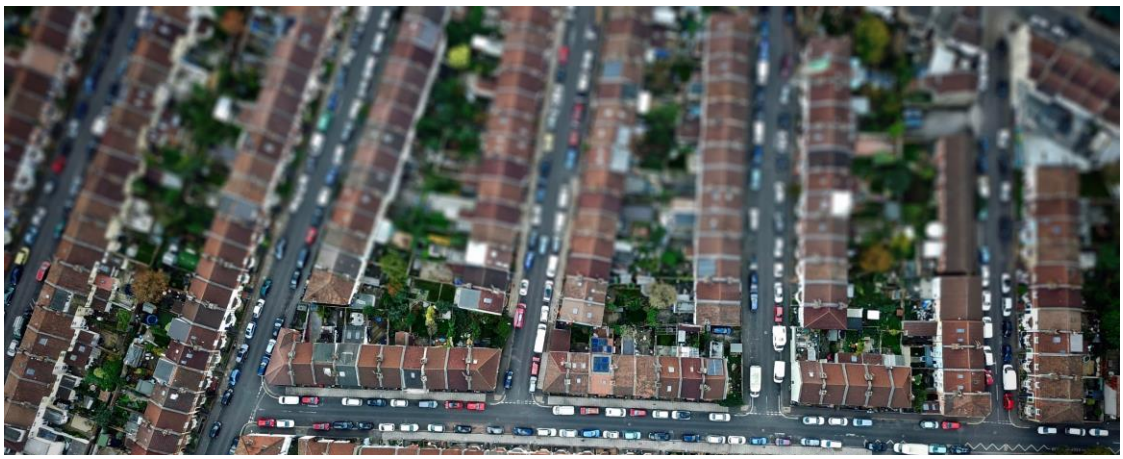
UK Parliament
POST

POSTnote 703

By Abigail Collins,
Alan Walker
25 July 2023

Local area energy planning: achieving net zero locally



Overview

- Local area energy planning (LAEP) is a relatively new process designed to deliver effective local action to contribute to the UK's 2050 net zero greenhouse gas emissions target.
- LAEP provides an action plan for local leaders that also accounts for action at the national level. It incorporates technical evidence on the whole energy system, wider non-technical factors and engagement with stakeholders.
- LAEP aims to deliver cost savings, social benefits and a more coordinated energy transition by taking a proactive, whole-systems, place-specific approach to energy planning. Innovate UK are working with the Government to gather evidence on value added and investment returns.
- LAEPs have recently become a statutory requirement for Welsh local authorities. 'Trailblazer cities' like Greater Manchester have adopted LAEPs with ambitious pre-2050 net zero targets across the UK.
- 20 local authorities have LAEPs in the UK. There are significant barriers to roll-out such as the capacity and skills of local authorities, short-term funding, data transparency and a lack of standardisation.
- The role of local authorities and the governance structure between local, regional, and national net zero plans is not yet formalised. The regional energy planning system has gained more focus and recently been consulted on by Ofgem.

Introduction

The Climate Change Act, as amended in 2019, sets a legally binding target of net-zero greenhouse gas emissions by 2050.[1–5] A number of policy documents set out the Government's strategy to meet this target at the national level.[6–9]

Greater policy focus is being given to more local approaches to the energy transition.[10–13] In 2018, almost 300 local authorities (LAs) declared a 'climate emergency' (now 308).[14,15] Over a third have developed some form of plan to deliver their own net zero targets by dates ranging between 2030 and 2050.[13]

The Government's 2021 Net Zero Strategy estimates that 82% of the UK's emissions are "within the scope of influence of local authorities".[16] In 2020, the then Ministry of Housing, Communities and Local Government identified 45 policy areas as "likely to affect the opportunities, decisions, and barriers for local action on climate change", highlighting a gap between the UK's ambitions for local energy and current national energy policy.[10]

In its 2022 Progress Report to Parliament, the Climate Change Committee (CCC) recommended that Government "should formally adopt local area energy planning, providing clear guidance on who should be responsible for and involved in producing plans, along with support and funding for doing this".[17]

What is LAEP?

Local area energy planning/plans (LAEP/s)[a] is a bottom-up, data-driven, whole-system approach to delivering net zero in a particular region.[18,19] Whole systems planning means all parts of the system are mapped including energy supply and demand, transport, buildings, local industry and the environment.[20] Plans can consider non-technical factors and new technological developments.[21] The aim of LAEP is to outline the most cost-effective way for a local area to decarbonise and to set out an action plan for implementation.[22]

LAEPs cover the local needs and targets of a city, district or county councils, from LA to combined authority (CA) level. When determining the scale of LAEPs, there should be sufficient capacity within the authority to complete the plans and drive changes, while retaining a local, bottom-up perspective.

LAEP does not have a formal place in the LA planning system unlike other mandated plans, such as Local Plans or Local Transport Plans.[23–25]

LAEP brings together stakeholders including energy companies, industry and local community groups. The process is iterative with groups giving feedback and agreeing a realistic, data-based action plan[18] that should be updated regularly to include any significant technological, local or political changes.

