Staffordshire. ENGIE's aim is "to create a flagship development for tomorrow's decentralised, digitalised and decarbonised world". The design and access statement submitted with the outline planning sets out, amongst others, the following innovations:

> **"COMMUNITY ENERGY SYSTEMS**
>
> **Community Energy Systems which generate renewable energy and optimise consumption through centrally controlled systems, such as solar and battery microgrid solutions. The systems should be capable of extension and modification to include infrastructure for electric vehicles, hydrogen storage and grid flexibility services.**
>
> **DIGITALLY ENABLED**
>
> **The ENGIE Home and Community Energy Systems will be digitally enabled. Digital solutions will allow access to the Community Energy Systems, devices within the home and site wide facilities.**
>
> **LONG-TERM STEWARDSHIP**
>
> **ENGIE retain a key role in the development beyond the masterplanning and construction phase through an integrated estates, services and energy management role with responsibility for infrastructure, property and energy."**

These models represent a shift away from the 'develop and sell model', which fails to provide a payback mechanism for low carbon energy infrastructure. Some regulatory changes are still needed to enable developers to recoup high upfront investments through energy service charges over time, but this approach could change the way in which development is undertaken. Installing this infrastructure at the point of development is clearly much less costly than retrofitting it at a later date.

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[3] Campaign Against Climate Change. (2019) Councils Declaring Climate Emergency: What Next? http://bit.ly/2YAn9w4

[4] National Infrastructure Commission [NIC] (2016) *Smart Power*. March. Available at: http://bit.ly/2KvMtk8

[5] OFGEM and Department for Business, Energy and Industrial Strategy [BEIS] (2017) *Upgrading Our Energy System Smart Systems and Flexibility Plan*. July. Available at: http://bit.ly/2UPBMx2

[6] OFGEM and Department for Business, Energy and Industrial Strategy [BEIS] (2017) *Upgrading Our Energy System Smart Systems and Flexibility Plan*. July. Available at: http://bit.ly/2UPBMx2

[7] National Infrastructure Commission [NIC] (2016) *Smart Power*. March. Available at: http://bit.ly/2KvMtk8

[8] HM Government (2018) *The Clean Growth Strategy: Leading the Way to a Low Carbon Future*; Amended April 2018 from the version laid before Parliament in October 2017. Available at: http://bit.ly/2IcXvZX

[9] Committee on Climate Change (2019) *Net Zero - The UK's Contribution to Stopping Global Warming.* Available at*:* http://bit.ly/2R9i1vZ *,* p. 12.

[10] Town and Country Planning Association [TCPA] (2016) *Planning for the Climate Challenge: Understanding the Performance of English local plans.* Available at: http://bit.ly/2WrxU1W

[11] This shift is being driven by market responses to the consumer demand for convenience - something demonstrated strongly through the international case studies examined. See Appendix C, available at www.rtpi.org.uk/smartenergy)

[12] ENGIE & JTP (2019) *Design & Access Statement, Rugeley Power Station*. Available at: http://bit.ly/2IPvx49

3. Planning for energy storage

This chapter explores the range of storage technologies that are likely to be encountered by planners and the potential impacts the planning system will need to address. In doing so, a number of barriers to the successful delivery of energy storage projects are discussed together with recommendations to address them. The chapter, as good practice learning points, sets out how positive planning can support energy storage.

The role of energy storage in a smart energy future

Storage has an important role to play in the development of a smart, flexible and decarbonised energy system. Storage technologies fulfil a range of roles in supporting the operation of the UK's electricity network, from responding to short term outages of generation to frequency response. In particular, storage can play a crucial role in enabling a higher proportion of variable renewable generation in the UK's generation mix. Energy storage (particularly batteries) can support a wide variety of operational functions and services:

- **response:** the ability to respond quickly (milliseconds to minutes) to grid, frequency and/or price signals;
- **reserve:** the ability to store energy and discharge it when it is needed; and
- **price and time shift:** the ability to shift energy from lower to higher demand and price periods.

Storage encompasses a wide range of technologies, including pumped hydro-electric storage, fly wheels, compressed air, and batteries (including lithium-ion, lead acid, flow batteries and high temperature). These technologies have different impacts and pose different issues for local planning authorities (LPAs) to consider. With the exception of pumped hydro systems, most energy storage constitutes relatively new technology of which planning authorities have little experience and there is little precedent or technical context on which to draw.

Pumped hydro-electric and lithium-ion batteries are the dominant technology types for storage schemes at present. Looking forward, compressed air and flow batteries are likely to play an increasing role.

Regen has written two 'white papers' on storage and its role within the energy system and these are useful resources for planners who want to improve their understanding of this area:

- Energy Storage: Towards a commercial model (2016) – this paper addresses role of storage in the energy system and offers and analysis of emerging business models[1].
- Energy Storage: The Next Wave (2017) – this paper covers the growth prospects and potential markets available for storage.[2]

The potential planning impacts of storage

The impacts of storage will depend on the type of technology employed, its power capacity (MW), the duration of the storage (how long it can produce power for, measured in MWh) and its footprint. Footprint is to a certain extent a function of the power capacity and duration, but some sites may be more tightly packed than others. For example, battery storage projects can have a range of potential impacts that need to be considered through planning:

- landscape and visual impact and impact on openness;
- type of building – these might be shipping containers housed in a field, a bespoke building, or within an existing industrial building;
- noise, including heating, ventilation and air conditioning systems and cumulative noise;
- security lighting;
- fencing;
- land take;
- flood risk;
- ecology; and
- construction impacts – e.g. noise, vehicle movements, tree removal.

The location of storage is dependent on the service that it is designed to provide. To date, storage has tended to be deployed to provide grid services, with the location determined predominately by the availability of sites close to a suitable sub-station. These can be brownfield or greenfield sites.

Storage co-located with renewables is an emerging business model that may see more uptake in the near future. Storage could, in addition, be part of a new residential or non-residential development site, as an essential element of an energy strategy to decarbonise the new development. Similarly, companies like GridServe and Pivot Power are proposing EV charging hubs served by associated large scale storage capacity (see Box 12, Chapter 6).

Lack of national planning policy on energy storage[i]

In contrast to the consideration of energy storage in Planning Policy Wales, storage is not addressed explicitly in the NPPF or in an energy related National Policy Statement (NPS).[3] The NPPF refers only to policy for associated energy infrastructure "[The planning system] should help to…support renewable and low carbon energy and associated infrastructure."

This lack of policy direction in England has led to inconsistent treatment of storage by LPAs. There is uncertainty about the role of storage projects in the energy system, what are acceptable conflicts

[i] References to national policy in this report are to planning policy for England as set by UK government unless otherwise stated in the text.

with regard to landscape and heritage policies, and debate over whether storage projects should be considered as low carbon infrastructure. Storage developers report very different approaches to storage, both between and within LPA areas, depending on the attitudes of officers and elected members, and the composition of planning committees. This particularly applies to the type, scope and breadth of supporting evidence that an LPA requires to support a planning application, which can range from no additional studies to a full suite of detailed technical and environmental assessments.

Box 2: East Devon planning decision on battery storage project[4,5]

A report for East Devon's planning committee on 31 October 2017 about a proposed 10 MW lithium-ion battery storage project housed in a barn illustrates the many and varied reasons for objections that can arise locally. Objections ranged from the industrialisation of the rural space, to lack of support in the NPPF for storage, to the already significant contribution to renewable energy being made in the parish (through solar farms), to concerns about water run-off. The scheme was recommended for approval by officers but refused by the committee for the following reason:

> **The proposal is not considered to be a renewable or low carbon energy project therefore representing inappropriate development in the countryside with a harmful visual impact contrary to Strategy 7 (Development in the Countryside) and Policy D1 (Design and Local Distinctiveness) of the East Devon local plan 2013 - 2031 and the provisions of the NPPF.**

The applicant initially submitted an appeal but this was later withdrawn.

Potential noise impacts seem to be a particular concern for LPAs, partly driven by lack of information about the noise levels emitted by transformers and inverters. As a relatively young technology in the UK, there are few operational energy storage facilities to provide empirical evidence of noise levels. Whilst some LPAs are content to manage noise risk via an appropriate planning condition that sets specific noise limits, others, because of public concern, have been reluctant to grant permission without a detailed technical report to demonstrate that noise will not be an issue.

There is a real concern that inadequate understanding of the likely impacts of energy storage, and the effect of misinformed public opinion, could outweigh the planning merits of a proposal and put at risk needed energy storage. Box 2, above, gives examples of the objections to a storage project that can arise in a local community.

There can also be uncertainty around what constitutes very special circumstances for allowing storage projects in the Green Belt. Box 3, below, gives an example of where very special circumstances have been accepted by a planning committee.

Box 3: Decision on Green Belt storage facility near York[6,7]

The Publication Draft City of York local plan 2018 includes Policy CC1: Renewable and Low Carbon Energy Generation and Storage:

> **Proposals for renewable and low carbon energy storage developments will be supported and encouraged. Developments should be sited a suitable distance from major residential areas and have suitable fire suppression procedures.**

With the supporting explanation stating:

> **Energy storage is crucial to increasing the proportion of renewable and low carbon energy in the system. This is an emerging area and the Council will continue to work with relevant experts to ensure that suitable energy storage opportunities are identified and brought forward. A Supplementary Planning Document will be produced in due course, including on safety requirements for storage sites.**

Drawing on the emerging local plan Policy CC1 and the NPPF, in February 2019, a York planning committee approved a 50 MW battery storage site in the Green Belt (subject to a number of conditions). The very special circumstances that were acknowledged included:

- Locational need: the site is close to a substation and seen as the only viable storage location in York.
- Innovation: the proposal was considered to support the achievement of sustainable development by providing a new technology which has only recently been introduced to the UK
- Energy resilience: the proposal was accepted as providing resilience to the UK's electrical grid helping to facilitate the move to low carbon renewable energies.

In some cases, energy storage projects have been taken forward without the submission of a planning application utilising the flexibilities provided by the Use Class Order and permitted development rights.

Evidence-based planning practice guidance addressing energy storage would help to encourage a consistent approach by LPAs to policy formulation and decision-making. The guidance, ideally published by government, should sit within the context provided by new national planning policy for energy storage.

The Energy Institute has been working on guidance on the potential planning impacts of energy storage infrastructure. The guidance, due to be published in 2019, is aimed at the development industry and planners and provides a useful and detailed assessment of the potential impacts and relevant regulation and standards to be considered in preparation and determination of a planning application. This could be used to inform government guidance or be endorsed by government.

Organisation	Recommendation
MHCLG **BEIS**	Update the NPPF, the Overarching Energy NPS and supporting guidance to include storage technologies.

Opportunities to plan for energy storage

The research has identified a number of ways LPAs can plan proactively for energy storage, including:

- **working with the local DNO, National Grid and the storage industry** to identify potential areas for allocation of energy storage uses and consider safeguarding or allocating such sites through the local plan process;
- **providing clarity on the treatment of storage** by developing local plan policies and supporting guidance for energy storage; and
- **training members and officers** on the likely issues in determining planning applications for energy storage.

Engage actively with the DNO, National Grid and the storage industry on potential for storage in the area

LPAs can allocate sites for energy storage infrastructure in their plans. The optimum operational location of storage facilities is based on proximity to the appropriate grid infrastructure and the need for storage to play a role in the local or national system in that location. Proactive LPA engagement with National Grid, the local DNO and the storage industry would aid site selection suitable for storage facilities both from the perspective of network infrastructure and planning impacts. An informed evidence base should support decisions to allocate sites or safeguard areas for storage facilities in areas where opportunities in the area are limited or future needs not yet fully evidenced. DNOs would welcome positive engagement by LPAs.

Figure 3: Zenobe's 29 MW battery storage site at Aylesford in Kent, co-located with a solar farm[8]

Develop local policy and supporting guidance on storage

Although there are, as yet, limited examples of local plan policies for energy storage, plans can include policies that encourage appropriately sited storage facilities, and support such policies with guidance in a supplementary planning document. Examples include the draft York Local Plan (see Box 3) and Milton Keynes Council's local plan, Plan:MK. Plan:MK was found sound in March 2019 and includes a policy on storage and new development:

> **"Development proposals will be required to….Review the opportunities to provide energy storage and demand management so as to tie in with local and national energy security priorities."[9]**

Training members and officers on effective determination of planning applications for energy storage.

To improve consistency and quality in decision-making, LPAs should consider developing member and officer training resources to set out the context for energy storage as a decarbonisation tool and raise understanding of technology specific planning impacts of energy storage schemes.

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4. Planning for smart new development

This chapter sets out the main features of a 'smart development' and makes suggestions for how to plan proactively to support net-zero carbon new developments. It also addresses the lack of national policy ambition in this area and considers how to drive-up standards in development proposals.

