EnergyREV

Post-pandemic recovery: How smart local energy systems can contribute

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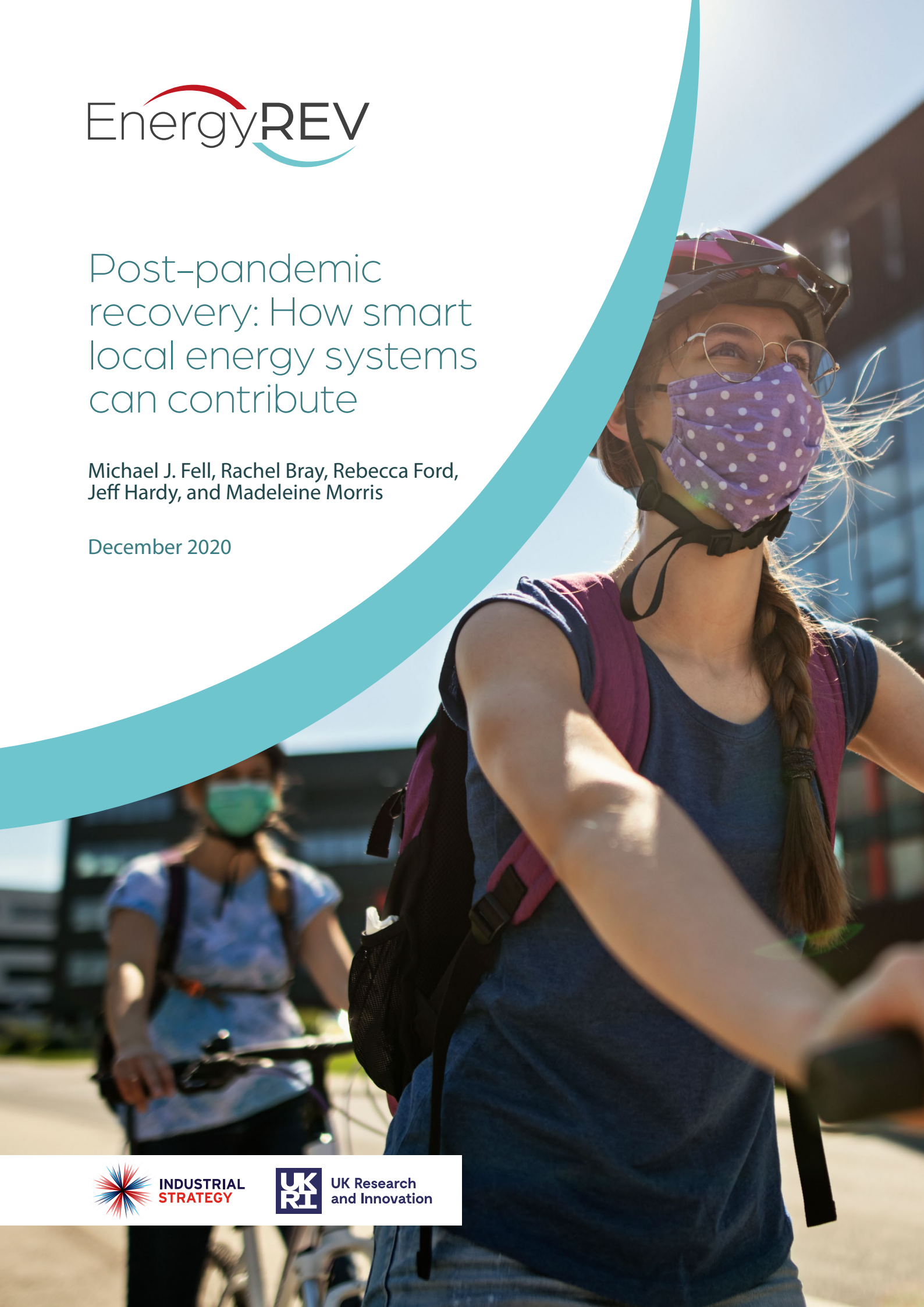
December 2020



INDUSTRIAL STRATEGY

UK Research and Innovation

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This report should be referenced as:

Fell, M.J., Bray, R., Ford, R., Hardy, J. and Morris, M. 2020. Post-pandemic recovery: How smart local energy systems can contribute. EnergyREV, University of Strathclyde Publishing: Glasgow, UK. ISBN 978-1-909522-70-1

Acknowledgements

We would like to thank members of the EnergyREV Policy Contact Group for their comments, which helped us shape this report.

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Introduction

On top of tragic health impacts, the coronavirus disease 2019 (COVID-19) pandemic has caused widespread economic harm. Governments around the world are already planning and implementing measures intended to foster rapid economic recovery. There is also a broadly maintained desire to ensure that such recovery is supportive of social and environmental sustainability goals. This insights report, from the EnergyREV consortium, considers whether, and how, smart local energy systems might support these ambitions in the United Kingdom (UK).

Unemployment has been rising since the outbreak of the pandemic, and firms have been closing, with many more expected to do so in the months to come. It is therefore essential that recovery actions should aim to deliver **maximum economic benefits**: protecting and creating jobs, boosting regional development, boosting private sector investment, stimulating the UK supply chain, and generating export opportunities. But for any such economic gains to be sustainable in the longer term, it is also important that the recovery supports and improves the health of society and ecosystems. This entails a number of further objectives:

- **Deliver against the UK's net-zero targe**t: decouple emissions from growth, cut future greenhouse gas emissions, support transition of industry consistent with a zero-carbon future;
- **Deliver wider environmental and biodiversity 'net gains'** for future development, improving the health of natural systems;
- **Improve the UK's resilience** to climate change and other unexpected events; and
- **Focus on social equity** and support the UK's "levelling up" agenda: address worker dislocation, improve family income and tackle fuel poverty issues, improve environmental and physical assets inherited by future generations.