[a] In this document we will use the LAEP acronym to represent either the noun, local area energy plan, or the verb, local area energy planning. The context will determine which option is being used.

LAEP was first developed from the Smart Systems and Heat programme by the now closed Energy Technologies Institute and the Energy Systems Catapult (ESC)[b] in 2018.[27,28] ESC, Regen, the Centre for Sustainable Energy and other organisations offer their technical expertise to LAs, and employ a variety of methodologies.[29–32] However, the cost of working with external organisations is usually high, and some LAs are starting to gather data and begin stakeholder engagement independently.[33]

What does a Local Area Energy Plan cover?

Every region of the UK is unique, with different geography, physical infrastructure, natural resources, political and social landscape. If a 'top-down' approach is taken there is a risk of adopting a policy that works for one area but not another.[19] Wider policy decisions from central government will affect local plans so collaboration with the national picture is essential for a realistic LAEP.[18,34]

Plans can vary in ambition and scope but most have common themes in the sectors of energy, buildings, transport and the environment.[29,35–41] Examples of some of the proposals from early LAEPs include:

Buildings

- Identifying priority areas for retrofitting of domestic homes and public buildings to improve energy efficiency (PN 650).[42–47]
- Identifying priority areas for heat pump installation (PN 699) or other types of low-carbon sources of heating.[48–50]
- Encouraging the development of 'smart' buildings with improved energy efficient designs.[51,52]
- Encouraging the installation of rooftop solar panels and low-carbon, flexible energy technologies, such as batteries, to reduce demand at peak times.[53]

Transport

- Identifying priority locations for the installation of electric vehicle (EV) charge points based on projected EV use, particularly around dwellings without off-street parking.[35]
- Identifying opportunities for active travel (such as investment in cycle routes and pedestrian crossings) and improvements to public transport including expanded bus routes and caps on fares.[54,55]
- Encouraging 'working from home' and use of carpools to reduce unnecessary trips.

[b] Catapults are a group of nine research and technology centres funded by Innovate UK that aim to bridge the gap between research and industry across a range of societal and industry challenges facing the UK.[26]

Energy

- Identifying suitable sites for large-scale, low-carbon energy developments such as onshore wind (PN 602),[56] hydroelectric power (PN 652),[57] solar energy farms,[35] geothermal resources (PB 46), and district heat networks (PN 632).[37,58,59]

- Work in conjunction with local electricity distribution network operators (DNOs) to ensure the electricity network can handle expected extra capacity and grid connections. Reducing peak energy demand via 'smart' or flexible electricity systems.[60]

Local industry

- Understanding the energy requirements and decarbonisation options for local industry.[18,61]

Other sectors

Some LAEPs go beyond the sectors of buildings, transport and energy, incorporating wider approaches to reach net zero targets such as:

- Land use and agriculture: decarbonisation of farming machinery and improved biodiversity.[62] Coastal LAs may include marine environments in their LAEPs.

- Environment: this is specific to each area but could include peatland restoration (PN 668, PB 48),[35] planting new woodlands and hedgerows or growing biomass crops (PN 690).

- Additional behavioural changes:[63] options could include encouraging sustainable food consumption, reducing household waste or increasing recycling rates.[64]

Current state of LAEP in UK

'Trailblazer cities'

104 out of 327 UK LAs or CAs have set ambitious 2030 net zero emissions targets, however a third of these have not published any form of climate action plan.[65] Creating an LAEP is not a statutory requirement in the UK, participation is voluntary and usually done in conjunction with innovation funding from publicly funded bodies.

The first LAEPs were developed by ESC for Bury, Bridgend, and Newcastle in 2015.[28] As of 2022, LAEPs have been developed for 20 LAs[28,66] with ambitions to become 'trailblazer cities' including Newcastle, Peterborough, Newport, and Greater Manchester (see Box 1), alongside counties such as Oxfordshire and the Borderlands.[39,29,40,41]

In January 2023, York & North Yorkshire Local Enterprise Partnership (YNYLEP) published an LAEP with a target of net zero by 2034, and net negative by 2040.[35] The

councils signed a proposed devolution deal in August 2022 that would give the region new powers and included £7 million investment into green economic growth.[67]

Box 11: Greater Manchester Combined Authority

Greater Manchester Combined Authority (GMCA) is a 'trailblazer' city-region, being the first region to complete LAEPs at this scale.[68] A net zero target of 2038 was set in 2019 and LAEPs completed for all 10 boroughs, with one scaled up plan for Greater Manchester. The plans were funded by Innovate UK and done in conjunction with ESC, and were adopted in September 2022.[69]