What is smart new development?

This report uses the term 'smart new development' to describe residential and non-residential developments that use the latest smart technologies to minimise their carbon emissions, in line with the net-zero emissions target.

To support the delivery of smart new developments, the planning system will increasingly be asked to engage with matters such as the technology used by buildings, as well as low or zero carbon infrastructure within and near to sites. Energy will need to feature in relation to both the allocation and masterplanning of sites. Planners will need to be familiar with the features of smart new development that are described below.

Smart new developments will have:

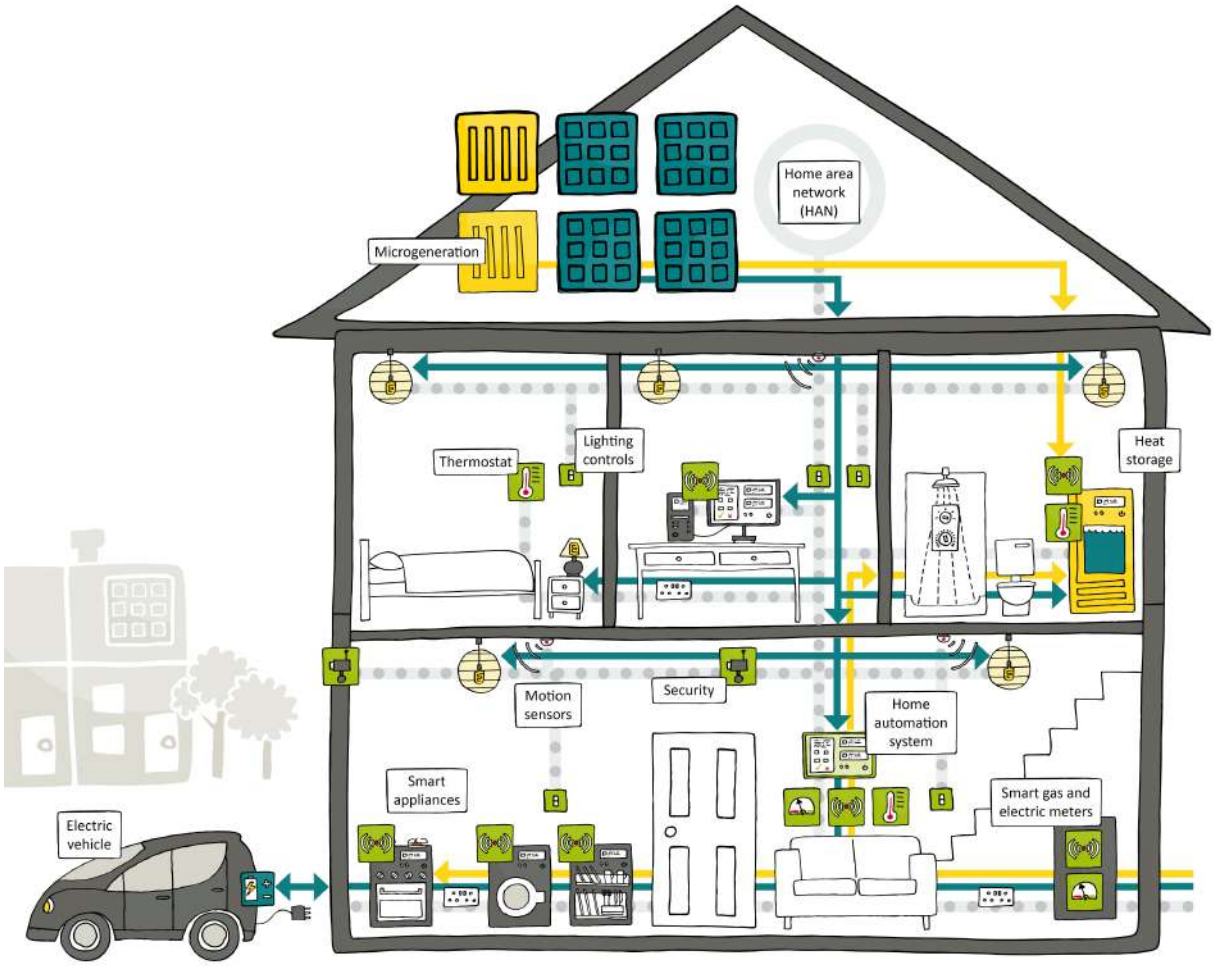
- incorporated and maximised the use of low or zero carbon generation, including where appropriate: renewable electricity generation, low carbon heat distribution networks, large scale storage, microgrids and associated network infrastructure;
- paid attention to energy issues in relation to building orientation and site layout, e.g. taking into account solar gain and solar generation;
- incorporated sufficient tree planting and green space or used other techniques, such as green walls or roofs, to mitigate increasing temperatures;
- considered the impact of different densities and land use mixes on heat demand and supply opportunities; and
- been designed to maximise the use of active, public and shared transport over private transport.

Within smart new developments, individual buildings are likely to feature:

- ultra-high fabric efficiency;
- passive cooling and appropriate ventilation;
- low carbon heat installed or connected, or where this is not possible, low carbon ready features are incorporated;

- thermal storage used as a source of flexibility;
- building integrated renewables and storage;
- EV chargepoints; and
- smart meters, controls, systems and appliances that measure, control and optimise assets behind the meter to:
    - maximise consumption of local generation;
    - reduce peaks and respond to time of use tariffs;
    - provide demand response services to the grid and network operators; and
    - provide useful feedback to the building user.

Figure 4: A smart new home[1]



Lack of national policy ambition

The 2019 CCC report, UK Housing: Fit for the Future, calls for new development to include ultra-high levels of energy efficiency by 2025, at the latest, with no new homes connecting to the gas network from that date.[2] The UK Green Buildings Council (UKGBC) has argued for all buildings to be net zero carbon by 2050 and for all new buildings to meet this standard by 2030, in line with the World Green Buildings Council commitment.[3] The homes being built now will still be in use in 2050, so both cost and energy efficiency considerations point to the need to ensure that current development is designed, built and performs to a standard that meets the UK's net-zero emissions target, rather than retrofit at a later date.

However, in recent years the direction of policy in England has been to slacken the pace of expected change. The commitment to all new homes being zero-carbon in 2016 and the associated planned phased improvements of Part L of Building Regulations that were to lead up to zero carbon (stepped increases to energy efficiency requirements for new homes) were cancelled in 2015.[4] At the same time, the winding up of the Code for Sustainable Homes was announced. In 'Fixing the foundations: Creating a More Prosperous Nation', the government stated these measures were taken to "reduce net regulations on housebuilders".[5] Although recent political announcements have been more encouraging, including the Chancellor's Spring Statement 2019 which announced the development of a Future Homes Standard,[6] there remains much uncertainty about what energy standards will be applied to new buildings and when.

Without strong national standards, only the most committed developers will bring forward developments that meet the UK's decarbonisation objectives. LPAs have been unsure of their scope to 'fill the gap' through local planning policy requiring higher and smarter energy standards. The position was clarified in March 2019 when the government updated planning practice guidance on climate change to state that:

> **"…local planning authorities … can set energy performance standards for new housing or the adaptation of buildings to provide dwellings, that are higher than the building regulations, but only up to the equivalent of Level 4 of the Code for Sustainable Homes."[7]**

Code Level 4 is approximately 19% above current (2013) Part L.

Despite this, a number of LPAs are proposing local policies that exceed this level, including Greater Manchester,[8] Reading and Bristol City Council.[9,10] Plan: MK,[11] the Milton Keynes local plan, was found to be sound in early 2019 and includes a policy for energy efficiency standards to meet Code Level 4 equivalent, with a further 20% reduction in carbon emissions through onsite renewables and for financial contributions to a carbon offset fund to offset any residual carbon emissions. There are already zero-carbon ambitions in place in the London Plan.

There is clearly an urgent need for the UK government to set a robust trajectory for achieving zero carbon standards for new domestic and non-domestic buildings in England through tightening Part L of the Building Regulations. In the meantime, or perhaps in parallel with a new trajectory to zero-carbon, government should allow LPAs to set local standards that drive up ambition. Local

authorities who have declared a climate emergency with the ambition for their area to be 'net-zero' will want to make good use of their planning powers. Restricting the ability of LPAs to set higher energy efficiency or zero carbon standards seems at odds with the overall direction of government policy on decarbonisation and localism.

Organisation	Recommendation
MHCLG	Change planning policy guidance to enable LPAs to set standards that are higher than Code Level 4 equivalent in their local plans.

Signposting to UKGBC's Policy Playbook

The UKGBC's Policy Playbook sets out guidance for LPAs on driving up sustainability standards in new development.[12] It aims to be a 'live' document that is added to as new examples of good practice emerge. It sets out policy options and examples for local plans on energy efficiency standards, overheating and performance management. Case studies of exemplar developments are also included.

UKGBC is facilitating a task group on the definition of net zero carbon and its recommendations report is due to be published in early summer 2019. This work offers an opportunity for the RTPI and UKGBC to share knowledge and resources around common interests.

Organisation	Recommendation
RTPI, UKGBC	Engage on how best to signpost planners to the UKGBC's Policy Playbook.

Opportunities to plan for smart new development

There are a number of opportunities for LPAs to plan proactively for smart new development:

- setting ambitious energy standards for new developments;
- requiring energy strategies for new developments that demonstrate that energy has been considered in every aspect of the development's design;
- requiring developments to demonstrate, through energy strategies, that they will be net-zero ready;
- writing local plan policies to support the delivery of flexibility technologies in new developments;
- where possible, planning for outcomes rather than specific technologies in setting long term policy for new developments;

- taking a proactive approach to delivering developments to higher standards through partnerships with developers;
- developing policies to monitor as built energy performance of new developments to close the performance gap; and
- employing innovative, smart approaches to communicate information on energy.

Box 4: Plan: MK, Policy SC1 Sustainable Construction[13]

Development proposals will be required to demonstrate how they have implemented the principles and requirements set out below.

"Energy and Climate

1. Implement the Energy Hierarchy within the design of new buildings by prioritising fabric first, passive design and landscaping measures to minimise energy demand for heating, lighting and cooling.

2. Review the opportunities to provide energy storage and demand management so as to tie in with local and national energy security priorities.

3. The design of buildings and the wider built environment is resilient to the ongoing and predicted impacts of climate change.

4. Development proposals for 11 or more dwellings and non-residential development with a floor space of 1000 sq.m or more will be required to submit an Energy and Climate Statement that demonstrates how the proposal will achieve the applicable requirements below:

a. Achieve a 19% carbon reduction improvement upon the requirements within Building Regulations Approved Document Part L 2013, or achieve any higher standard than this that is required under new national planning policy or Building Regulations.

b. Provide on-site renewable energy generation, or connection to a renewable or low carbon community energy scheme, that contributes to a further 20% reduction in the residual carbon emissions subsequent to a) above 17.

c. Make financial contributions to the Council's carbon offset fund to enable the residual carbon emissions subsequent to the a) and b) above to be offset by other local initiatives.

d. Calculate Indoor Air Quality and Overheating Risk performance for proposed new dwellings.

e. Implement a recognised quality regime that ensures the 'as built' performance (energy use, carbon emissions, indoor air quality, and overheating risk) matches the calculated design performance of dwellings in d) above.

f. Put in place a recognised monitoring regime to allow the assessment of energy use, indoor air quality, and overheating risk for 10% of the proposed dwellings for the first five years of their occupancy, and ensure that the information recovered is provided to the applicable occupiers and the planning authority."

Setting ambitious energy standards for new developments

A number of LPAs are looking to set higher energy and sustainability standards through their local plans. These LPAs are collaborating with each other and support organisations such as the UKGBC to gather the evidence required to support higher standards and counter arguments advanced by some developers that higher standards make development unviable. As more of these policies are found to be sound, other LPAs should consider adopting a similarly ambitious approach, drawing on existing evidence bases where possible.

Box 5: West Carclaze – an eco-community[14,15]

Development of a new 1,500 home "eco-community" at West Carclaze in Cornwall is required to meet the following energy related requirements:

> **"Demonstrate high levels of energy efficiency in the fabric of buildings on the site…**
>
> **Meet all of the regulated energy requirements of the development from renewable and low carbon sources on or near to the site…**
>
> **Provision of low carbon heat via a heat network with consideration given to sourcing that heat from geothermal resources within the vicinity of the site."**

This policy was written to be ambitious. By requiring 100% of energy requirements from on or near site sources, the policy has the intended consequence of incentivising the developer to both minimise energy demand and to include flexibility technologies to ensure the efficient use of local energy generation.