Box 1: What is a smart local energy system?

Smart local energy systems (SLES) are emerging in response to the increasing decentralisation, digitalisation and decarbonisation of energy systems. They incorporate information and communication technologies and implement automation and self-regulation to help improve energy system operation. In some instances, they rely on autonomous operation. In others, the additional data and insights generated as a result of digitalisation are used to inform more effective decision making. This enables increasingly localised forms of system balancing and network management, supported by flexibility across energy vectors like electricity and heat. SLES also include more local forms of system management, operation, governance, ownership, and user engagement and participation. This occurs within a geographical boundary around the system, often defined loosely around generation assets, network infrastructure, or social identity.

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Box 2: What is EnergyREV?

The Energy Revolution Research Consortium (EnergyREV) is made up of more than 60 researchers from 22 UK universities, working together to tackle challenges around smart local energy systems from an interdisciplinary and whole-systems viewpoint. It is one of the three key components of the UK Industrial Strategy Challenge Fund's Prospering from the Energy Revolution (PFER) programme. Its multidisciplinary approach and strong links with industry, policy and the wider local energy community make EnergyREV one of the most significant international academic programmes delivering research to accelerate the uptake, value and impact of SLES.

As we review later in this report, there is already broad agreement that actions in certain energy-relevant sectors are likely to be consistent with many of these goals. These include **improving building energy efficiency, supporting transition to low-carbon heat and mobility, and improving energy infrastructure**. Here, we want to go further and suggest why delivering these solutions through a locally-led, smart approach has the potential to improve post-pandemic recovery by enabling **more, better value, better targeted and faster (but enduring)** investment and action.

Our starting point is that the UK's future net-zero carbon economy will necessarily require a great deal of action that is inherently local. From insulating buildings to reinforcing electricity distribution networks so they can support higher levels of distributed (e.g. solar) generation and electric vehicle use, these are activities tied to place. The key issue is with whom ownership, coordination, and delivery of these local activities resides. While there will always remain a fundamental framework-setting role for national government and institutions, reason and, increasingly, evidence suggest that local stakeholders have a key role to play.

In this report, we seek to justify why a smart, local, energy system approach to post-pandemic recovery should be considered, and draw together policy recommendations from previous EnergyREV outputs that would support such an approach.

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Key measures for green economic recovery

We reviewed[1] 19 sets of proposals for economic stimulus that could also deliver the wider green recovery objectives highlighted in the introduction. We consistently identified measures in four key areas.

1. Energy efficiency of buildings

What

Energy efficiency upgrades on existing buildings; new buildings to be built to net-zero standards.

Why

In addition to reducing energy demand, which reduces both the need for investment in energy supply and the associated carbon emissions, improving energy efficiency is good economics (Liebreich, 2020): it is estimated that every £1 spent on energy efficiency could increase GDP by £3.20 (PwC & Energy UK, 2020). UKGBC (2020) note that "targeted capital investment for zero carbon new homes & buildings will be a timely boost to the supply chain." Energy efficient buildings also bring additional co-benefits. Cold houses cause thousands of excess winter deaths (E3G & NEA, 2019) and it is estimated that tackling this could save the NHS move than £1.4 billion each year in England alone (see Energy Efficiency Infrastructure Group, 2020). Energy efficiency projects would not just support existing workforces but as many as 150,000 full-time roles by 2030 all over the country (Green Alliance, 2020).

How

Stakeholder proposals for energy efficiency can be split into two main areas: retrofitting existing homes/ buildings and improving new building standards.

Stakeholders expressed confidence that energy efficiency in the UK is "shovel ready – with labour-intensive projects rooted in local supply chains" (UKGBC, 2020). Projects could start small and then be rolled out and scaled rapidly (UKGBC, 2020; BloombergNEF, 2020; Liebreich, 2020).

Those calling for improving energy efficiency standards in new buildings emphasise that policy certainty on strengthening building regulations will support the UK businesses already investing in building lower carbon. Scottish Power have called for the Future Homes to be brought forward from 2025 to 2022 to "send a clear signal to the UK's supply chain about the importance of developing and investing in cleaner commercial alternatives to gas boilers, such as heat pumps" (Scottish Power, 2020).

1 Documents were identified through the authors' networks and online searching using terms such as "green recovery", "post Covid stimulus", "build back better", etc. Examples of the organisations whose proposals we looked at include Bloomberg NEF, Green Alliance, and PwC. The full list of included proposals, data extraction and brief description of methodology can be viewed online: EnergyREV Post-COVID proposal extraction

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2. Low-carbon heat

What

Low-carbon heating (and cooling systems)

Why

Heating accounts for around a third of the UK's carbon emissions so decarbonising this sector is vital for reaching the UK's net-zero emissions target. As with energy efficiency, there was significant emphasis on the co-benefits of economic stimulus measures involving low-carbon heating. These include fairness and levelling up, particularly in relation to families in fuel poverty. Fuel poverty already affects 2.4 million households in England and without interventions this number is likely to increase in the wake of COVID-19 (Szuda, 2020).