Outcomes

- The plans identified 5 key measures to complete by 2027:[68]
  - 2 gigawatts of rooftop solar panels on domestic homes and 2.5 gigawatts installed on public buildings
  - 8,000 homes to be connected to heat networks
  - 116,000 heat pumps to be installed
  - 140,000 energy-inefficient homes to be fabric retrofitted[70]
  - 190,000 petrol and diesel vehicles to be replaced with EVs
- Conducted online public engagement using a tool developed by ESC that allows people to vote for their preferences on zero carbon technologies.[71]
- Worked closely with the local electricity network operator Electricity North West to understand the grid system and identify potential solutions to meeting the extra capacity needed by 2038.[72,73]
- Developing a 'Local Energy Market' in parallel to LAEPs,[c] an association of 12 partners taking a place-based approach to "support the implementation of […] new business models, customer propositions and a trading platform."[76] The core concept is a digital marketplace (PN 655) where residents can buy or sell energy from local supply sources based on cost, carbon intensity and location.[76]

GMCA has estimated that £65bn of investment from public and private sectors is required to meet its 2038 net zero target.[73,77] Manchester has seen increased investment in green energy including a regional hydrogen hub,[78–81] although it is not clear if this is as a direct result of LAEP.

[c] GMCA also completed a citizens' jury (chosen to represent the demographics of the area) in collaboration with Carbon Co-op to understand how citizens would want their local energy market to be governed.[74,75]

Devolved nations

The devolved parts of the UK, broadly speaking, have power over local government and housing, as well as the environment and planning,[82] but energy policy is generally reserved to Westminster in the case of Wales and Scotland. In the case of Northern Ireland only nuclear energy policy is reserved to Westminster (CBP 8544).

Planning policy is devolved to LAs. Some CA regions are applying for devolution deals with increased powers over their energy systems.[83–86] In April 2023, the Welsh Government issued a recommendation for all Welsh LAs to develop an LAEP by 2024 with a net zero target of 2030.[87] The individual plans will be scaled up to form the National Energy Plan (NEP).

Welsh LAs were initially concerned that a lack of in-house capacity and expertise would limit ability to deliver the plans. However, responses improved after engagement with ESC.[88] The Welsh government has promised public funding support to all LAs and technical expertise from ESC.[87,89]

The Northern Ireland Executive has set its own net zero targets. The Executive aim to deliver energy savings of 25% from buildings and industry and meet 75% of energy demand with renewable electricity by 2030.[90] In February 2023, Belfast City Council started working with ESC to map the energy system and develop an LAEP for the city.[91,92]

In 2022, the Scottish Government introduced a statutory requirement for all 32 LAs to develop Local Heat and Energy Efficiency Strategies (LHEES)[93,94] to tie in with Scotland's target for net zero emissions from homes and buildings by 2045.[95] LAs must set out a long-term plan for the energy efficiency and heat decarbonisation of all building stock. Much like an LAEP, LHEES prioritise areas for delivery of low-carbon technologies and strategic heat decarbonisation zones, and ESC is offering support to Scottish LAs expanding to a full LAEP.[96]

An evaluation by the Scottish Energy and Climate Change Directorate into outcomes of the earlier pilots identified "skills development and improved understanding of energy efficiency and decarbonisation as a key benefit to local authorities".[97] Challenges in the development of LHEES included "local authority buy-in, lack of clarity on the LHEES process, and the skills and resourcing required." The report called for additional guidance and support from the Scottish Government for LAs and to provide significant resources for the delivery rollout, which was given.[97]

Potential benefits of LAEP

The aim of LAEP is to identify the most effective route to net zero for a local area, which, in turn, is expected to produce economic and social co-benefits.

Since LAEP is a new concept, early reports of benefits such as increased investment are largely anecdotal. More robust evidence is still being gathered by Innovate UK and central government.[98,99]

Local costs less

By providing a net zero roadmap and details of which stakeholders are responsible for delivery, the ESC predict that areas with LAEPs could become more attractive for 'green investment' and boost green jobs.[18,28]

The process of making an LAEP brings stakeholders together to collectively produce a plan that is fully costed with clear responsibilities, and stakeholders can make their own investment plans in conjunction.[18,100] If stakeholders work together and share information, cost savings could be made by avoiding doubling up of efforts. The stakeholder engagement process itself can help to create momentum and build political and community buy-in,[101–104] which in turn leads to increased public acceptance of the outcomes.

In a 2022 report on the potential benefits of regional climate action, economic analysis by Innovate UK and PwC estimated that achieving net zero targets with a place-agnostic 'top-down' approach would require more than triple the investment needed to meet targets for the sixth carbon budget,[d] and release roughly half of the social benefits and savings of a place-specific 'bottom-up' approach.[e19]

Social benefits

Key social benefits can include reduced traffic and air pollution (PN 691), reduced fuel poverty levels and enhanced energy security.[19,106] Retrofitting of older housing stock to reduce energy consumption could save residents significant money on their energy bills.[107] In 2022, the Department for Energy Security and Net Zero (DESNZ) estimated there were 3.26 million households in fuel poverty in England, representing 13.4% of households.[108] Reducing fuel poverty has been shown to lead to improved quality of life and reduces chances of ill health.[108]

Increased use of renewable 'home grown' energy could also lead to enhanced energy security (PN 676) and reduced exposure to volatile global energy markets.[8,109,110] Solar panels can be installed in conjunction with batteries to store power ready for peak demand times.[111] LAEPs identify suitable sites for large-scale wind and solar farms as well as domestic measures, which can add up to a more resilient UK energy system.