Requiring energy strategies for new developments that demonstrate energy has been considered in every aspect of the development's design

The smart use and generation of energy should be embedded in the design of new development at every stage of the planning process; including:

- **site allocation:** which should consider opportunities for on, or near, site energy generation, connection to existing low carbon infrastructure or sources of waste heat and for storage and flexibility services;
- **masterplanning:** which should incorporate energy generation considerations, and use orientation, layout and density to optimise operational use of energy; and
- **building design:** design of individual buildings should incorporate energy efficiency measures, low carbon technologies and smart controls to minimise energy use through the lifetime of the development.

An energy strategy should be prepared by the developer demonstrating that smart energy has been considered in every stage of the development process. For phased developments, the energy strategy should be updated to reflect the up to date baseline circumstances and new or emerging opportunities.

Box 6: Leeds Climate Innovation District[16,17]

Citu is developing 800 new low carbon homes alongside manufacturing, leisure, offices and climate resilient public facilities in the Leeds Climate Innovation District. The Innovation District has been part-funded by a £7.7m loan from the Leeds City Region Revolving Investment Fund.

The homes will be timber framed and based on a 'Citu House'; a product which was developed with Leeds Beckett University, with the help of an Innovate UK grant from national government. According to the developer, each Citu Home will be ten times more air-tight than current UK building regulations require, and will prevent heat loss through an "envelope" that stops heat escaping through the building's structure. Each home will offer heating requirements 10 times lower than UK averages and will also offer green roofs, rainwater harvesting systems and solar panels.

Each house owner in the district will be enrolled as a member of a Community Interest Company (CIC). The CIC will own the renewable energy systems within the district and all energy produced will enter a community network (a micro-grid and district heat network). The CIC will purchase 100% certified renewable electricity from the National Grid. The CIC then bills residents according to energy use, with surplus sold back to the grid.

Requiring developments to demonstrate through energy strategies that they will be net zero ready

There are a number of factors that can be designed into developments to ensure that they are net zero carbon ready. For example, maximising fabric efficiency is important for ensuring expensive retrofit solutions, such as external wall cladding, are not needed at a later date. Similarly, 3 phase electricity provision to support heat pumps, EV chargepoints and larger PV arrays is far cheaper to incorporate during building design and construction than to retrofit. The inclusion of low temperature heat distribution systems (for example, underfloor heating or oversized radiators) can also help to prepare a development for future improvement even if low carbon heat is not included

at the point of build.

The new draft London Plan features a requirement that energy strategies are prepared that include 'proposals explaining how the site has been future-proofed to achieve zero carbon on-site emissions by 2050'.[18]

Writing local plan policies to support the delivery of flexibility technologies in new developments

Storage and smart controls are not considered through the Standard Assessment Procedure (SAP) of energy performance. SAP measures predicted energy and carbon use for a building, not the technology that enables building users to shift their demand outside of peak periods or to use available renewable generation. As a result, these technologies tend not to be included in energy strategies designed to achieve a particular level of carbon savings.

These technologies nonetheless have a clear role to play in a smart energy future and local plan policies can encourage their use. For example, Plan: MK requires that developments should: 'review the opportunities to provide energy storage and demand management so as to tie in with local and national energy security priorities'.[19]

Another route to supporting the delivery of flexibility technologies would be to require developers to measure the performance of developments against a smart readiness indicator. The EU is currently developing a smart readiness indicator for new buildings under a 2018 amendment to the Energy Performance of Buildings Directive.[20] The aim is to:

> **"…raise awareness amongst building owners and occupants of the value behind building automation and electronic monitoring of technical building systems and should give confidence to occupants about the actual savings of those new enhanced-functionalities."**

In rating a building, features to be considered include:

- smart meters;
- building automation and control systems;
- self-regulating devices for the regulation of indoor air temperature;
- built-in home appliances;
- recharging points for EVs;
- energy storage; and
- and detailed functionalities and the interoperability of those features, as well as benefits for the indoor climate condition, energy efficiency, performance levels and enabled flexibility.

An initial methodology has been developed and is currently being tested.[21] Measurement against the indicator could be required by LPAs through appropriate policy in local plans. This would enable LPAs to require new development in their area to meet a certain level of smartness and for this to be monitored independently through the indicator.

Where possible, planning for outcomes rather than specific technologies in setting long term policy for new developments

Smart and low carbon technologies, particularly microgrids, smart controls, and storage technologies are developing rapidly, at a pace that can be at odds with the timescale required to bring forward and implement a local plan. To retain flexibility for developments to use the best available energy technologies when needed, and avoid the imposition of sub optimal technologies, LPAs should plan for outcomes rather than specific solutions. Policies should be framed to encourage developers to 'design in' energy efficiency to meet a particular (high) standard. The technology choices can then be reviewed through the energy masterplan and updated, for example for multi-phased development, as phases come forward for delivery.

Box 7: Explaining Microgrids

Microgrids are intelligent local electricity grids that can optimise local generation and consumption, minimise local grid constraints and capacity, and provide balancing services for the grid.

Virtual microgrids can be created, which are local energy marketplaces providing the same balancing services through market transactions. These operate over the DNO's wires and do not interface with the planning system.

Physical microgrids consist of private wire networks that integrate generation assets, storage and demand. Using smart controls, they attempt to balance the development's generation and demand, with any excess generation or demand using the DNO controlled adjacent network. There is a requirement that building users can switch to another supplier; the microgrid cannot operate as a monopoly or charge excessively for electricity. Electricity users should experience a similar service with a physical microgrid as with a traditional connection.

Physical impacts are limited; the infrastructure to support a physical microgrid is similar to that used by the DNO operated network, although additional controls, storage and low carbon generation are usually integrated into the system.

Physical microgrids could be considered through a site's energy strategy as a means to reduce carbon emissions by maximising onsite use of renewable generation and as a way of generating revenue through flexibility services. A microgrid may not be appropriate for all development sites.

Taking a proactive approach to delivering developments to higher standards through partnerships with developers

The exemplar sustainable developments considered by this research, some of which are achieving net zero carbon development, all result from the determined drive by the LPA and the developer to achieve high standards.[22] A collaborative, innovative partnership between an LPA and a willing developer can overcome barriers, even in difficult financial markets. The resource implications for an LPA of such collaboration should not, however, be underestimated, and appropriate technical capacity and time need to be allocated to delivery.

Developing policies to monitor as built energy performance of new developments to close the performance gap

Smart technology could play a key role in performance monitoring, allowing LPAs, developers and building owners to access live information about how a building is performing. The CCC estimates that emissions from new homes can be two to three times higher than predicted.[23] This means that even when high energy efficiency standards are in place in policy and appear to have been met, excess carbon emissions can continue to be created. This is because of developers designing for compliance rather than designing for performance. New homes perform to the required standard through their lifetime, rather than just in their designed performance.

Plan:MK which was found to be sound in early 2019, includes a policy aimed at closing the performance gap through a requirement for a quality regime and for post-occupancy monitoring of at least 10% of dwellings for the first five years.

LPAs can use the recommendations set out in the UKGBC Policy Playbook to develop a performance monitoring regime for new developments that require data and information to be gathered and the most up to date data management systems to be installed in buildings to facilitate smart energy.

Employing innovative, smart approaches to communicate information on energy

Planning officers and elected members determine planning applications based on the information submitted with the planning application and any additional documents such as an Energy Strategy. Usually these take the form of 2D plans and written assessments. Some of the energy related impacts of the development are, however, difficult to understand in this format and 3D modelling software is needed to fully explain technical detail, such as how natural light is used in a building design.

In order to fully understand the implications for planning of new and emerging technologies, LPAs when appropriate could usefully ask for information in a more immersive format, such as videos and virtual reality software.

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5. Planning for the decarbonisation of heating and cooling

This chapter considers the challenges of decarbonising heating and cooling and the likely impacts on the built environment the planning system will need to address. In doing so, the chapter includes recommendations on how issues identified by the research should be addressed. It sets out, as good practice learning points, the opportunities for local planning to support the decarbonisation of heating and cooling.

Decarbonised heating and cooling in a smart energy future

Within the lifetime of much planning policy being written today, the production of energy to meet the UK's heating and cooling needs to be largely decarbonised. As temperatures rise, the demand for low carbon cooling will increase. Decarbonised energy sources for heating and cooling will be central elements of a smart energy system by the 2030s.

Thermal storage can be used to support the balancing of the energy system as a whole. Taking a multi-vector approach, which integrates the energy needed for heating and cooling with demand for power, offers clear value in the form of energy storage and demand flexibility: the two key elements of a smart energy system.

Provision of affordable, zero-carbon energy for heating and cooling presents a major challenge. For example, strategic decisions on the future of the natural gas network are still to be taken. Given the full answer to decarbonising heat and cooling in the existing building stock is not known, the focus is currently on low regret measures that make sense now. Scenarios for the future energy mix produced by National Grid, Imperial College and others, point to the importance of reducing demand for heating and cooling through fabric improvements and ventilation systems; alongside considering low and zero carbon energy sources such as heat pumps, hybrid heat pumps, and biomass boilers.[1,2] The scenarios also recognise the value of installing new smart heat network infrastructure in appropriate locations to move heat around.

The potential planning impacts of decarbonising heating and cooling

The range of impacts on local environments likely to arise from decarbonising heating and cooling is relatively limited. In relation to district heat networks there will be impacts from installation, including the disruption associated with retrofitting heat network pipework, or incorporating accessible soft verges into new developments to facilitate installation of networks. Other technology specific impacts include noise from air source heat pumps (noting that newer generation heat pumps have significantly lower noise impacts[3]) and air quality issues arising from

biomass.

In their forward planning, and decision-taking on proposed developments, LPAs need to be aware that district heating networks may not always be the right answer. A district heating network should be weighed against other heat delivery options and networks should only be developed where there is a proven low carbon heat source available. Lower temperature networks provide the greatest ability to use waste and renewable heat and should be the priority. Where cooling demand is also significant, fifth generation approaches can work (see below).

Uncertainty in national policy for decarbonising heating and cooling

In December 2018, the UK government published Clean Growth - Transforming Heating, Overview of Current Evidence.[4] This sets out the government's latest thinking on heat decarbonisation, pointing to the need for further action and research on most deployment options. The government is working on a new roadmap for policy on heat decarbonisation, due for publication in 2020. This follows a significant gap in policy making surrounding heat, with the previous strategy published in 2012.

In UK Housing: Fit for the Future? the CCC urges government to commit to a:

> **"fully-fledged heat strategy which:**
>
> - **includes a clear trajectory of standards set well in advance;**
> - **funding for low-carbon heat from 2021;**
> - **incentives for able-to-pay householders;**
> - **and a governance framework to drive decisions on heat infrastructure."**

The CCC also said that by 2025 at the latest no new homes should be connected to the natural gas network. Clarity about the medium and long term future of the gas grid is critical to future planning. Many respondents to this research called for an objective discussion about the future of gas, as is taking place in Denmark through the Future Gas Project.[5] And, in contrast to the current situation in England, the Scottish Government has taken a lead through its vision for 2030:

> **"Our Vision: by 2030… gas networks remain a vital and flexible component of Scotland's national infrastructure, delivering affordable energy for heating our homes and businesses. The energy resource carried by the networks will be lower carbon than it is today. The policy, regulatory and technical developments will have been put in place to allow natural and low carbon gas to be blended in the networks, including a contribution from hydrogen. We will also understand clearly the feasibility and costs of repurposing the gas networks to carry 100% hydrogen, and will have made strategic decisions about the long term role of the networks and the wider decarbonisation of heat."**
>
> **Scottish Government, A vision for Scotland's electricity and gas networks[6]**

Organisation	Recommendation
BEIS, MHCLG	Work together on the development of a national heat strategy so as to fully address the role and potential of spatial planning in delivering local decisions on the future of heat.

A sympathetic approach to energy efficiency measures in historic buildings

Many energy efficiency measures (and building integrated renewables) do not require formal planning approval by the LPA. There are fewer flexibilities in the case of listed buildings, conservation areas and World Heritage Sites.

Gaining planning permission for measures that would be permitted development in other properties can be challenging for applicants. Heritage conservation officers and Historic England are cautious about energy efficiency improvements if they are perceived to impact on the special quality or fabric and appearance of the historic building. Approaches that reduce carbon emissions that are sympathetic to a building's historic value need to be promoted, for example through guidance. For example, greater attention could be given to vapour permeable natural materials in internal wall insulation, which have been shown not to be detrimental to the building physics of traditionally constructed buildings.

Bath and North East Somerset Council has prepared guidance on retrofitting listed and historic stock.[7] This builds on advice and a series of events and training delivered by the Centre for Sustainable Energy with the Bath Preservation Trust.[8]

Organisation	Recommendation
Historic England	Work with energy efficiency experts to promote appropriate ways to cut carbon emissions from historic buildings.