Stakeholders highlighted a clear link between improved building energy efficiency and measures to decarbonise the heat sector. Higher standards of energy efficiency will aid the shift to low-carbon heating systems, as well as protect against overheating (CCC, 2020).Homes built or retrofitted today should be 'future proofed' for low carbon heating (CCC, 2019). Ensuring that low-carbon heating and energy efficiency measures are well-coordinated in skills, jobs, supply-chain and project delivery could ensure the biggest bang per stimulus buck.

How

Proposals for zero carbon heat covered:

- Heat-pump technologies (Szuda, 2020; Climate Assembly UK, 2020; Scottish Power, 2020; BloombergNEF, 2020; COP26 Universities Network, 2020);
- Heat networks (COP26 Universities Network, 2020; Scottish Power, 2020; Darcy, 2020);
- Fuel switching to hydrogen (Energy Transitions Commission, 2020; IEA, 2020; COP26 Universities Network, 2020; Scottish Power, 2020).

Increased grant funding for heat pumps and heat networks was suggested alongside strengthened building standards as a measure to accelerate the roll-out of low-carbon heating and cooling systems.

3. Zero-carbon mobility

What

Electric vehicles; active travel infrastructure (incl. walking, wheeling, cycling)

Why

Transport is the largest source of carbon dioxide emissions in the UK (BEIS, 2020), accounting for 34% in 2019.

Many of the measures are linked with the health and wellbeing co-benefits of cleaner air and increased physical activity, in addition to the contribution to net-zero greenhouse gas targets. A shift of just 1.7% of car kilometres to active travel is estimated to provide health benefits worth over £2.5 billion per year in 2030 (Green Alliance, 2020).

How

Stakeholders identified the link between the pandemic-hit automotive sector and an opportunity to accelerate the electric vehicle revolution (Scottish Power, 2020; COP26 Universities Network,2020; IEA, 2020; Turgis, 2020). Some stakeholders (COP26 Universities Network, 2020 and Scottish Power, 2020) suggest bringing forward the ban on internal combustion engines to 2030 – a measure now included in the Government's 10 point plan. A number also propose for grants and incentives for both EV and the associated charging infrastructure to accelerate the EV revolution (COP26 Universities Network, 2020) and PwC & Energy UK, 2020). Accelerating the EV rollout and focusing on developing the supply chain could support up to 220,000 jobs (PwC & Energy UK, 2020).

Stakeholders were also supportive of urban planning to make it easy for people to walk, wheel and cycle (CCC, 2020; Climate Assembly UK , 2020). There is support for measures to improve remote working, particularly where it leads to reduced greenhouse gas emissions (CCC, 2020). Alongside these proposals there are calls to improve local and national public transport infrastructure, including high speed rail (IEA, 2020).

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4. Electricity generation and infrastructure

What

Investment in energy infrastructure and electricity generation.

Why

The electrification of heat and transport will increase electricity demand, meaning new renewable generation capacity will be required and existing infrastructure will have to become more flexible. New renewable generation and projects such as battery storage were highlighted as a boost for supply chain development (Scottish Power, 2020) and the associated green jobs (Energy Transitions Commission, 2020). Stakeholders cited evidence showing that, per unit of energy, renewable technologies are more labour intensive than fossil fuel sources, offering more job creation potential (BloombergNEF, 2020).

How

Several stakeholders proposed that there should be an emphasis on developing smarter, more flexible, more resilient, strengthened electricity infrastructure/networks suitable for net zero (Green Alliance, 2020; Hepburn et al., 2020; Climate Assembly UK, 2020; COP26 Universities Network, 2020; CCC, 2020; Turgis, 2020; Scottish Power, 2020; Darcy, 2020). This included an emphasis on the importance of whole systems thinking, strategic/anticipatory investment and rapid progress on smart and climate resilient grids within current transmission and distribution networks through the RIIO-2 price control (COP26 Universities Networks, 2020; Scottish Power, 2020; Turgis, 2020; PwC & Energy UK, 2020).

Stakeholders sought to ensure new zero-carbon electricity generation projects are supported through mechanisms such as the contracts for difference regime (IEA, 2020; Energy Transitions Commission, 2020; COP26 Universities Network, 2020; PwC & Energy UK, 2020). ADEPT (2020) proposes introducing a requirement in the National Planning Policy Framework for local plans to account for renewable energy and storage with distribution network operators at a regional level to meet anticipated demand from EV and heat pumps.

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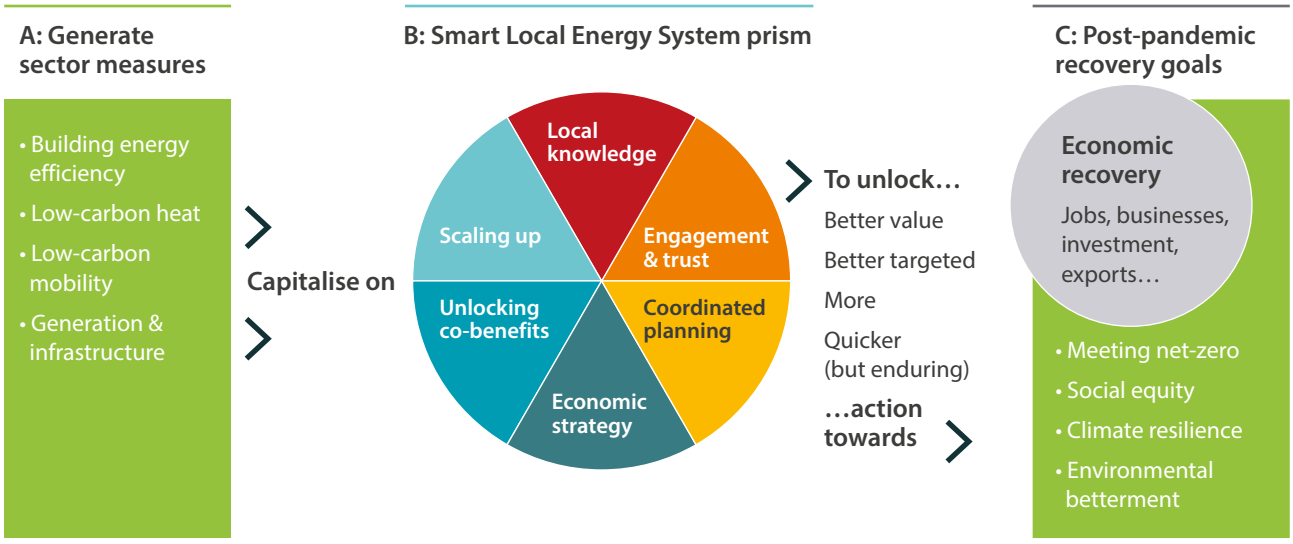
The SLES prism: how smart, local, energy system approaches could maximise benefits