[d] The sixth carbon budget covers UK greenhouse gas emissions targets during the period 2033-2037.[105]

[e] Place-agnostic (assumes uniform deployment low-carbon measures across the country) approach requires £195bn investment and releases £444bn. Place-specific (assumes city-regions choose most appropriate low-carbon measures) approach requires £58bn and releases £825bn in wider social benefits and energy savings.

Lessons learned from early examples of LAEP

Support needed for under-resourced LAs

UK100, a network of LAs pledged to a rapid net zero transition, say funding cuts have led to a real terms reduction in spending power of 28.6% from 2011 to 2018.[112] The pandemic impacted LAs,[113] and most report a lack of people, expertise and money.[114]

Due to a lack of in-house expertise, the development of LAEPs has often been outsourced to consultancy companies to create a 'static' plan.[31,32,115] There is concern within LAs that this could lead to an expensive plan that 'sits on a shelf' with no actions taken, as the expertise rests with the consultants rather than within the LA.

Funding sources and allocation

At present, most local net zero funding is allocated via short-term competitive bids for innovation funding (such as Innovate UK's 'Prospering from the Energy Revolution'[116]). This can lead to a 'postcode lottery' with well-resourced LAs winning a bigger funding share. However, most aspects of LAEP require long-term investment to build infrastructure.

Some stakeholders, including Energy Capital, argue that energy network companies should fund the development of energy plans because these inform network investment plans.[28,117] There is a consensus among local authorities, and the DNOs themselves, that network companies should not lead the delivery of LAEPs since this could provide an unfair commercial advantage for a private company, but should instead provide support to LAs.[118,119]

LAEPs are fully costed to provide an investment plan that includes the option of private funding. If LAEPs are formally supported by central government, private stakeholders may be more willing to invest.[30]

If LAEPs were to be rolled out UK wide, it would require large amounts of long-term funding. While the initial investment is high, estimated between £70-100 million for the whole country, the process could potentially generate savings that outweigh costs.[120,19]

However, others interviewed highlighted the importance of producing a sufficient evidence base that returns on investment will be made to demonstrate cost effective expenditure.[98,99] Scotland and Wales have publicly funded their councils to produce LHEES and LAEPs respectively.[87,97]

Ensuring communities are engaged

Community engagement is seen as essential for turning LAEPs into successful actions.[106] LAs have a democratic mandate to act on behalf of the people,[112] and already have avenues of communication open for other planning processes.[103,104]

In June 2023, research by Citizen's Advice[121] showed people were overwhelmingly supportive of meaningful community engagement throughout the LAEP process.[102] This can be done via citizen's assemblies, online engagement, or surveys in public places such as at supermarkets or town centres.[102,121] The report states that it should be the LAEP developers' responsibility to ensure engagement is accessible and inclusive, and this is key to getting buy-in and support early on.[102]

Once an LAEP is in place, there should be opportunities for residents to feedback on the success of actions undertaken and to hold developers to account if plans have not been delivered.[102] A visual spatial plan with 'live' data can provide a tool to track progress.[30]

Using data to inform the plans

LAEPs model the whole energy system for an area across different sectors, meaning that many different data sets are needed. Multiple sources have cited the sharing of data between 'siloed' organisations as a barrier to LAEP.[28] Transparency of data is a significant obstacle to overcoming the 'postcode lottery' of LAEP standards as varying levels of details inform the plans.[33]

Close collaboration with electricity companies can help LAs manage unfamiliar data.[122] Electricity Northwest Limited have been involved in supporting northern LAs,[72] but there is no statutory requirement. UK Power Networks (UKPN) also created an open data portal with over 100 datasets which are used by LAs.[123]

Electricity distribution network operators are required to publish distribution future energy scenarios (DFES) each year which forecast the changes needed in the grid network by 2050.[124] In a survey run by UKPN, 90% of LAs planned to use the DFES data in their climate action plans.[124] In turn, LAEPs can identify areas of increased future demand on the grid that inform the DFES and grid investment plans.

Modelling local energy demand and supply

Models are used as a tool to inform the development of a LAEP. There is no one standard model used across LAEPs and a range of software has been trialled. A model should be usable by non-expert members of the community, who can vary inputs to visualise future scenarios and possible outputs. To create a detailed LAEP a model should:[18,125–127]

- understand the network down to street or building scale
- represent all aspects of the energy system and their interactions
- forecast annual power consumption (such as from EV charging infrastructure) and how the system will change over time (increasing demand, rate of installation of new technologies)
- provide readable analysis to convey the plan and attract investors.