Opportunities to plan the decarbonisation of heating and cooling

LPA support for the decarbonisation of heating and cooling could include:

- **whole system strategic energy planning**;
- adopting policies that **only support a district heat network where a low carbon heat source is available**;
- **setting policy to restrict direct electric heating** to buildings with ultra-high energy efficiency standards; and
- **supporting whole house retrofit** through making local development orders (LDOs) that grant appropriate permissions.

Whole system strategic energy planning

The whole system strategic energy planning described in Chapter 7 is a powerful tool for considering local options to decarbonise heat and cooling. This because the route to decarbonising heat will be different in different areas depending on a number of locally specific factors, such as:

- the extent of the gas network;
- building stock age, type and density;
- potential sources of waste heat;
- potential for district heat networks to be fuelled by low carbon heat;
- electricity grid capacity;
- fuel poverty rates; and
- political will and community engagement in decarbonisation.

Only supporting a district heat network where a low carbon heat source is available

When considering development of low carbon heat networks, care should be taken to ensure the heat source is supplied by low carbon energy generation technologies. Otherwise there is a risk of developing redundant assets that are more carbon intensive than connection to the gas network. For example, it can be prohibitively expensive (and complex) to convert high temperature networks fuelled by gas or gas Combined Heat and Power (CHP) technologies to low carbon, low temperature heat sources such as heat pumps, or waste heat.

Plymouth City Council is looking to future proof new development in the city by identifying a Low Temperature Building Zone, requiring new developments to include the necessary heating and cooling infrastructure to enable future connections to a planned fifth generation low temperature heat network.

Fifth generation networks run at close to ambient ground temperature. They employ distributed heat transfer in each building using heat pumps to achieve heating when buildings need heating, and cooling when buildings need cooling. Cooling can extract heat that can be utilised in other buildings, either at the same time or with storage over time, as an energy transfer. Heat losses to the ground are reduced as a result and the network can more readily integrate heat from low grade waste heat and renewable heat sources.[9]

New heat networks should also require a smart approach, with data collection and performance management built into the design. There may be opportunities to integrate the heat network with the local electricity network enabling a multi-vector smart approach, as shown in Box 8 with the Celsius Project in London.

Box 8: The Celsius Project in London[10]

The Celsius project, an EU funded project, is working on a number of demonstrators to identify alternative low carbon heat sources. Examples include a project in London looking to provide waste heat from the London Underground and an electricity substation to the local Bunhill Heat and Power Network. The demonstrator's second phase will be to incorporate a thermal store to support local electricity and heat balancing services.

LPAs can have an important role in bringing together potential heat customers and facilitating mixed used development, rather than purely residential environments, and at sufficiently high densities to help underpin the viability of networks. Planning policy can also provide support by requiring new development to connect to existing networks, or to be built "connection ready" (see Box 9), and LDOs can be used to grant planning permission for heat network infrastructure in an area.

Regen and Stephens Scown's guide to heat networks offers a useful introduction to the issues to consider.[11] CIBSE's Heat Networks: Code of Practice for the UK offers a detailed technical guide to issues, for example engineering calculations around required levels of pipe insulation and network densities.[12] The THERMOS project led by CSE has developed a free online modelling tool that enables local authorities to undertake the initial stages of planning new heat networks in-house using high-resolution spatial information, avoiding the need for outsourcing costly pre-feasibility studies.[13]

It is important when considering a district heating network to take into account the learning gained from those areas which have been in the vanguard of delivering district heating, such as Cranbrook, in East Devon (more information about this case study is available in the appendices to this research, available on the RTPI website).

Box 9: Bristol City Council: Draft Policy CCS2: Towards zero carbon development[14]

Bristol City Council's draft policy CCS2 sets out a comprehensive approach to zero carbon ready development and is worth reading in full. In relation to heating systems, the draft policy sets out a hierarchy for new development:

New development will be expected to demonstrate that heating systems have been selected in accordance with the following approach:

- **Where possible, connection to an existing classified heat network or a new classified heat network from the point of occupation;**
- **Where it is likely that existing or proposed heat networks will grow, designing development with a communal heating system which could connect in the future;**
- **Elsewhere, employing sustainable alternatives to heat networks such as individual renewable heat or communal renewable/low-carbon heat.**

Classified heat networks are defined as:

'Classified heat networks' include those being developed by Bristol City Council and third party networks that meet certain requirements including:

- **Compliance with appropriate technical standards (presently the CIBSE code of practice);**
- **They are powered by renewable/low carbon sources or are on a clear timeline and technology pathway towards decarbonising the heat provided by the energy centre in line with the council's aspiration for the city to be run on entirely clean energy by 2050 and carbon neutral by 2050;**
- **They offer heat and/or cooling services at a fair and affordable price to the consumer;**
- **They provide annual reporting on their performance and carbon content.**

Restricting direct electric heating to buildings with ultra-high energy efficiency standards

Property developers are, in some circumstances, starting to favour direct electric (resistive) heating over other forms of heating, due to low upfront costs and convenience of installation. This form of heating can, however, result in high bills for the end user, higher carbon emissions than alternative options and place high demands on the electricity network.

Regen's analysis shows that there are some circumstances where direct electric heating can be a suitable low cost and low carbon option, where a combination of factors is at play. This can be the case where it is deployed alongside ultra-high energy efficiency standards (substantially improved over existing Building Regulations) so as to reduce heat demand; where heat network approaches are not suitable and where individual boilers; or heat pumps are prohibitively expensive. Rather than a blanket ban on direct electric heating, a more nuanced approach is to restrict its application to buildings with ultra-high energy efficiency standards where other low carbon heating options are not feasible.

Supporting whole house retrofit

80% of the 2050 building stock is already built and bringing this stock up to a high energy

efficiency standard represents a huge but unavoidable challenge. In many cases a whole house approach to energy retrofitting is required if sufficient carbon savings are to be achieved. Box 10 sets out a whole house retrofit approach developed by Energiesprong. This type of approach can require planning permission in some circumstances, for example, when there is a need to raise the roofline and add external wall insulation. LPAs could consider making LDOs that grant appropriate permissions so as to encourage the roll-out of whole house retrofit in suitable areas.

Box 10: Energiesprong – whole house retrofit

Energiesprong is an innovative approach to whole house deep retrofit developed in the Netherlands and now deployed in over 5,000 homes. The principal features of the approach are:

- the use of off-site manufacturing to reduce costs (once at scale) and time spent on site;
- performance guarantees from the contractor;
- innovative use of finance, underpinned by the guaranteed performance.

From a planning perspective the considerations are relatively straightforward - an Energiesprong retrofit would typically result in external wall insulation, an increased roofline (incorporating solar PV) and an individual 'energy pod' housing a heat pump and other building services.

The picture below shows a row of social homes in Nottingham that have undergone the Energiesprong treatment (the home without the measures installed is privately owned).

Image: Energiesprong International

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6. Planning for electric vehicles

This chapter explores the role of electric vehicles (EVs) in a smart energy future and the likely impact on places. In doing so, the chapter draws out a number of considerations for planners and, as good practice learning points, highlights the opportunities for positive planning to support the roll-out of EVs.

Electric vehicles in a smart energy future

The UK government has committed to ban the sale of fossil fuelled cars by 2040 and acknowledges that EVs will have a major role to play in decarbonising the transport system. The scale of decarbonisation achieved will depend on the extent to which the electricity network is powered by low carbon energy. Smart charging will enable vehicles to be charged outside times of peak demand and at times of excess renewable generation. The development of effective Vehicle to Grid (V2G) technology, and business models to allow batteries in EVs to be used as a source of flexibility, offers further potential for EVs to play an active role in a smart energy future.

Figure 5: EV uptake scenarios[1]

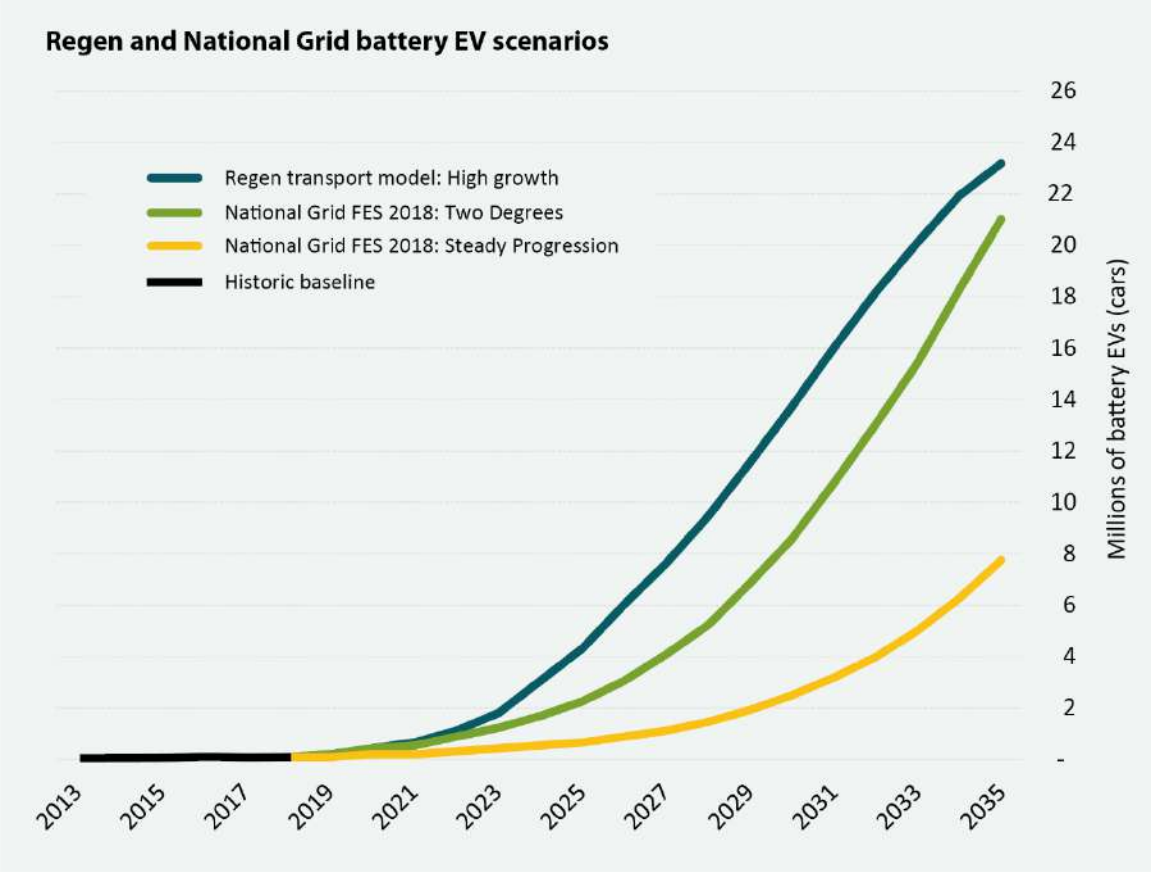
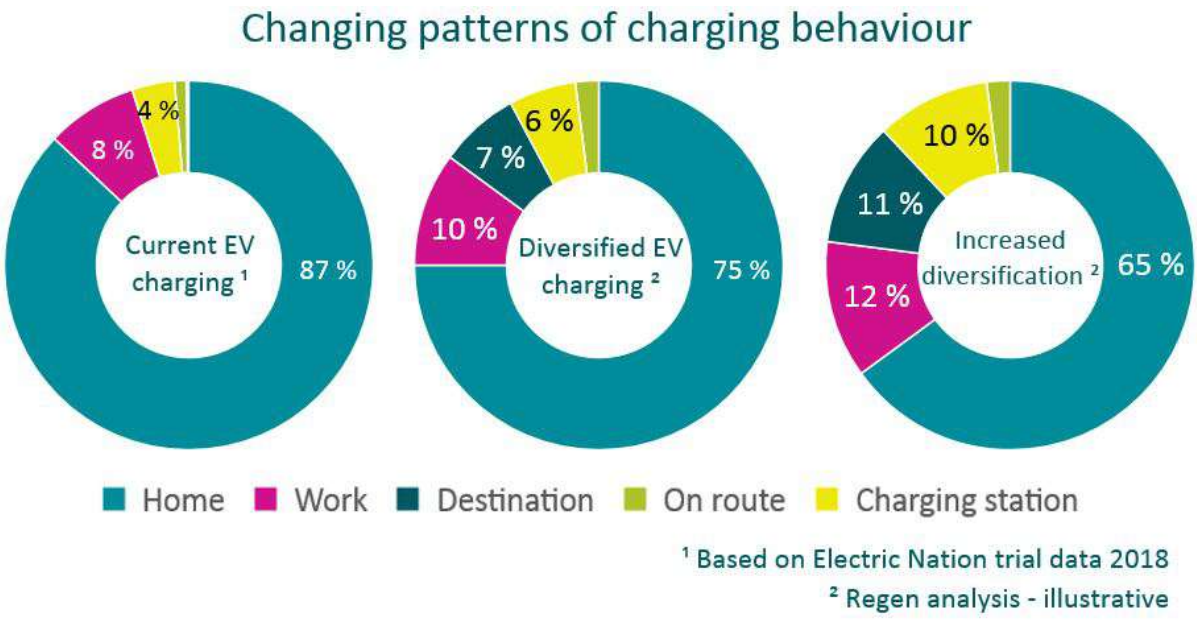


Figure 5, above, shows the variation in potential uptake in EVs for the period to 2040. Recent UK sales figures are, in practice, already ahead of the most ambitious level assumed in National Grid's Two Degrees Future Energy Scenario for 2019.[2]

Figure 6, below, shows current charging patterns and potential future scenarios. While likely future charging patterns are not yet fully understood, Regen anticipates that home-based charging will continue to be the primary charge option for car owners with off-street parking, offering ease of use as well as access to competitive electricity tariffs.[3] As vehicle ranges increase, however, the proportion of at-home charging will reduce as rapid and fast charging becomes more widely available at destinations, including places of work, and roadside.