As identified in the introduction, many of the measures identified as critical to deliver a green economic recovery require implementation at household, community, or regional scales, rather than at national or centralised scales. They are also interrelated. For example, decarbonising heating and mobility through electrification through the use of heat pumps and EV has an impact on electricity infrastructure including generation, networks, and ancillary services. District heating schemes have impacts on different types of infrastructure and may require local planning to implement.

Because of the decentralised and interconnected nature of these key measures for green economic recovery, an SLES approach could help identify synergies and maximise benefits. We have identified six key elements of this, which we term the 'SLES prism' (see Figure 2).

The following sections outline the rationale for each of the elements of the SLES prism approach, and seek to show how they can help deliver more, better value, better targeted, and faster (but enduring) investment and action. We also include a number of case studies which highlight various facets of the SLES prism in action.

Figure 1: The SLES prism, and how its facets can support post-pandemic recovery.



Local knowledge

Local authorities and local actors such as community groups and distribution network operators hold data, knowledge and assets that can inform green and resilient recovery strategies. They work in a local and national context and deliver on multiple local objectives.

For example, they are well positioned to know where those residents live who would benefit most from home efficiency improvements. Local actors are also more likely to be familiar with the local building stock, local building styles and methods, and the specific skills and techniques required to effectively retrofit them. They are also likely to have a good understanding of local supply chains. There has been strong local government and local actor involvement in the projects across the PFER programme, which has contributed to a myriad of different and locally bespoke SLES projects.[2]

Use of smart technologies increases data collection and the potential to build and update knowledge about local conditions, for example on building performance. An evaluation of a home energy improvement scheme in Oldham targeted at those in fuel poverty revealed significant financial benefits for individuals and the NHS, for instance (Bashir et al., 2016).

So what for post-pandemic recovery?

- 'Big win' targets for retrofit and infrastructure upgrade can be recognised and delivered more quickly and with greater confidence, bringing forward associated job creation, investment and other benefits.
- It is easier to recognise which measures are likely to make best use of the local workforce, and where they can be targeted to have the most positive impact for a given level of investment.
- Familiarity with local suppliers allows efficient supply chain management and coordination.

Effective engagement and trust

Councils and community groups are an important "trusted brand" for many (Gillich et al.,2016; Wade et al., 2020). This trust makes it more likely that people will choose to participate in recovery-related schemes with these groups than if some unknown or less trusted entity were involved. This in turn can help drive growth through uptake of related products and services. It can be easier for all parties to interact and collaborate when they are operating in the same spatial scale. Capitalisation on these factors is well illustrated in the Better Buildings Neighbourhood Program (see box) and the Cornwall Local Energy Market (LEM) trial (see case study).

As well as increasing participants' levels of trust and confidence in the system, better engagement can ensure that local challenges, constraints and desired outcomes are better integrated and monitored on an ongoing basis.

Better Buildings Neighbourhood Program

A successful energy efficiency scheme in the United States found the most effective route to generating participation was through personal outreach and community-based social marketing (CBSM) delivered through trusted messengers:

> " The BBNP repeatedly demonstrated that … a deeper connection through a CBSM approach using trusted messengers is more effective … While [BBNP and the UK's Green Deal programme] are successfully engaging high numbers of assessments, the BBNP is more successful at converting these assessments to actual retrofits. This is in large part driven by the different ways in which the BBNP reaches out to homeowners using multiple touch points and trusted messengers to engage both homeowners and the workforce." (Gillich et al., 2017)

2 See details of the PFER demonstrator projects, and of the detailed design projects.

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So what for post-pandemic recovery?

- Stimulus activities that depend on wide participation may be started more quickly and taken up more widely than would otherwise be the case.
- Working processes may proceed more quickly and efficiently with coordination by a trusted local intermediary (e.g. local authority).

Coordinated local planning

Considering a green and resilient recovery from a local perspective permits adoption of a whole, local, system planning approach that combines energy generation, mobility, heat, wider environmental and other objectives such as economic goals. For example, as part of local energy planning processes, local authorities can help ensure that plans on efficiency and heating are aligned. Under this approach efficiency measures could be intensively targeted to areas where homes are in particular need of upgrades – and, with the right level of coordination, combined with promotion of heat pump installation and even EV charging infrastructure.