Modelling outcomes can vary depending on the assumptions used in the system.[128] Advanced Infrastructure Technology Ltd have developed an online software tool

called LAEP+, a subscription service for LAs providing an interactive model for spatial network mapping.[129] The tool was used in 2021 for Project LEO (Local Energy Oxfordshire) to identify low-carbon opportunities in their area and feedback from the LAs was positive.[130] In March 2023, building on Advanced Infrastructure's existing LAEP+ software,[131,132] UKPN released a prototype of its own digital net zero tool - Your Local Net Zero Hub - developed through its project CLEO (Collaborative Local Energy Optimisation). This tool, which includes UKPN electrical network data and third party geospatial data, is due for launch in spring 2024 and will be free for use by LAs.[131]

In preparation for the roll-out of heat networks, the government have undertaken mapping and analysis of the UK's energy system.[59] Stakeholders note that if this data was made available to LAs to support LAEPs, this would significantly reduce the requirements for in-house expertise and cost. Modelling centrally and disseminating the data would reduce a significant portion of the cost of a potential LAEP rollout.[133,98]

Governance framework from local to national

Lack of definition and standards

While ESC has published guidance for LAs on LAEP, there is no standardisation of the process.[18] This leads to significant variation between LAEPs.[134] Consistency in language and methods would allow comparison between plans or scaling up to a regional or national level plan,[28] and would be welcomed by most stakeholders.

However, some LAs report not wanting a highly detailed energy plan. They say they already know priority actions to be taken in their local area and would prefer the funding to complete these.[134] The Centre for Sustainable Energy and some academics suggest that a diversity of plans can be beneficial for establishing 'best practice'.[135–137] However, others argue LAEP has now passed this stage of development.

Scale of organisation and governance framework

There is no defined scale for LAEP. Plans are usually done on a LA or CA level. Smaller LAs can join up plans to CA level, or in a very rural area a county plan may be more appropriate. The scale reflects the local ability and agency to coordinate between stakeholders and deliver the plans.[30]

Scaling up LAEPs to a regional or national level would require a local-to-national governance framework.[34,120,138] A regional viewpoint could ensure that plans join up across boundaries and are consistent in methodology.[34,120] Government could amalgamate regional plans into a national net zero plan,[87] giving an opportunity to view progress on national targets, and providing a more detailed picture of the UK energy system as a whole.

Some stakeholders interviewed suggested Net Zero Hubs, set up in 2019 by the Government across 5 regions of England[139] with a role to support LAs with practical guidance and expertise, have the potential to fill this role.[12]

In March 2023, Ofgem ran a consultation on 'local energy system governance for a net zero future'.[140] The proposed 'regional system planner' (RSP) would:

> "develop a whole system region plan of the energy system coherent with national and local net zero ambitions" and "coordinate, facilitate and ensure effective participation between local actors".[140]

Though the consultation states that it does not prescribe LAEP and responsibility would remain with LAs, many supporters of LAEP have responded to the consultation positively, citing the potential value of the RSP in coordination and coherence of plans.[141–143]

Translating plans into action

According to ESC guidance, LAEPs should come with a prioritised action plan for the area.[18] The plan should identify the 'low-hanging fruit' short-term solutions, as well as longer-term 'low-regret' actions. At present, there is a lack of evidence that the plans have led to tangible results or investment in an area.[98]

Many aspects of the LAEP are contingent on policy decisions from central government.[144] ESC guidance suggests plans should be reviewed and adapted if needed every 3-5 years to keep up with potential technology and policy changes.[18] Data Map Wales is a publicly available geographic map which will be used for tracking progress of LAEP projects in the pipeline.[145] A regional planner role could also monitor and report on progression.

References

1. BEIS (2019). The Climate Change Act 2008 (2050 Target Amendment) Order 2019.
2. Climate Change Committee (CCC) (2019). Net Zero - The UK's contribution to stopping global warming.
3. Climate Change Committee (CCC) (2021). Progress in reducing emissions 2021 Report to Parliament.
4. Department for Business, Energy & Industrial Strategy (BEIS) (2021). 2020 UK greenhouse gas emissions, provisional figures. 22.
5. Dray, S. (2021). Climate change targets: the road to net zero?
6. HM Government (2020). The Ten Point Plan for a Green Industrial Revolution.
7. HM Government (2020). Energy white paper: Powering our net zero future.
8. Department for Energy Security and Net Zero (2022). British energy security strategy.
9. Department for Energy Security and Net Zero (2023). Powering up Britain. Department for Energy Security and Net Zero.
10. (2021). Local government and net zero in England. National Audit Office.
11. 2022 Progress Report to Parliament. Climate Change Committee.
12. Department for Energy Security and Net Zero (2022). Mission Zero: Independent Review of Net Zero.
13. Local Authorities and the Sixth Carbon Budget. Climate Change Committee.
14. UK100 (2022). Our response to the Net Zero Review. UK100.
15. Climate Emergency UK (2021). List of Councils who have declared a Climate Emergency.
16. (2021). Net Zero Strategy: Build Back Greener. BEIS.
17. Climate Change Committee (2022). Progress in reducing emissions 2022 Report to Parliament.
18. Energy Systems Catapult (2022). Guidance on creating a Local Area Energy Plan. Energy Systems Catapult.
19. Innovate UK *et al.* (2022). Accelerating Net Zero Delivery - Unlocking the Benefits of Climate Action in UK City-Regions. Innovate UK.
20. Energy Networks Association Whole energy systems. *Energy Networks Association*.
21. Cowell, R. *et al.* Local Area Energy Planning – A Scoping Study.
22. Progress-in-reducing-emissions-2022-Report-to-Parliament.pdf.
23. Department for Transport (2022). Transport decarbonisation: local authority toolkit. *GOV.UK*.
24. Planning Inspectorate (2023). Local Plans: the examination process. *GOV.UK*.
25. Goddard, J. (2023). Local Authority Provision of Essential Services.
26. The Catapult Network About the Catapult Network. *The Catapult Network*.
27. Energy Technologies Institute (2023). Smart Systems and Heat. *The ETI*. The ETI.
28. Energy Systems Catapult (2021). The future of Local Area Energy Planning in the UK. Energy Systems Catapult.
29. Regen Borderlands Energy Masterplan.
30. Centre for Sustainable Energy *et al.* (2020). Local Area Energy Planning: The Method.
31. ARUP Local Area Energy Planning.
32. BHESCo Local Area Energy Plan | Why you should partner with