More diverse charging options will also become important as the EV market extends to the 30% to 40% of households without off-street parking.[4] It is anticipated that factors such as more competition, price deals at destination locations, and the evolution of rapid charging alongside larger batteries, will encourage more diverse charging behaviour.

Figure 6: Illustrative EV charging patterns[5]



The potential planning impacts of electric vehicles

On-street and off-street (car park) charging

On-street chargers can take a range of forms, from curb-stone chargepoints to freestanding bollards and electrified lamp-posts. Off-street chargepoints can be located in (private and public) residential, employment, retail and leisure carparking areas. All have the potential to alter street scene, accessibility and service routes. As such, although generally dealt with as permitted development (see Box 11, below), there are a number of factors that should be considered when installing chargepoints. These include:

- pavement space – allow enough space for secure and free movement by pedestrians and disabled users and avoiding trailing cables;
- clutter, design and street-scene – consider opportunities to use existing street furniture and redundant assets to house chargepoints e.g. lamp posts and redundant phone boxes;
- loss of parking for other car users – consider the appropriate allocation of on-street or carpark spaces dedicated to chargepoints;
- adequate provision for disabled users;
- how to mitigate disruption during installation;
- opportunities for accessing power supply from associated renewables and battery storage and the need for additional network infrastructure such as substations; and
- ensuring redundant assets are removed once no longer needed.

Box 11: Permitted development right for vehicle chargepoints

Schedule 2, Part 2 of The Town and Country Planning (General Permitted Development) (England) Order 2015 (as amended) sets out permitted development for wall-mounted (Class D) and freestanding (upstand – Class E) chargepoints in off-street public and private carparks subject to a number of provisions, including that chargepoints:

- are not within 2 metres of a highway;
- Class E (freestanding) chargepoints do not exceed 1.6m in height within the curtilage of a dwellinghouse or block of flats, or in any other case 2.3m in height (as amended in May 2019)
- Class D (wall mounted) do not exceed 0.2 cubic metres;
- are not within a site designated as a scheduled monument, or within the curtilage of a listed building;
- are removed once no longer needed;
- Class E do not result in more than 1 upstand for each parking space[1].

Local Authorities and urban development corporations can also install on-street chargepoints as permitted development, in a similar way to other street furniture (Part 12 Class A).

Dedicated rapid charging hubs

Rapid charge hubs are likely to become the norm as EV technology evolves, with EV users able to "re-fuel" in a relatively short amount of time at hubs as they would at a petrol station. National Grid has identified 50 strategic locations around the UK where the transmission and motorways networks overlap, enabling the installation of banks of 350kW chargers which could recharge EV batteries in as little as five minutes.[6] Gridserve and Pivot Power have both announced ambitious plans for networks of rapid charging hubs (see Box 12, below).

Box 12: Charging companies announce plans for networks of charging hubs[7,8]

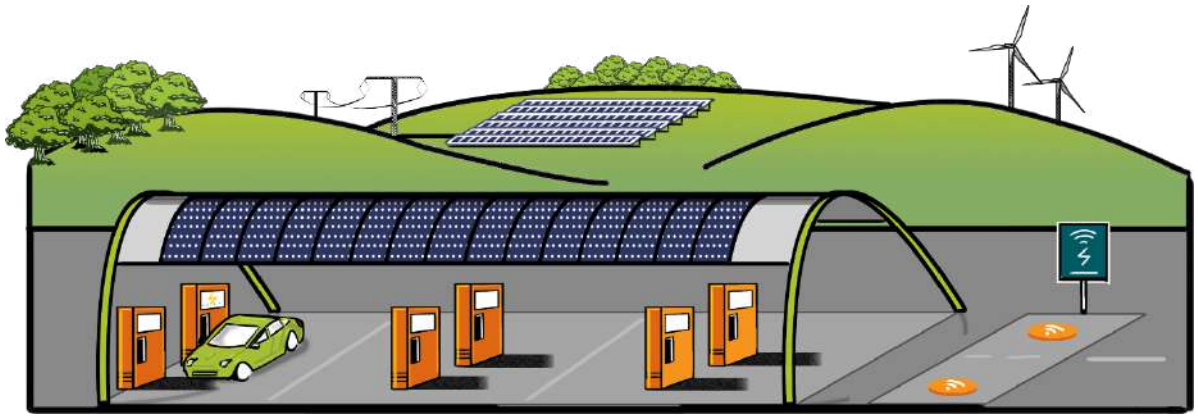
Gridserve is planning a network of 100 Electric Forecourts across the UK, with associated solar farms and battery storage. 80 of the sites have already been secured with the first sites due in 2019 and the remainder planned to be completed within five years. Sites will allow charging for up to 24 vehicles at a time. The forecourts will include facilities such as lounges with WiFi, coffee shops and fresh food. The aim is to make electric charging as convenient as it is to refuel a petrol or diesel vehicle.

Pivot Power plans to develop 45 rapid charging hubs with up to 100 chargers at each. The facilities will be located close to towns and major roads and will be fed directly by the high-voltage transmission network. Each site will have a 20 MW grid connection – large enough to supply around 10,000 homes. Pivot Power says co-locating batteries and chargers and connecting them to the transmission network will reduce building and operating costs.

The scale of charging hub infrastructure has a number of potential implications for planning:

- for additional vehicle movements or different patterns of movement;
- for additional footfall to be created and opportunities to harvest this for local economic benefit;
- the size of site required and potential loss of greenfield sites;
- the effects of additional infrastructure, such as a hub roof similar to a petrol forecourt, café, toilets and recreational facilities; and
- the effects of additional infrastructure, such as associated renewables, battery storage and network infrastructure such as sub-stations.

Figure 7: A service station of the future?[9]



National policy support for electric vehicles

The factors driving government support for EVs include the need to cut greenhouse emissions and to tackle air quality. The Road to Zero sets out the UK government's strategy to support the roll out of EVs, with the ambition that at least half of new cars are ultra-low emission by 2030.[10] The strategy includes proposals of direct relevance to planning including:

- using the Building Regulations in England to ensure new homes and new non-residential buildings provide chargepoints (see below);
- extra permitted development rights in England (see Box 11);
- taking powers through the Automated and Electric Vehicles Act (2018) to ensure that chargepoints are:
    - available at motorway service areas and large fuel retailers;
    - easily accessed and easy to use;
    - 'smart ready' (smart in the sense of being able to transmit and receive data and respond to external signals); and
- requiring all new street lighting columns to include charging points, where appropriately located, in areas with current on-street parking provision.

Enabling smart and managed charging

There have been a number of reports in the national press suggesting that the impacts on the grid from the transition to EVs will be prohibitive.[11,12] With high levels of EV uptake, and without widespread upgrades, there is a risk that the electricity system will be unable to cope with the additional load from chargepoints. Through innovation funding, DNOs are exploring how to mitigate the impact of EVs on the electricity network through smart and managed charging. Examples include My Electric Avenue led by Scottish and Southern Electricity Networks (SSEN) and Electric Nation led by WPD.[13,14]

These and other studies show that the need for costly network upgrades and additional infrastructure could be partially mitigated by enabling and incentivising users to shift their charging to times of lower electricity demand (smart charging), and by allowing DNOs to curtail charging at peak times (managed charging).

Although those considering converting fleets of vehicles to electric may currently face difficulties in getting enough network capacity at a reasonable price to meet their needs at depot sites, smart control systems and energy storage can help to manage the issue.

To enable smart solutions, additional standards and controls will be needed. The Automated and Electric Vehicle Act (2018) includes provisions that will require:

- all new chargers to be 'smart'; and
- chargepoint operators to provide publicly available data on the location and live availability of chargers and to provide consistent data to National Grid, DNOs and others, to help manage the electricity network.

Figure 8: An EV charging at home[15]

Figure 9: A wall-mounted EV chargepoint[16]

Minimum chargepoint standards for new developments

The government is expected to consult shortly on using the Building Regulations in England to set minimum chargepoint provision requirements in new buildings and will consult on:[17]

- introducing changes so that every new home has a chargepoint, where appropriate;
- ensuring that all new non-residential buildings with more than 10 parking spaces have as a minimum ducting infrastructure for 1 in 5 car parking spaces and at least one chargepoint; and
- the appropriate minimum requirements for existing non-residential buildings with more than 20 car parking spaces.

The revised NPPF requires local plans to consider adequate provision of chargepoints according to local needs. Supporting guidance is expected this year. Meanwhile, the Energy Saving Trust (EST) offers free support to local authorities on electric vehicles and charging infrastructure through its Local Government Support Programme, funded by the Department for Transport.[18]

Opportunities to plan for electric vehicles

In the early years of EV roll-out, there are likely to be significant differences in local uptake rates,[19] and LPAs will need to:

- consider **EVs and chargepoint provision as part of their transport and energy planning**;
- set **parking standards for active and passive charging** infrastructure;
- adopt **locally appropriate ways to secure high quality design and public engagement**

in the provision of on and off-street chargepoints, and rapid charging hubs; and

- **keep local policies under review** to stay abreast of technical developments.

Consider EVs as part of transport and energy planning

The impact of EVs needs to be carefully considered in the context of both local transport planning (including EV's role in low carbon emissions zones and the adequacy of chargepoint provisions), and their effect of the wider energy system. For the latter, EV charging will have an impact on the electricity network and potentially require new infrastructure. Planning for and managing the effects of infrastructure development would benefit from a coordinated approach by LPAs and local DNOs to spatial and network planning through some form of whole system, strategic energy plan (see Chapter 7).

To support the development of an effective EV charging network, a chargepoint needs-assessment should be considered. Such an assessment would review current chargepoint provision, and future need, mapping out plans for a network of chargepoints on public and private land.

An assessment would:

- consider current chargepoint and parking provision in the area, looking, for example, at the proportion of on-street or off-street residential parking and its accessibility to local communities and business;
- forecast the growth of EVs in the area, informed by local factors such as housing types, public transport provision and demographics;
- consider the economic benefits that chargepoint provision can bring to local businesses, for example by attracting additional patronage to local businesses by locating chargepoints close to local services and retail outlets; and
- engage with:
    - private carpark owners, car club providers and chargepoint companies to gain understanding of their plans;
    - Highways England to understand, where appropriate, plans for motorway service provision; and
    - the DNO and National Grid to understand where network provision supports chargepoint roll-out and where strategic network upgrades might be needed.

An effective chargepoint network should offer a range of on and off-street charging locations, with a good geographical spread and a choice of slow, fast and rapid charge times. Consideration should be given to:

- on-street or alternative charging for those without off-street parking. The RTPI is exploring climate issues through the lens of climate justice,[20] and there is a real concern that those who cannot afford or do not own a property with off-street parking could be excluded from owning an EV;

- public and private carpark chargepoints related to employment and transport hubs. Cenex's report for Innovate UK (EV Charging in Car Parks) offers a useful resource for understanding the considerations around EV chargepoint provision in public car parks;[21]
- rapid charging hubs similar to existing fuel stations, including at motorway service areas;
- destination charging at retail and leisure facilities ensuring that charger types are appropriate to the location, for example that retail outlets offer fast or rapid, rather than slow chargepoints;
- encouraging providers to adopt models that ensure EVs are moved once charged, rather than blocking a chargepoint for extended periods;
- management of future maintenance of chargepoints, for example via a management company, funded through service charges, or by the local authority as part of their adoption of new roads or improvements to existing roads; and
- using LDOs to facilitate provision of public chargepoints based on the chargepoint needs assessment (see for example Swindon's LDO described below in Box 13, below).