Local actors, especially local authorities, are potentially in a good position to have oversight of the skills, supply chain, and planning requirements of such coordinated activity. If it can be achieved successfully, there is the potential to bring forward investment, employment and training opportunities sooner than would otherwise be the case since interventions take place simultaneously and there is greater policy commitment. By coordinating effectively with local distribution network operators grid infrastructure upgrades can also potentially be deferred or avoided.

Local coordination could also reduce the risk that individual businesses and householders make ill-informed investment decisions, such as extensively installing heat pumps in an area where a heat network is planned.

The coordination of efficiency improvements and low-carbon heating can go further still. Working with local mainstream construction trades could bring awareness of energy efficiency and sustainable heating measures more fully into their standard skill set and range of services offered, while strengthening local supply chains. As trusted intermediaries, tradespeople could be well-positioned to encourage uptake of approaches consistent with local area plans for net zero, particularly at "trigger points" such as substantial home renovations or break-down of existing heating systems.

So what for post-pandemic recovery?

- Implementing measures alongside each other rather than in a linear fashion brings forward investment, job creation, and training opportunities -- along with benefits to users such as warmer homes and reduced emissions.
- A coordinated approach demonstrates policy commitment to goals, increasing investor confidence.
- Opportunities for cost savings can be more easily recognised and captured, while minimising ill-informed investment decisions that overlook wider planned activities.

Economic strategy

An integrated system of support mechanisms is needed to align with the objectives of post-pandemic economic stimulus to enable SLES. But, governance and institutional barriers can stand in the way of realising the benefits of integrated SLES approaches. Many local and national schemes and funding streams have specific criteria that create silos and prevent multiple benefits being realised from integrated local energy approaches. Access to the national Green Homes Grant scheme, for example, is likely to be determined more by proximity to, and availability of, approved suppliers than by assessment of where the biggest economic and other benefits could be delivered.

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A local focus on green and resilient post-pandemic economic recovery enables alignment with Local Energy Plan (LEP) strategies. These can cover local business initiatives, development of workforce skills and other identified training needs, local and national supply chain development and innovation strategy. Such approaches could unlock multiple benefits both locally and nationally.

So what for post-pandemic recovery?

- Use of existing plans can bring forward activity (since problems, solutions, capabilities etc. have already been identified), and gives greater confidence in effectiveness since it has already received significant thought/planning.

Unlocking co-benefits

When looked at from the national level, the impacts of individual local energy projects could appear almost negligible. However, local actors are well-placed to capture any resultant benefits much more directly. For example, providing warmer homes for people in more vulnerable circumstances could feed through directly to a reduction in care-related costs, which are often borne by local authorities.

The same goes for measures to promote active transport which, if implemented correctly, have the potential to reduce health impacts of air pollution and reduce town centre congestion, to the benefit of local businesses. Projects owned at the local level are better able to explicitly factor such benefits in at the planning stage.

SLES projects are, at least in part, necessarily unique. They work with different technologies, resources, communities and stakeholders, and geographical and socio-economical landscapes. While some benefits could be consistent across all SLES, some could be unique to individual SLES, through leveraging advantages derived from local knowledge, engagement, planning and economic strategy. Local actors understand local values and preferences and so can more easily link up post-pandemic recovery strategy with delivery of multiple benefits.

Local governments, in particular, have multiple objectives and thus are motivated to capture the co-benefits of SLES.

Changing land use and environmental impacts

The renewable energy transition in the UK is intrinsically linked with land-use change because, as lower energy density renewable energy sources such as wind, bioenergy and solar PV mean a greater footprint on the landscape.

Careful consideration and management of land use associated with SLES infrastructure may offer environmental co-benefits and enhance provision of vital ecosystem services (Randle-Boggis et al., 2020). The move away from fossil sources may also alleviate overall pressures on biodiversity (Holland et al., 2019). Conversely, if the environmental impacts of land use change for renewable energy are not considered there is potential that global scale climate change issues are swapped for local scale degradation. Land use change was identified as the greatest cause of decline in nature, over and above that of climate change (IPBES, 2019).

So what for post-pandemic recovery?

- More money is unlocked for recovery because savings in other areas can be better factored into cost-benefit analysis.
- The efficiency of benefits out for investment put in is improved, making it easier to recognise, measure, and account for important local benefits.

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Scaling up

Developing smart, customisable, and interoperable digital products and services can make local energy system solutions more replicable and investible, both within the UK and as an export opportunity. This requires digital technologies to be:

- **Flexible** – able to cope with a growing set of use cases, connection of new devices and assets, integration of new data systems or new data analysis requirements, increased numbers of end users, and additional energy vectors being integrated over time.
- **Scalable** – able to deal with physical extensions through additional generation technologies or energy delivery devices.
- **Reusable** – able to be transplanted to similar problems in other locations.