BHESCo. *Brighton & Hove Energy Services Cooperative (BHESCo)*.
33. (2021). Look before you LAEP: Ending the postcode lottery of local area energy plans. Citizens Advice.
34. Tingey, M. *et al.* (2020). Governance institutions and prospects for local energy innovation: laggards and leaders among UK local authorities. *Energy Policy*, Vol 138, 111211.
35. (2023). York and North Yorkshire's Routemap to Carbon Negative. York and North Yorkshire Local Enterprise Partnership.
36. Newport City Council Local Area Energy Plan.
37. GM LAEPs.pdf.
38. Energy Systems Catapult Local Area Energy Plans delivered across Greater Manchester.
39. Newcastle City Council (2021). Net Zero Newcastle.
40. Newport City Council Local Area Energy Plan.
41. Local Energy Oxfordshire Project LEO. *Project LEO*.
42. Green Finance Institute (2020). Financing energy efficient buildings: the path to retrofit at scale.
43. Alabid, J. *et al.* (2022). A review on the energy retrofit policies and improvements of the UK existing buildings, challenges and benefits. *Renewable and Sustainable Energy Reviews*, Vol 159, 112161.
44. UK Green Building Council (UKGBC) *et al.* (2021). Retrofit funding propositions: Short report.
45. Wade, F. *et al.* (2022). Local government capacities to support net zero: Developing comprehensive heat and energy efficiency strategies in Scotland. *Energy Research & Social Science*, Vol 89, 102544.
46. Wentworth, J. *et al.* (2023). Environmental housing standards.
47. Tingey, M. *et al.* (2021). Housing retrofit: six types of local authority energy service models. Vol 2, 518–532. Ubiquity Press.
48. Trask, A. *et al.* (2022). The future of home heating: The roles of heat pumps and hydrogen. *64*. Energy Futures Lab, Imperial College London.
49. Department for Energy Security and Net Zero (2023). Heat Pump Investment Roadmap.
50. Turner, K. *et al.* (2023). Unlocking the Benefits of Heat Pumps: The Role of Electricity and Gas Prices. UK Energy Research Centre.
51. ARUP Smart buildings.
52. Cisco What Is a Smart Building? *Cisco*.
53. Bahramara, S. (2021). Robust Optimization of the Flexibility-constrained Energy Management Problem for a Smart Home with Rooftop Photovoltaic and an Energy Storage. *Journal of Energy Storage*, Vol 36, 102358.
54. Department for Transport £200 million to improve walking and cycling routes and boost local economies. *GOV.UK*.
55. Greater Manchester Local Energy Market (2022). GM Wide LAEPs.pdf.
56. Michalakakis, C. *et al.* (2023). Developments in wind power.
57. Miller, J. *et al.* (2023). Marine renewables.
58. (2018). What is a heat network? BEIS.
59. Miller, J. (2023). Heat networks.
60. Miller, J. *et al.* (2023). Flexible Electricity Systems.
61. Industrial decarbonisation strategy (accessible webpage). *GOV.UK*.
62. Wentworth, J. (2021). Reducing the environmental and biodiversity impacts of agriculture.
63. Wentworth, J. (2021). Changing consumption behaviours to meet environmental goals.
64. Wentworth, J. (2021). Changing consumption behaviours to meet environmental goals.