Box 13: Swindon's LDO for EV chargepoints[22]

To support the roll out of public charging infrastructure, Swindon Borough Council made an LDO in June 2015 granting planning permission for hydrogen fuel cell and EV refuelling points at all existing petrol filling stations and for EV refuelling points at certain supermarket car parks. The conditions state that the LDO does not apply on greenfield land or where any ancillary buildings are higher than 4m or greater than 200m³. The LDO is one of 27 low carbon LDOs in use in the Borough.

Setting parking standards for active and passive charging infrastructure

The NPPF supports the use of local parking standards to promote EV chargepoints:

> **"If setting local parking standards for residential and non-residential development, policies should take into account:**
>
> **…e) the need to ensure an adequate provision of spaces for charging plug-in and other ultra-low emission vehicles."[23]**

A proposed update to Building Regulations in England is expected to set minimum provision levels for chargepoints in new developments. LPAs will need to consider whether local standards, based on the needs and characteristics of the local area, could be framed to exceed the nationally set minimum.[24]

Local parking standards tend to take the form of a required percentage of the provided spaces to offer either active (actual useable chargepoints) or passive provision. Passive provision can mean either the cabling is in place to enable straightforward connection of a chargepoint at a later date, or sufficiently wide ducting is provided to enable cables to be inserted at a later date without the

need for excavation. For clarity of delivery, the definition of passive provision should be clearly set out in local parking standards.

Evidence from the REA indicates that the installation of chargepoints in locations with passive provision can be about 70% cheaper than retrofitting where there is no passive provision.[25] Requiring passive provision rather than active provision has other potential benefits including:

- enabling home/business owners to choose and install the most up-to-date/appropriate technology at the point when they invest in an EV; and
- the cost of the chargepoint installation is not borne by the developer, so reducing adverse impact on development viability.

LPAs should judge what constitutes adequate provision based on a chargepoint needs assessment if carried out, and engage with the DNO to examine the impacts of the proposed policy on the network.

In setting standards, LPAs should consider:

- the impact of the envisaged standards on differing types and scales of development, and how best to secure the right mix of rapid, fast and slow chargers;
- provision for disabled users of EVs;
- provision for car clubs; and
- specific standards for proposed development in areas subject to, or at risk of, poor air quality.

Locally appropriate ways to secure high quality design and public engagement

Guidance on good design principles and public engagement encourages acceptance of chargepoints and can help to deal with public concerns about the roll-out of infrastructure in a local area. LPAs should consider producing guidance reflecting the characteristics of their area or if replicating guidance produced elsewhere ensure it is tailored to the local context. In particular, LPAs may wish to consider design guidance for EV chargepoints in conservation areas and other heritage designations.

Surrey County Council adopted an Electric Vehicle Strategy in February 2019, following public consultation. The strategy covers a range of EV issues, from developing the public network to residential charging.[26] Transport for London is currently producing guidance on EVs and their impacts on the street-scene.

Box 14: Go Ultra Low West[27,28]

Go Ultra Low West is a £7m project to accelerate the purchase of EVs across Bristol, South Gloucestershire, North Somerset and Bath & North East Somerset. The project includes:

- **Public charging network:** informed by market research, over 120 new chargepoints will be installed to double the size of the current charging network 'Source West' and enable owners of EVs to charge at more destinations.
- **New Charging Hubs:** by 2021 there will be four Rapid Charging Hubs in the West of England area. The first of these is being developed in Eastville Park in Bristol. Expected to launch summer 2019, the charging hub will have space for four vehicles to 'rapid charge', meaning a standard EV could refuel to 80% in as little as 20 minutes. Alongside the latest EV technology, the hub will include new toilets and a food and drink kiosk.
- **New Electric Car Clubs:** Go Ultra Low West is working with West of England car club providers to install charging points for EVs.
- **Business grants:** Go Ultra Low West provides 50% match funding for chargepoints to be installed by businesses across the area.
- **Council fleets:** each local authority in the area is converting part of its diesel / petrol powered fleet to EVs. To date, over 70 EVs have been added to the fleets.
- **Demonstration vehicles:** an opportunity to try out an EV for two weeks, for only the cost of the electricity used. This is in partnership with ECar, part of the Europcar group. People can experience an EV without having to purchase one.

Keeping local policies under review to stay abreast of technical developments

New battery chemistries, new charger technologies and longer range vehicles: EV technology is developing rapidly with longer range vehicles and faster chargers coming to the market. For example, charging models may shift towards rapid charge point hubs and although expensive now, wireless chargers, inductive roadways or garages with inductive floors may become a viable option as costs fall. With these potential developments, it is important that planning policy and the planning evidence base remains informed and sufficiently flexible to enable the delivery of appropriate technologies.

Vehicle to Grid: there is potential for EV owners (private and fleet) to generate income through V2G services, which provide electricity from the battery to the home and/or building or back to the network at times of high demand. Although not yet sufficiently mature for significant deployment today, local planning will need to be alive to the charging infrastructure requirements arising from V2G technologies and business models.

Autonomous vehicles, hydrogen HGVs and flying cars: in January 2019, the Government Office for Science published The Future of Mobility, a report by Foresight on emerging transport technologies. Of the predicted future technology types, only electric cars and LPGs and vans are predicted to be widespread by 2030.[29]

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7. Smart planning practice

Features of LPAs leading the energy transition

This research identified a number of key factors which are common to those LPAs where progress towards supporting the smart energy transition is most evident. These factors offer a helpful checklist for LPAs looking for guidance to improve local action and include:

- a **dedicated team resourced to lead work on smart energy** and integrated policies and action for decarbonisation cutting across all local authority functions;
- **strong, informed leadership with the appetite to drive forward innovation** and sufficient ambition and long-term perspective. This political buy-in allows the LPA to set and strive to achieve ambitious targets on energy and is supported by a commitment to regular training on cutting edge energy issues for councillors and officers;
- **robust planning policy on smart energy;**
- comprehensive and up to date evidence derived from **whole system strategic energy planning**; and
- **proactively and publicly disclosing actions to reduce emissions**, to demonstrate transparency, share knowledge and encourage citizen buy in.

In LPAs where all of these features are displayed, the high levels of engagement across the council and community have led to councils investing in and developing their own projects, supported by solid understanding of the issues and opportunities. Examples of such action include developing low carbon district heat networks, ultra-energy efficient housing and local renewable energy generation projects. Councils operating as a developer of smart energy and building projects can also use their purchasing power to require the highest possible standards, enabling development to demonstrate innovation and inspire further action in the area.

Each of the factors listed above are discussed in turn below.

A dedicated team resourced to lead work on smart energy

In England, areas displaying all of the characteristics listed above are predominantly urban, and are mainly those administered as combined authorities, with the political independence and organisational benefits to take collective strategic decisions across council boundaries. These authorities have more scope than smaller or rural authorities to invest in enhanced planning services capacity, and to commission external resources for support. Combined authorities also have the advantage of powers and resources devolved to them from national government and can be active in nurturing relationships across their hinterlands and wider regions.

Elsewhere, a range of innovative work is being done by less well-resourced planning authorities, using local circumstances and needs to drive innovation in, for example, policy formulation or development of specific energy expertise. These authorities tend to have one person, or a small team of individuals, with a dedicated role, or specific interest, in planning for smart energy. Characteristically, they demonstrate active interest in pursuing innovative approaches and sharing knowledge with elected members to ensure consistency of informed decision-making. Where most effective, this team tends to work across planning, climate change and infrastructure disciplines, ensuring that 'energy' is not isolated from mainstream planning functions.

Strong, informed leadership on energy issues that sets targets and ambitions

Leadership tends to flow from the special interests and mandates of elected individuals. It can also be nurtured by regular training and information, backed up by evidence, to raise awareness of smart energy issues. Similarly, regular contact between elected members and local community energy groups and activists can help to lift issues up the political agenda. With Climate Emergencies being declared across the UK, there is a real opportunity for strong political leadership to be shown on energy issues which focus resources and effort on the sector. Box 15, below, sets out an example of how a local authority can act on the implications of declaring a Climate Emergency.

Authorities with strong political leadership are able to set targets for their areas that signal their level of ambition to planners and developers. These targets can be used by planners to demonstrate the need for smart energy in policy, in determining planning applications and to justify ambitious energy efficiency standards for new developments.

Box 15: Implications of the Climate Emergency movement

The Climate Emergency movement is increasingly focussing local authorities' attention on climate issues and setting decarbonisation targets. Once an authority has declared a climate emergency and the resulting commitment to decarbonisation, if the declaration is to be meaningful the authority needs to set out potential pathways supporting delivery of that commitment. This should include an assessment of baseline carbon emissions in the area, understanding of resources, high level analysis of potential future energy scenarios and the establishment of an action plan. Whilst the evidence base is important for informing local priorities, the main focus should be on establishing and delivering the action plan.

Action plans are likely to start with quick wins, such as reducing energy use and modal shift in heating, power and transport, but further elements required to achieve high levels of decarbonisation will be unclear. Achieving rapid decarbonisation will require a dynamic action plan that is continuously updated as pathways become clearer. Governance structures should not be onerous in order to focus resources on action, but need to be developed, recognising the need for regular updates and reporting requirements, along with stakeholder engagement.

To develop the action plan, the authority should work with local, regional and national partners and businesses who can help raise funding and deliver the changes needed. The action plan should include consideration of how local planning policies can be amended to support the transition.

Robust planning policy on smart energy

This report draws from some outstanding and pioneering examples of policies and policy instruments developed by LPAs that drive a proactive stance to supporting smart energy. Draft local plans from Bristol City Council, Reading Borough Council, Greater Manchester Combined Authority, and York City Council, and the approved Milton Keynes Local Plan all set new policies to support smart new development and smart infrastructure. Key features of supportive plans include:

- detailed locally specific evidence, including whole system energy planning and engaging with the local Distribution Network Operator (DNO), gas DNO, housing developers, smart energy industry and communities to create a deliverable plan with high levels of local buy-in (see Box 16, below);
- requiring consideration of energy in every aspect of development, from allocating sites, to masterplanning, to detailed design;
- recognition that an extended plan period is not always commensurate with the pace of change in the smart energy industry. For example, the Greater Manchester carbon neutrality plan of March 2019 sets a 5-year duration to maintain flexibility. LPAs can use Supplementary Planning Documents (SPD) to detail action over a shorter timescale than the plan period;
- clear locally specific policies on smart energy, for example, for commercial energy storage;
- planning for homes and developments that are “smart-ready” i.e. have features that support the addition, at a later date, of smart technologies, for example low temperature distribution heating such as underfloor heating enabling later connection of a heat pump;
- planning for outcomes rather than specific technologies. For example, setting levels for onsite energy efficiency or mobility, rather than requiring a particular technology; and
- including performance monitoring and guarantee policies, to provide feedback to energy end users and to the LPA, and to provide recourse when a performance gap is evident.

Whole system strategic energy planning

Strategic, whole system, energy planning is a process that engages local stakeholders, including the DNO and gas DNO, local businesses and local communities, in discussion of the challenges of the energy transition and availability of local evidence to underpin action plans. The process should inform and work with DNOs’ investment planning processes and local community processes, such as neighbourhood planning. Box 16, below, sets out the whole energy system planning process developed by the Energy Systems Catapult (ESC), which is one example of how a local process could be undertaken.

The best energy solutions are locally bespoke and are dependent on specific details of an area, such as geography, demography and building stock mix and quality. A whole system energy plan should therefore be specific to the local situation. Local areas that successfully undertake whole system energy planning can prompt community support, deliverable projects and a positive

planning environment that helps facilitate the components of a smart energy future.

There is a need for further research on how to enable LPAs, DNOs and gas DNOs to engage with each other so as to better align local plans and network investment strategies.

Box 16: The Energy Systems Catapult Local Area Energy Planning process

In a project delivered for the Energy Technologies Institute, the ESC has designed a planning framework to help local government, energy network operators and other key local stakeholders prepare for a low carbon future in a cost-efficient and strategic way. The Local Area Energy Planning process is a means of exploring a range of different future local energy scenarios to achieve deep decarbonisation. The planning process takes a whole system view, accounting for building energy performance, heating technologies, electrification of transport, the capacity of and potential for gas, power and heat networks, local spatial constraints and opportunities. It involves area-specific energy system modelling, embedded in a process of collaborative dialogue between stakeholders and local government.