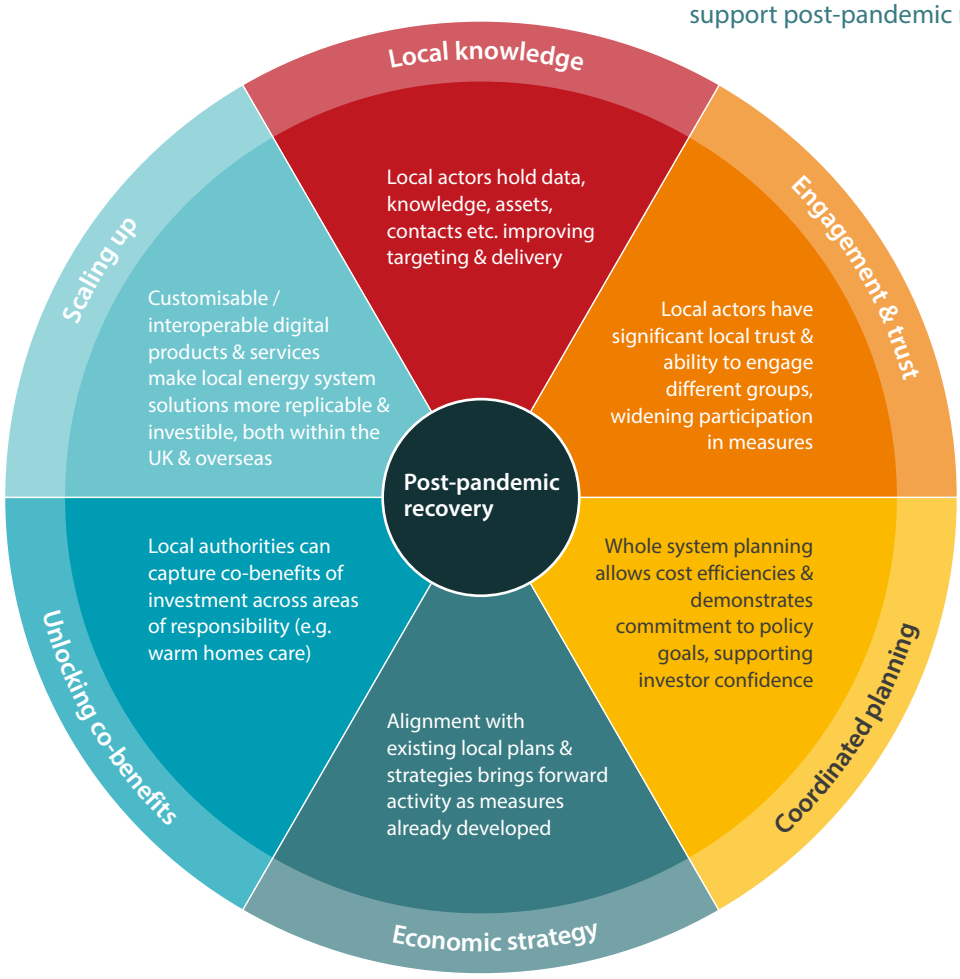
If they are developed and deployed effectively, these approaches improve use and effectiveness of SLES, and simultaneously support capitalisation through wider roll-out and the offering of commercial services or products (Verba et al., 2020). The UK is home to a wide variety of high growth UK tech startups, many of which have products and services applicable to the development of SLES.

So what for post-pandemic recovery?

- Investing recovery efforts in smart scalable solutions will maximise value from point of view of future investment and export potential.

These six reasons for the contribution of SLES approaches to post-pandemic recovery are summarised in Figure 2.

Figure 2: The SLES prism, and how its facets can support post-pandemic recovery.



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Risks

While we argue that there are many good reasons to consider a SLES approach to post-pandemic recovery, there would also be a number of potential risks to manage.

As we transition to a zero-carbon economy it is paramount to ensure that the costs, benefits and ability to participate is distributed fairly across all areas of society. Ensuring a fair distribution of benefits is not only important from a moral sense; if SLES are seen to benefit only certain segments of society, there is a real risk of loss of the current popular mandate for a net-zero carbon transition. Therefore, SLES planning should also consider social equity (Liebreich, 2020) and support the UK's "levelling up" agenda (COP 26 Universities Network, 2020) within the wider political context around net-zero. Those employing SLES approaches should also explore how justice and "levelling up" outcomes can be aligned with wider benefits such as economic, health and net-zero, and monitor the distributional effects of the SLES over time.

For each SLES-associated proposal it is therefore important to ask "who wins, who loses, how and why?". A recent review of 72 peer-reviewed articles exploring social equity, local energy and smart technologies by Knox et al. (2020) identified that renters; low-income households and communities; the elderly; unemployed and disabled are most at risk of the injustices of SLES. High-income households and communities tend to be the beneficiaries. It is possible to manage social equity, and the review makes a number of recommendations for how this can be done.

Consideration also needs to be given to alignment of measures at different scales and for different actors to help join the dots between national policies / incentives and implementation by end users including households. Tensions between local and national government have been increasingly evident as the pandemic has progressed. It is therefore key to ensure that governance across these scales works as far as possible in synergy, rather than antagonistically. Pursuing a SLES approach to post-pandemic recovery does not obviate the need for national measures, but it must be clear how the roles and responsibilities between national and local actors are divided. For example, it will be up to national government to recognise where areas are being, or are more likely to be, left behind by recovery measures, and allocate resources appropriately.

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Case studies

Financing Community Energy Case Studies: Brighton and Hove Energy Services (BHESCo)

BHESCo is an example of a community owned company that focuses on making buildings more energy efficient by installing:

- **Renewable energy** – solar PV and heat pumps
- **Storage** – electricity and heat storage
- **Energy efficiency measures** – LED lighting, double glazing and insulation

It employs a Pay-As-You-Save approach community energy project, whereby the customer pays nothing upfront, but covers the cost of the measures through the savings they generate, normally over a 10 year period. Consequently, it derives only a small percentage of its income from subsidy schemes such as the Feed-in-Tariff. The majority of its income comes from these Pay-As-You-Save contracts, although many of these are facilitated by government grants.

BHESCo offers an end-to-end service. It offers free advice on energy efficiency and, pay-for energy performance surveys and installs. It also monitors energy and efficiency measures.