65. Place-based Climate Action Network *et al.* (2021). Trends in Local Climate Action in the UK.
66. Energy Systems Catapult Decarbonising local places: local area energy planning. *The Catapult Network*.
67. York & North Yorkshire Local Enterprise Partnership (2023). York & North Yorkshire Devolution. *YNY Devolution*.
68. Energy Systems Catapult (2022). Local Area Energy Plans delivered across Greater Manchester. *Energy Systems Catapult*.
69. Energy Systems Catapult SSH Phase 2 D40: Whole System Smart Energy Plan - Greater Manchester.
70. 07 Pathways to Healthy Net Zero Housing GM_.pdf.
71. Energy Systems Catapult ZeroCarbon.Vote. *Energy Systems Catapult*.
72. Electricity North West (2019). Leading the North West to zero carbon.
73. Energy Systems Catapult *et al.* (2022). Greater Manchester Local Area Energy Planning: Overview & Insight.
74. Carbon Co-op *et al.* (2022). GMLEM Citizens' Jury. *Carbon Co-op*.
75. Carbon Co-op *et al.* (2022). The Greater Manchester Local Energy Market Citizens' Jury Report.
76. Greater Manchester Local Energy Market (2022). Greater Manchester Local Energy Market - Final Report.
77. Timan, J. (2022). We need a U-turn on energy policy, Andy Burnham says as he sets out £65bn vision. *Manchester Evening News*.
78. Mavrokefalidis, D. (2021). 'Manchester's first' hydrogen fuel hub takes steps forward. *Energy Live News*.
79. The Business Desk (2022). Substantial investment for expanding Manchester energy business. *North West*.
80. Manchester Energy Manchester Energy, LLC.
81. Energy Central (2021). Greater Manchester's first low carbon hydrogen hub. *Energy Central*.
82. HM Government (2020). Guidance on devolution. *GOV.UK*.
83. Department for Levelling Up, Housing and Communities West Midlands Combined Authority: "Trailblazer" deeper devolution deal. *GOV.UK*.
84. Department for Levelling Up, Housing and Communities East Midlands devolution deal. *GOV.UK*.
85. Department for Levelling Up, Housing and Communities Greater Manchester Combined Authority Trailblazer deeper devolution deal. *GOV.UK*.
86. Department for Levelling Up, Housing and Communities North East devolution deal. *GOV.UK*.
87. Welsh Government Renewable energy deep dive biannual recommendations update 2: strategy [HTML]. *GOV.WALES*.
88. Parliamentary Office of Science and Technology (2023). POST Interview with Energy Systems Catapult.
89. Energy Systems Catapult (2023). LAEP in Wales. *Energy Systems Catapult*.
90. Department for the Economy *et al.* (2021). Energy Strategy - Path to Net Zero Energy.
91. (2022). Draft Economic Strategy for Belfast. Belfast City Council.
92. Stoles (2023). Local Area Energy Plan for Belfast & Queens Island Energy Decarbonisation Plan. *Local Area Energy Plan for Belfast & Queens Isl... | Stotles*.
93. Scottish Government Local heat and energy efficiency strategies and delivery plans: guidance.
94. Wade, F. *et al.* (2022). Local government capacities to support net zero: Developing comprehensive heat and energy efficiency strategies in Scotland.

Energy Research & Social Science, Vol 89, 102544.
95. Scottish Government Heat in Buildings Strategy - achieving net zero emissions in Scotland's buildings.
96. Tim German *et al.* (2023). A Scottish Local Area Energy Plan (LAEP) Route to Net Zero. *Energy Systems Catapult*.
97. Local Heat and Energy Efficiency Strategy (LHEES) pilot programme: synthesis evaluation. Scottish Government.
98. Department for Energy Security and Net Zero *et al.* (2023). POST Interview with the Department of Energy Security and Net Zero.
99. Parliamentary Office of Science and Technology (2023). POST Interview with UKRI Innovate UK.
100. (2019). The policy and regulatory context for new Local Energy Markets. Energy Systems Catapult.
101. Single Source Regulations Office (2020). *Stakeholder engagement strategy*.
102. Citizens Advice (2020). Striking the right balance - Putting people at the heart of local area energy plans.
103. Gooding, L. *et al.* (2023). The best-laid plans: Tracing public engagement change in emergent Smart Local Energy Systems. *Energy Research & Social Science*, Vol 101, 103125.
104. Bull, R. *et al.* (2023). Who has the power? Reflections on citizen engagement in district heating schemes in the UK and Sweden. *Energy Policy*, Vol 177, 113505.
105. Climate Change Committee (2020). Sixth Carbon Budget.
106. Regen (2019). Exploring community benefits for and from Local Area Energy Planning.
107. HM Government £1.8 billion awarded to boost energy efficiency and cut emissions of homes and public buildings across England. *GOV.UK*.
108. (2023). Annual fuel poverty statistics report: 2023. Department for Energy Security and Net Zero.
109. BEIS Major acceleration of homegrown power in Britain's plan for greater energy independence. *GOV.UK*.
110. (2022). Net Zero Britain: developing an energy system fit for the future. Ofgem.
111. Which? (2023). Solar panel battery storage. *Which?*.
112. UK100 *et al.* (2021). Power Shift - Research into Local Authority powers relating to climate action. UK100.
113. Local Government Association (2022). LGA statement on IFS report on impact of COVID-19 on council finances in 2020/21.
114. (2023). Powers in Place: The handbook of local authority Net Zero powers. UK100.
115. Buro Happold Energy planning. *Buro Happold*.
116. Prospering from the energy revolution.
117. Parliamentary Office of Science and Technology (2023). POST Interview with Energy Captial West Midlands Combined Authority.
118. UK Power Networks LAEP Basics.
119. Parliamentary Office of Science and Technology (2023). POST Interview with UK Power Networks.
120. Energy Systems Catapult (2022). Building a governance framework for coordinated Local Area Energy Planning. Energy Systems Catapult.
121. Citizens Advice (2023). Close to home: How to engage local communities in the development of Local Area Energy Plans (LAEPs).
122. National Grid National Grid - Projects. *National Grid*.
123. UK Power Networks Open Data.
124. Distribution Future Energy Scenarios 2023.