The ESC argues that Local Area Energy Planning will create benefits for people and business, including the opportunity to drive local clean growth, create new jobs and increase confidence to invest in new energy products, services and infrastructure. Areas that do not have a Local Area Energy Plan in place would likely cost more to decarbonise in the long term, would have less influence over change affecting the local area and miss out on the opportunities for clean growth. The ESC has piloted the process in three local authority areas. For more information, visit http://bit.ly/2XspyMM

Proactively and publicly disclosing actions to reduce emissions

A further shared characteristic of local authorities that are proactive and effective in efforts to decarbonise their areas is that they have the confidence to disclose in public their policies, progress, emissions and other markers of their activity in promoting resilience to climate change. At a global scale, all of the international examples studied to inform this research and, in the UK, cities such as London and Greater Manchester, disclose their progress to the global platform operated by the charity CDP Worldwide.[1] Less formal disclosure is practiced elsewhere, as local authorities declare achievements such as hitting goals for emissions targets.[2] As well as encouraging public interest and involvement in actions needed to decarbonise society, disclosure models support transparency and good practice, and provide the opportunity for other authorities, businesses and stakeholders to learn from data, knowledge and practical experience, and establish collaborative activities with the LPA.[3]

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8. Research conclusions and overall recommendations

This chapter set out the conclusions reached from a detailed literature review, stakeholder engagement and examination of case studies in a range of technology areas. From these conclusions overall recommendations are drawn out. These focus on the changes necessary for planning policy and practice to support the role government expects smart energy to have in cutting emissions. In doing so, the organisations key to securing recommend changes are identified.

The planning system must fully engage if the UK is to meet its decarbonisation objectives

The availability of appropriate technology is not a barrier to achieving a smart energy future. The technology needed to deliver clean energy is developing rapidly, in both the clean energy sector and the digital economy to expedite smart development. Similarly, the concept of smart energy is central in UK energy policy, with significant focus from BEIS to investigate regulatory issues, resolve potentially obstructive market barriers and inspire innovation.

There is, however, a fundamental disjoint between the expression and delivery of the UK government's policies for economic development, energy and planning and it is noteworthy that smart energy does not feature in national planning policy or guidance produced by MHCLG. This is despite the UK Government's Industrial Strategy embracing smart systems to deliver cheap and clean energy across power, heating and transport.[1]

The UK Clean Growth Strategy is unequivocal that moving to a productive low carbon economy cannot be achieved by central government alone.[2] The strategy recognises that local areas are best placed to use their powers and responsibilities to drive emission reductions, by managing policy on land, buildings, water, waste and transport, and by aligning low carbon measures across health and social care, transport, and housing functions. In England, the local industrial strategies, which BEIS has asked combined authorities and LEPs to produce, are likely to give added impetus to the local dimension.[3]

The Government's assumption that local areas in England will pull their weight in driving forward a productive low carbon economy does not flow effectively into national planning policy. This seriously reduces the impetus for LPAs to consider energy as an important part of their planning function, especially when compared to policy areas like housing delivery and economic growth, which are widely perceived to be the overwhelming priorities of the National Planning Policy Framework. There is, instead, a widespread feeling in LPAs that they are not supported by

Whitehall to take a proactive stance on planning for smart energy. This results in LPAs not giving sufficient priority to cutting carbon emissions, both in how they allocate policymaking resources, and in their development management.

If the planning system in England does not embed decarbonisation objectives in every aspect of the planning process, the Government's efforts to deliver the environmental and economic benefits of the smart energy transition will not be achieved. BEIS must therefore engage more effectively with MHCLG, to ensure that energy policy is properly informed by planning and land use considerations and energy concerns are properly reflected in national planning policy and its implementation. The forthcoming White Paper on energy offers an early opportunity to demonstrate this integration in its content on smart energy.

Going forwards, the collaborative model adopted by BEIS and Ofgem to formulate the plan for Upgrading our Energy System offers a template for greater coordination and cooperation between BEIS and MHCLG.[4] Some form of joint action planning would be helpful, with both departments agreeing core objectives and actions on smart energy. With an action plan, progress against the objectives and action can be monitored and reported, perhaps to a select committee.

Organisation	Recommendation
MHCLG, BEIS	Consider a joint action plan on delivering smart energy with key milestones against which the departments could report to Parliament. Scrutiny could be provided by a select committee.

National planning policy to emphasise smart energy as a core element of placemaking

Energy planning, including for smart energy, must be treated as a fundamental element of placemaking. Smart energy is central to achieving the UK's decarbonisation target. It also underpins economic growth ambitions; is integral to the delivery of high-quality, cost-effective buildings and homes and: to tackling congestion and management of poor air quality.

National planning policy has downgraded the role of smart energy

Although the revised NPPF remains supportive of sustainable development principles, it is widely perceived to constrain ambition and impede planning's role in taking innovative actions to cut carbon emissions. Subtle changes in the framing of the 2018 NPPF created a sense that the Government's commitment to planning's role in delivering clean growth was lukewarm. Retaining the option for developers to deploy a viability argument to avoid compliance with development plan policies on local requirements for decentralised energy sent mixed messages, as did incorporating the substance of the 2015 written ministerial statement (WMS) on planning and onshore wind power

The statement on onshore wind was taken by many LPAs as legitimising a de facto ban on new

onshore wind turbines, irrespective of the potential contribution to cutting carbon emissions. This has resulted in just eleven schemes (over 1 MW) being approved in England since the WMS was published, despite the need for significant additional onshore wind to be deployed by 2030 to meet the UK's 2050 decarbonisation objectives.[5,6]

Concerns about the NPPF also have to be read in the context of government's downgrading of regulatory policy for low and zero carbon buildings in England, seemingly prioritising the delivery of homes in quantity over their long-term sustainability credentials. Indeed, there is a sense amongst planners and stakeholders that in practice, and in terms of resources and guidance available to support local planning authorities, the government's focus is on housing numbers. This was exemplified in the January 2018 rebirth of the former Department for Communities and Local Government (DCLG) as the *Ministry of Housing*, Communities and Local Government. The change in name was discussed by stakeholders in workshops for this research as marking a significant narrowing of purpose for the department.

The perceived lack of priority given to clean energy in national planning policy and its implementation has pushed energy down the list of LPA planning priorities. This perception needs to be changed by MHCLG, and the balance redressed, either through updating the National Planning Policy Framework in line with the net-zero emissions target or, for greater immediacy, through a written ministerial statement (WMS). Either route should expressly underline that national planning policy affords energy and climate change equal status with the provision of housing, alongside infrastructure and economic growth, and set out the clear role smart energy has to play in decarbonisation. An early WMS, consolidated subsequently in updated planning policy and supported by practice guidance, would send a powerful message of the Government's intent.

The WMS could usefully underline the importance of properly engaging local communities in a discussion about a smart energy future. This engagement is central to creating 'meaningful consent', without which there is risk that public opinion will shift against emerging technologies, and generate local opposition to proposed developments akin to that experienced by onshore windfarms. The WMS, and expectations of planning, should be set within the context of the proposed Future Homes Standard,[7] as presented through the spring budget of 2019 and the expected tightening of Part L of the Building Regulations (Conservation of Fuel and Power). A coordinated national approach to the progressive decarbonisation of new building standards is needed, to give a clear message to LPAs and certainty to developers, that energy issues must be assigned at least equal priority with other development priorities.

Organisation	Recommendation
MHCLG	An early written ministerial statement to support the new net-zero emissions target and underline that national planning policy explicitly affords energy and climate change equal status to the provision of housing, alongside infrastructure and economic growth.

MHCLG	Review all aspects of planning policy and guidance to ensure there is a clear and consistent message to all planning stakeholders that smart energy is a core component of placemaking.

Smart energy as a priority in plan-making

LPAs need to deliver on their legal duty to develop local plans that tackle decarbonisation

Despite the perceived downgrading of energy as a priority in national planning policy, all planning authorities in England remain subject to a legal duty that, taken as a whole, their development plan documents should contribute to the mitigation of, and adaptation to, climate change.[8] This duty, when combined with the policy requirement (that has been in the NPPF since it was first published) for plans to take a proactive approach to mitigating and adapting to climate change in line with the objectives and provisions of the Climate Change Act 2008,[9] should bind LPA plan-making and decision-taking to the pace of change set nationally to cut emissions. The RTPI and TCPA Guide for Local Authorities on Planning for Climate Change offers further guidance on this point.[10]

Notwithstanding the potentially powerful combination of the legal duty and the stated intentions of national policy, a 2016 study by the TCPA found that few local plans were consistent with the UK's decarbonisation objectives.[11] Despite some excellent examples to the contrary, the evidence does suggest LPAs are not taking the climate duty sufficiently seriously. It is important that they do and, in doing so, create locally specific pathways to a smart energy future. Where plans are silent or weak in this area, the Planning Inspectorate should arguably step in as part of the examination of plans.

The MHCLG, RTPI and other planning support organisations all have a role in helping to raise awareness and capacity in LPAs, so that supporting smart energy delivery through plan-making becomes the norm.

Neighbourhood Plans need to consider energy issues

Community-based planning provides significant opportunities for energy to be considered at a local level. In England, neighbourhood planning is set within a statutory framework but, unlike local planning, is not subject to any climate change duty. This potentially represents a significant lost opportunity for local communities to engage with energy issues, and to engender local interest and support for smart energy.

In the short term, this gap could be plugged by the provision of guidance, ideally validated by MHCLG for reference by the LPA and Examiner. Support for neighbourhood planning groups to embed energy planning as a core topic is readily available in advice published in 2018 by CSE,[12] which merits wide circulation by LPAs and the planning profession. Going forwards, it would be appropriate for government to consider legislative opportunities to introduce a climate change duty for neighbourhood plans.

MHCLG must communicate the message that smart energy is a core element of plan-making to the Planning Inspectorate and to statutory consultees

In public examination of plans and appeals, the Planning Inspectorate's focus on the interrogation of housing numbers outweighs meaningful examination of other fundamental strands of sustainable development. Decarbonisation policies, if considered at all, are frequently assigned less time for discussion or determined to be 'not viable', despite clear evidence from the Committee on Climate Change that additional costs are limited, and of the legal imperative for planning to support low carbon development.[13]

In order to ensure that smart energy is treated as a core element of placemaking in local plans, and appeal decisions, there is a need for a clear message of intent to be communicated by MHCLG that a plan's ambition on climate mitigation will form part of a planning inspector's examination of plans. Planning inspectors should receive up to date training and guidance on smart energy issues. A powerful statement of intent would be to expand the test of soundness of consistency with national policy to include explicitly a demonstration of the plan's ambition to cut emissions commensurate with the Climate Change Act.

There is also a need for statutory consultees to the planning process to develop a consistent and informed approach to their planning responses, that ensures smart energy is given appropriate weight, commensurate with the pace of change required by the Climate Change Act, alongside their statutory and organisational objectives.

Organisation	Recommendation
MHCLG, RTPI	Promote awareness of the legal duty on local planning authorities to ensure that their plans contribute to climate change mitigation and adaptation.
MHCLG, Planning Inspectorate	A plan's ambition on climate mitigation should routinely form part of a planning inspector's examination of plans. Inspectors should be expected to make recommendations where necessary to bring a plan's content into line with the pace of change required by the Climate Change Act.
MHCLG	Consider how best to encourage neighbourhood planning to address energy issues.
MHCLG	Encourage statutory consultees to update their planning advice to ensure appropriate weight is given to smart energy's contribution to achieving net-zero-emissions.

Harness smart energy as a driver to build meaningful consent

Smart systems automatically measure and report on energy use as an operational feature of optimising the energy system. Providing this data to users offers an opportunity to encourage awareness of energy use and issues in local communities. Smart energy is therefore a natural

trigger and opportunity to engage public interest in energy, and to lift energy issues up the local and political agenda. Respondents to this research noted the need to 'take the community along on the decarbonisation journey' to build meaningful consent for the changes that are needed. There is ample evidence that local communities are able to make sensible and good choices about their future if they have sound information, at the right time and in a form that is relevant.

Organisation	Recommendation
MHCLG, BEIS	Work jointly to develop guidance for LPAs on how smart energy can be used as an opportunity to engage local communities in planning for energy.

Local planning authorities to be resourced to support delivery of smart energy

Improving access to resources and training

The chronic under resourcing of planning services, in terms of both numbers of officers and training, is evidenced by responses to the survey undertaken by this research and the 2019 RTPI report, Working in the Public Interest.[14]

Given the pressing need for upskilling of planners to address the clean energy revolution, urgent consideration is needed by MHCLG on how best to fund the necessary resources in LPAs, and/or external resources to support LPAs to deliver proactive planning policies on smart energy. There is a clear case that this investment is needed to unlock the economic and environmental benefits of smart energy in line with national energy policy and the Industrial Strategy.