It has advised nearly 2000 people and installed measures in over 500 properties, domestic and commercial. It works closely with the local authority and with other community groups and organisations. It is technology agnostic and given the long-term nature of Pay-As-You-Save contracts, it has a symbiotic relationship with its customers.

The company is delivering carbon and wider benefits such as reduced fuel bills and greater comfort at potentially no upfront cost. While this business model is somewhat complex, it does appear scalable or replicable in other places.

- **Keep reading**: Financing community energy case studies: Brighton and Hove Energy Services. UKERC (Cairns et al., 2020).

ReFLEX Orkney, Scotland – an Integrated Energy System

Orkney produces 130% of its electricity demand through existing renewable generation, yet 63% of its residents live in fuel poverty. Wind turbines must frequently be turned off to prevent overloading the electricity grid, which limits their economic potential.

At the same time, residents are faced with high energy bills as a result of Orkney's off-gas-grid status, aging housing stock and local climate. ReFLEX aims to combat these issues by developing a decarbonised "integrated energy system".

It seeks to balance out intermittent local renewables generation with a network of technologies, including batteries for homes and businesses, EVs and an industrial-scale hydrogen fuel cell. State-of-the-art monitoring of the Orkney virtual energy system (VES) network will ensure storage systems get charged when renewables generation is at a peak, and power released when demand is highest.

An exclusive Orkney tariff will be tailored to the needs of the ReFLEX's innovative integrated energy system, which will use advanced software to balance demand and supply.

This will help maximise the efficiency and economic potential of local resources, ensure higher quality and more affordable energy services and further lower the islands' carbon footprint. Local actors, which include the Orkney Islands Council and Community Energy Scotland, are at the heart of the ReFLEX model.

A community-facing drop-in centre is being developed to provide a place to engage with local residents and better understand priorities and needs In the future it will also become a 'shop-in' centre offering all of the energy products and services available.

Orkney's achievements have already earned it international recognition as a renewable energy pioneer, and R&D activities have drawn thousands of visitors to the island. ReFLEX is expected to drive investment, create high-quality jobs, and grow companies with export potential. The model is projected to double the number of jobs related to sustainable energy, almost triple the number of students studying energy in Orkney and increase the amount of exported energy ten-fold by 2030.

- **Keep reading**: Project set to turn Orkney into a 'smart energy island', Orkney.com.

Güssing: pioneering local

Austria has been a trailblazer in local, sustainable energy. An early example is the town of Güssing, in the southeast of the country. It is estimated that 60 new companies have been established in the town connected with energy, and approximately 1500 jobs created in a town of around 4000 inhabitants.

Emerging from the shadow of the Cold War in the early 1990s, Güssing was in the poorest district in Austria. It was characterized by an aging and diminishing population as younger, more highly educated people left to seek opportunities elsewhere.

An active council leader and local community recognised energy purchasing as a key expenditure and decided to pursue a policy of increased energy autonomy. Initially this was mainly intended as a route to financial savings. An integrated plan married energy saving measures in public buildings with identification and development of local energy for heating, electricity and transport (principally bioenergy). By 2013, the town was producing enough energy locally to cover its demand. But it had also realised impressive wider economic impacts. Alongside the new jobs created, income from energy sales is now largely retained locally, and amounts to more than €14m per year. Similar initiatives have subsequently been extended to the wider region.

- **Keep reading**: Güssing, Austria, 100% Renewable Energy Atlas.

Cornwall Local Energy Market project

The Cornwall Local Energy Market (LEM) project was a £18M four-year trial, which ran from late 2016 through to December 2020, jointly funded through the European Regional Development Fund and Centrica.

Working with both the local authority and network operator, the LEM project was able to position large scale storage assets in areas of the network where they could help unlock network constraints. This helped to relieve congestion and paved the way for future generation developments to be connected to the network in line with Cornwall Council's economic strategy, which includes the following aims:

- Meeting 100% of Cornwall's electricity demand from renewable and low carbon sources;
- Increasing the proportion of Cornwall's energy that is owned locally to 50% and

Increasing the proportion of Cornwall's energy 'spend' retained within the local economy to 30%. The Cornwall LEM project aimed to help alleviate the strain on the electricity distribution network caused by the abundance of renewable generation in Cornwall. It did this by creating a local marketplace where the network operator (Western Power Distribution) and the electricity system operator (National Grid) could procure flexibility from local assets.

The project recruited industrial and commercial, small business, and domestic participants. One hundred domestic properties were fitted with solar PV and a home battery system free of charge.

Several of the business participants were fitted with large scale storage and combined heat and power (CHP) systems and many more received grants for energy monitoring equipment. Seminars were run for businesses and householders.

Research later indicated that this local, personal approach was seen as important, as illustrated by feedback such as:

> "Communicate in a way that people can respond to positively. You can have the more complicated information for the people that want it but start simple and give local examples. Relate it back to people."

> "Include community champions – community groups are a great way of reaching people – isolated people and the elderly and Sure Start centres for women."

> "Social media – tell your friends, you know, have an initial set of people like us, and build it out. Keep, sort of, talking to your neighbours. I mean, we've already talked to the neighbours."

> "Word of mouth is more powerful than expensive marketing" (Bray & Woodman, 2020)

The project delivered benefits beyond relieving congestion. It found that participants had been incentivised to make other pro-environmental changes in their behaviour such as recycling more, being more aware of travel choices and getting involved in community activities such as beach cleaning. Business participants were able to better manage their workflows due to the information which came through their monitoring equipment, leading to different work hours in some places and being able to identify where they had energy leaks.