125. Spatio-temporal mapping of local areas for engaging communities in the planning of smart local energy initiatives.
126. Cowell, R. *et al.* (2021). Making useful knowledge for heat decarbonisation: Lessons from local energy planning in the United Kingdom. *Energy Research & Social Science*, Vol 75, 102010.
127. Li, F. G. N. *et al.* (2015). A review of socio-technical energy transition (STET) models. *Technological Forecasting and Social Change*, Vol 100, 290–305.
128. Oldham Local Area Energy Plan.
129. Advanced Infrastructure LAEP+.
130. Advanced Infrastructure Case Study: Project LEO (Local Energy Oxfordshire).
131. Your Local Net Zero Hub.
132. Advanced Infrastructure UK Power Networks chooses Advanced Infrastructure as delivery partner for Digital Net Zero Tool.
133. Parliamentary Office of Science and Technology (2023). POST Interview with Regen.
134. Citizens Advice *et al.* (2021). Local Energy Planning: Final report.
135. Parliamentary Office of Science and Technology (05-23). POST Interview with the Centre of Sustainable Energy.
136. Parliamentary Office of Science and Technology (05-23). POST Interview with Prof Janette Webb, UKERC.
137. Parliamentary Office of Science and Technology (05-23). POST Interview with Prof Matthew Cook, Open University.
138. Cowell, R. *et al.* (2017). Sub-national government and pathways to sustainable energy. *Environment and Planning C: Politics and Space*, Vol 35, 1139–1155. SAGE Publications Ltd STM.
139. Community Energy England Regional Networks and Support.
140. Ofgem (2023). Consultation: Future of local energy institutions and governance. *Ofgem*.
141. Energy Systems Catapult (2023). Energy Systems Catapult responds to Ofgem consultations on the future of the energy system.
142. download.pdf.
143. Citizens Advice response to Ofgem Future of local energy institutions and governance consultation May 2023.pdf.
144. (2022). UK hydrogen strategy. *GOV.UK*.
145. Data Map Wales DataMapWales.

Contributors

POST is grateful to Abigail Collins for researching this briefing, to RSC for funding her parliamentary fellowship, and to all contributors and reviewers. For further information on this subject, please contact the co-author, Dr Alan Walker.

Members of the POST Board

Avi Aithal, Energy Networks Association*

Neil Best, Centre for Sustainable Energy

Jess Britton, UK Energy Research Centre*

Simon Brooke, Electricity North West Limited

Laura Clark, Citizens Advice*

Matthew Cook, Open University*

Richard Cowell, Cardiff University*

Robin Dent, Department for Energy Security and Net Zero*

Kayla Ente, Brighton and Hove Energy Services Co-op*

Tim German, Energy Systems Catapult*

Jodie Giles, UKRI Innovate UK*

Ed Gill, Energy Networks Association*

Keith Hampshall, Centre for Sustainable Energy

Cheryl Hiles, West Midlands Combined Authority

David Joffe, Climate Change Committee*

Christos Kaloudas, Electricity North West Limited

Richard Leach, Energy Systems Catapult*

Poppy Maltby, Regen*

Flora Mavri, UK Power Networks

Ben O'Driscoll, Department for Energy Security and Net Zero*

Sean Owen, Greater Manchester Combined Authority*

Katie Privett, York and North Yorkshire Local Enterprise Partnership, and North East and Yorkshire Net Zero Hub*

Grazia Ragone, Department for Energy Security and Net Zero*

Zoe Roberts, UK100

Rob Saunders, UKRI Innovate UK*

Anna Stegman, Energy Systems Catapult

Neil Strachan, UCL

Joanne Wade, Association for Decentralised Energy

Janette Webb, UK Energy Research Centre*

* Denotes people who acted as external reviewers of this briefing

The Parliamentary Office of Science and Technology (POST) is an office of both Houses of Parliament. It produces impartial briefings designed to make research evidence accessible to the UK Parliament. Stakeholders contribute to and review POSTnotes. POST is grateful to these contributors.

If you have any comments on our briefings please email post@parliament.uk. Please note that we are not always able to engage in discussions with members of the public who express opinions about the content of our research, although we will carefully consider and correct any factual errors.

If you have general questions about the work of the House of Commons email hcenquiries@parliament.uk or the House of Lords email hlinfo@parliament.uk.

DOI: https://doi.org/10.58248/PN703

Image credit: Louis Reed on Unsplash

post@parliament.uk
parliament.uk/post
@POST_UK