Smart energy has not been part of the planning profession's traditional skillset. Lack of knowledge hinders the ability of LPAs to seize opportunities offered by new and emerging technologies, whether in framing the planning policy and practice that embeds clean energy in placemaking, or in responding proactively to development proposals. The lack of capacity for planners to maintain up to date knowledge and experience is also exacerbated by the continuing rapid development of technologies and markets. Even when higher standards for new developments are required by policy, development managers can lack the knowledge or access to expertise to judge whether a proposed energy strategy meets the standards set in policy, or indeed to insist on delivery when faced with viability arguments.

There is a clear need for LPA officers, councillors and the public to better understand the role of smart energy technology as part of the future clean energy system. Access, for example, to training and information about energy storage is currently lacking, both at a professional level and in a form suited to members of the general public. There is a need for resources to be made available and tailored to stakeholders, such as online videos or animations, virtual reality walk-throughs, photo case studies and, where appropriate, site visits to operational sites that that allow visitors to experience the genuine impacts of smart energy development. As an example of readily

accessible information, Regen's animation series for Western Power Distribution (WPD) includes illustrated smart energy topics, such as a video showing the benefits for storage in the electricity system.[15]

The emerging smart energy industry is keen to engage with LPAs to explain the current and emerging technologies and, subject to ensured impartiality of such resources, the sector could offer a technically advanced and cost-effective route to training planners. Guidance is also being developed by other stakeholders, for example the Energy Institute guidance on storage, which, as appropriate and where impartiality has been assured, could be endorsed by government and / or the RTPI to give planners confidence in the resource.

Organisation	Recommendation
MHCLG, BEIS, HMT	Ensure LPAs are adequately equipped, through direct or indirect resourcing, to facilitate the potential of smart energy.
MHCLG, BEIS, LPAs	Engage proactively with the smart energy industry to access up to date information and cost-effective training, subject to consideration of issues of impartiality.

A coordinated approach to support

There would be significant merit in BEIS and MHCLG working together to support LPAs in England in their plan-making.

One option to achieve such collaboration would be to establish a Joint National Energy and Planning Support Hub, building on concepts such as the Cities and Local Growth Unit and the Local Energy Hub. The support hub should ideally be resourced to take a proactive approach to engaging with LPAs, monitoring the current stage of plan-making and targeting support on those LPAs due to start a new round of plan-making, including the spatial development strategies being prepared by English combined authorities. The support offered would be framed to meet the specific need of the plan-making body, which might be for additional staff, access to external expertise, or officer and member training.

A number of non-governmental organisations (NGOs) offer direct support to LPAs on dealing with smart energy issues in plan-making, and some LPAs are working together to pool resources and commission studies. Validation of third-party support services, to ensure robust standards in the advice given to LPAs, could be undertaken by the recommended Joint National Energy and Planning Support Hub.

Progress cannot be recorded unless it is monitored. Encouragement by MHCLG, or a formal requirement if this could be funded, for LPAs to report publicly, ideally annually, on the planning steps taken to support the net-zero emissions target, would help to give visibility to smart energy, and give added impetus to decarbonisation. Submission of this evidence to the Joint Hub would

create an up to date resource for sharing of best practice between authorities.

Organisation	Recommendation
MHCLG, BEIS	Establish a Joint National Energy and Planning Support Hub to help embed smart energy in plan-making.
MHCLG, LPAs	Secure annual public reporting by LPAs of the planning steps taken to support the net-zero emissions target.

Greater collaboration needed between LEPs and LPAs on planning for energy

LEPs, as business-led partnerships between local authorities and local private sector businesses, are tasked with assembling local economic stakeholders to develop evidence-based economic strategies, and identify investment opportunities and strategies to drive economic growth across the country.

Although LEPs have no formal planning function, their purpose and activities have synergies with the core role of forward planning, which sets the strategic vision and framework for the future development of an area. Planning should be a critical input in informing and delivering the LEPs' Industrial Strategy. Coordination and cooperation between LEPs and LPAs on planning for energy however remains variable, with little change in cooperation overall since a 2015 RTPI research report investigated the role of LEPs in planning.[16]

Between 2017 and 2019, LEPs were funded to commission energy strategies for their area or, in some instances, for combined LEP areas. These strategies ranged in quality and output, from detailed and locally specific action plans that engaged with LPAs and other local stakeholders in a constructive manner, to more generic statements of intent which, in practice, failed to generate buy-in.

Learning from this experience, in a number of areas, LPAs and LEPs are working voluntarily to secure closer liaison and coordination. In others, progress is hampered by a lack of shared understanding of their mutual potential. Support available through five BEIS funded Local Energy Hubs is helping to encourage closer working, but this support is limited.[17]

Following the 2018 review of Local Enterprise Partnerships, LEPs and combined authorities with a 'metro mayor' are now required to develop local agreements that clearly set out roles, responsibilities and accountability.[18] This is resulting in a shift of responsibility and resources from the LEP to the combined authority in some cases, allowing for greater integration of planning roles and economic ambitions.[19] In addition, LEPs and the mayoral combined authorities are also eligible via Local Industrial Strategies for dedicated support from the Cities and Local Growth Unit, jointly resourced between BEIS and MHCLG. This collaborative resource spanning business, energy and planning, policy and functions, offers significant potential for more effective cooperation in delivering local action by LEPs and LPAs.

In 2019, research by the University of Warwick identified a need for greater co-ordination between local organisations, including LPAs and LEPs. This is supported by the findings of this research, which suggest joint action by planning authorities and their local LEP might be enhanced so as to deliver a shared vision and streamline delivery of LEP ambitions.[20] Practical approaches offered by respondents to overcome current constraints, focused on securing local technical and operational collaboration between LEPs and LPAs, for example by aligning LEP ambitions and activities within the spatial context of the local plan, introducing a duty on LEPs to cooperate with their LPA, and creating a functional link across allied portfolios within LPAs by appointing joint teams of officers involved in both LEP and spatial planning workstreams.

Organisation	Recommendation
MHCLG, BEIS	Consider ways to better integrate LEP activities with spatial planning in areas without a metro mayor.

Embed planning for smart energy into planning education and continuing professional development

The RTPI is the largest of the European and Commonwealth Institutes for the planning profession with 25,000 members in 80 countries across the globe. As such, it has exceptional capacity to influence members to step up to the challenge of the climate emergency and to promote decarbonisation in their professional activities.

As the professional institute supporting the role of chartered planners across the public and private sector, the RTPI has a key role to play in supporting planning for a proactive transition to smart energy. The recent announcement by the RTPI's President, of a campaign on climate change; "Resource Planning for Climate Action" is to be welcomed.

Additionally, there would be merit in the RTPI reviewing its institutional architecture and internal practices to ensure that climate change and smart energy are given equal standing and coverage to more traditional planning concerns.

Such a review also offers the opportunity to update and refresh training services offered to members, and CPD requirements, to ensure that planners are properly equipped with the information, guidance and support that they need to deal with smart energy matters. There is potential via RTPI Learn to create a specific resource, or module, on smart energy. This could complement the existing resource on 'Planning for Climate Change'.[21]

The intelligence and recommendations set out in this report, together with the RTPI's knowledge, experience and UK wide representation, provides a unique platform from which the Institute can support and work with government and other NGOs. The RTPI can help to ensure that energy and planning policy are aligned by BEIS and MHCLG, and give technical and practical input to the departmental joint action plan recommended by this report.

Organisation	Recommendation
RTPI	Review institutional architecture and internal practices to ensure that climate change and smart energy are given equal standing and coverage with more traditional planning concerns.

Academia has an important role to play in the generation and dissemination of knowledge surrounding the planning, design and delivery of smart energy systems. Although the smart energy field has many dimensions, there has been a lack of research with respect to the role that local planning systems can play in facilitating the implementation of key elements of smart energy. The literature review undertaken as part of this research helped to frame the project's context and was valuable for identifying definitions and the kind of factors that had been identified as either helping or frustrating the promotion and implementation of smart energy. The focus of these studies was typically directed to locations outside of the UK, so there is a need for UK universities, and planning schools in particular, to help fill the void identified. Case studies showing the impact of projects and policies from a range of different geographies would be particularly helpful, especially those that are able to focus on implementation in rural areas such as parts of the South West. Universities can play an important role in encouraging collaboration and fostering joint research amongst different stakeholder groups. Involving the commercial energy sector in research through, for example, Knowledge Transfer Partnerships, will be particularly important. The close links that universities have with LEPs can also be maximised to help fund and drive activity surrounding the pursuit of local smart energy systems.

Universities, colleges and the broader education sector also have an important role to play in educating society about climate and energy challenges, as well as more specific elements concerning smart energy. Universities delivering planning-based programmes have a particular responsibility in ensuring that our future planners are suitably equipped, with the knowledge and skills, to plan holistically for energy. While universities delivering accredited planning courses need to adhere to the expectations outlined by the RTPI and the QAA (via the subject benchmark statement for Town and Country Planning),[22,23] the relevant guidelines do not identify energy as a specific topic for focus. Coverage and practice are likely to vary, so an audit of programmes accredited by the RTPI should be undertaken to help map the presence of energy across university modules and to help promote best practice. Such a task could be undertaken as part of the annual Partnership Board programme.

Organisation	Recommendation
RTPI, accredited planning schools	Through the existing Partnership Board processes, explore the coverage, and encourage the increased exposure, of energy planning across accredited planning programmes.

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9. List of Appendices

Appendix A: Academic Literature Review

Appendix B: Planning Policy Review

Appendix C: Case Studies

Appendix D: Results of the Online Survey

Appendices A-D are available at www.rtpi.org.uk/smartenergy.

Appendix E: List of Recommendations

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Organisation	Recommendation
MHCLG **BEIS**	Consider a joint action plan on delivering smart energy with key milestones against which the departments could report to Parliament. Scrutiny could be provided by a select committee.
MHCLG	An early written ministerial statement to support the new net-zero emissions target and underline that national planning policy explicitly affords energy and climate change equal status to the provision of housing, alongside infrastructure and economic growth.
MHCLG	Review all aspects of planning policy and guidance to ensure there is a clear and consistent message to all planning stakeholders that smart energy is a core component of placemaking.
MHCLG **RTPI**	Promote awareness of the legal duty on local planning authorities to ensure that their plans contribute to climate change mitigation and adaptation.
MHCLG **PINS**	A plan's ambition on climate mitigation should routinely form part of a planning inspector's examination of plans. Inspectors should be expected to make recommendations where necessary to bring a plan's content into line with the pace of change required by the Climate Change Act.
MHCLG	Consider how best to encourage neighbourhood planning to address energy issues.
MHCLG **BEIS**	Encourage statutory consultees to update their planning advice to ensure appropriate weight is given to smart energy's contribution to achieving net-zero-emissions.
MHCLG **BEIS**	Work jointly to develop guidance for LPAs on how smart energy can be used as an opportunity to engage local communities in planning for energy.
MHCLG **BEIS** **HMT**	Ensure LPAs are adequately equipped, through direct or indirect resourcing, to facilitate the potential of smart energy.
MHCLG **BEIS** **LPAs**	Engage proactively with the smart energy industry to access and deploy up-to-date information and cost-effective training, subject to consideration of issues of impartiality.
MHCLG	Establish a Joint National Energy and Planning Support Hub to help embed smart

BEIS	energy in plan-making.
MHCLG **LPAs**	Secure annual public reporting by LPAs of the planning steps taken to support the net-zero emissions target.
MHCLG **BEIS**	Consider ways to better integrate LEP activities with spatial planning in areas without a metro mayor.
RTPI	Review institutional architecture and internal practices to ensure that climate change and smart energy are given equal standing and coverage with more traditional planning concerns.
RTPI and accredited planning schools	Through the existing Partnership Board processes, explore the coverage, and encourage the increased exposure, of energy planning across accredited planning programmes.
MHCLG **BEIS**	Update the NPPF, the Overarching Energy NPS and supporting guidance to include storage technologies.
MHCLG	Change planning policy guidance to enable LPAs to set standards that are higher than Code Level 4 equivalent in their local plans.
RTPI **UKGBC**	Engage on how best to signpost planners to the UKGBC's Policy Playbook.
BEIS **MHCLG**	Work together on the development of a national heat strategy so as to fully address the role and potential of spatial planning in delivering local decisions on the future of heat.
Historic England	Work with energy efficiency experts to promote appropriate ways to cut carbon emissions from historic buildings.

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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.

Royal Town Planning Institute,
41 Botolph Lane, London EC3R 8DL.

Registered Charity in England (262865) & Scotland (SC037841)