- **Keep reading**: Cornwall Local Energy Market, Centrica.

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Closing remarks

This report has one main purpose, which is to encourage policymakers to consider the benefits of taking an SLES-based approach to post-pandemic economic recovery. Existing green recovery proposals suggest the most productive measures are in the areas of building energy efficiency, low carbon heat and mobility, and infrastructure/generation. We propose that taking an SLES approach to planning and delivery of measures in these areas could unlock more, better targeted, better value and faster (but enduring) action and investment. This is because a SLES approach allows for capitalising on local knowledge; leveraging engagement and trust; enabling coordinated planning; building on local economic strategy; unlocking co-benefits; and providing a route to scale-up.

Government recently announced a ten point plan for a Green Industrial Revolution. The SLES approach maps onto all of these, as indicated in Table 1.

Government has already committed significant funding to drive forward the development of SLES through the Prospering from the Energy Revolution programme, and many of the measures required to support net-zero transitions are, by their very nature, local. While evidence is still being collected, and there are risks and coordination challenges that also need to be considered, we believe many of the approaches discussed in this report present relatively low- or no-regrets options. Providing local actors with the resources and responsibilities they need to drive forward a green post-pandemic economic recovery could help maximise the chance that stimulus gets delivered where and how it is most needed.

For specific recommendations, please see the EnergyREV outputs listed in the 'further reading' section below.

Table 1: HM Government 10 point plan for a "Green Industrial Revolution", published 17 November 2020, and the relevant facets of the SLES prism. Darker shading highlights those points with the most applicable facets.

	Ten point plan	SLES prism opportunity
1	**Offshore wind:** Producing enough offshore wind to power every home, quadrupling how much we produce to 40GW by 2030, supporting up to 60,000 jobs.	 Effective engagement & trust, coordinated local planning, economic strategy
2	**Hydrogen:** Working with industry aiming to generate 5GW of low carbon hydrogen production capacity by 2030 for industry, transport, power and homes, and aiming to develop the first town heated entirely by hydrogen by the end of the decade.	 Local knowledge, effective engagement & trust, coordinated local planning, scaling up, unlocking co-benefits, economic strategy

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	Ten point plan	SLES prism opportunity
3	**Nuclear:** Advancing nuclear as a clean energy source, across large scale nuclear and developing the next generation of small and advanced reactors, which could support 10,000 jobs.	 Effective engagement & trust, coordinated local planning, economic strategy
4	**Electric vehicles:** Backing our world-leading car manufacturing bases including in the West Midlands, North East and North Wales to accelerate the transition to electric vehicles, and transforming our national infrastructure to better support electric vehicles.	 Local knowledge, effective engagement & trust, coordinated local planning, scaling up, unlocking co-benefits, economic strategy
5	**Public transport, cycling and walking:** Making cycling and walking more attractive ways to travel and investing in zero-emission public transport of the future.	 Local knowledge, effective engagement & trust, coordinated local planning, scaling up, unlocking co-benefits, economic strategy
6	**Jet Zero and greener maritime:** Supporting difficult-to-decarbonise industries to become greener through research projects for zero-emission planes and ships.	 Economic strategy
7	**Homes and public buildings:** Making our homes, schools and hospitals greener, warmer and more energy efficient, whilst creating 50,000 jobs by 2030, and a target to install 600,000 heat pumps every year by 2028.	 Local knowledge, effective engagement & trust, coordinated local planning, scaling up, unlocking co-benefits, economic strategy
8	**Carbon capture:** Becoming a world-leader in technology to capture and store harmful emissions away from the atmosphere, with a target to remove 10MT of carbon dioxide by 2030, equivalent to all emissions of the industrial Humber today.	 Local knowledge, effective engagement & trust, economic strategy
9	**Nature:** Protecting and restoring our natural environment, planting 30,000 hectares of trees every year, whilst creating and retaining thousands of jobs.	 Local knowledge, effective engagement & trust, coordinated local planning, scaling up, unlocking co-benefits, economic strategy
10	**Innovation and finance:** Developing the cutting-edge technologies needed to reach these new energy ambitions and make the City of London the global centre of green finance.	 Scaling up, economic strategy

Further reading from EnergyREV

Net zero localities: ambition & value in UK local authority investment, Mags Tingey and Jan Webb (2020).

Describing a local energy business sector in the United Kingdom, Fabián Fuentes González, Jan Webb, Maria Sharmina, Matthew Hannon and Dimitrios Pappas (2020).

Common types of local energy system projects in the UK, Charlie Wilson, Natalia Jones, Hannah Devine-Wright, Patrick Devine-Wright, Rajat Gupta, Callum Rae and Mags Tingey (2020).

Working Paper 2: Digital energy platforms, Madeleine Morris & Jeff Hardy, with Elena Gaura, Matthew Hannon and Thomas Morstyn (2020).

How do we create successful smart local energy systems? Developing an organising framework, Michael Fell, Chris Maidment, Carol Vigurs, and David Shipworth (2020)

A framework for understanding and conceptualising smart local energy systems, Rebecca Ford, Chris Maidment, Michael Fell, Carol Vigurs, and Madeleine Morris (2019).

Working Paper 1: Electricity storage & electric vehicles, Madeleine Morris & Jeff Hardy, with David Elmes, Rebecca Ford, Matthew Hannon, Cameron Hepburn and Jonathan Radcliffe (2019).

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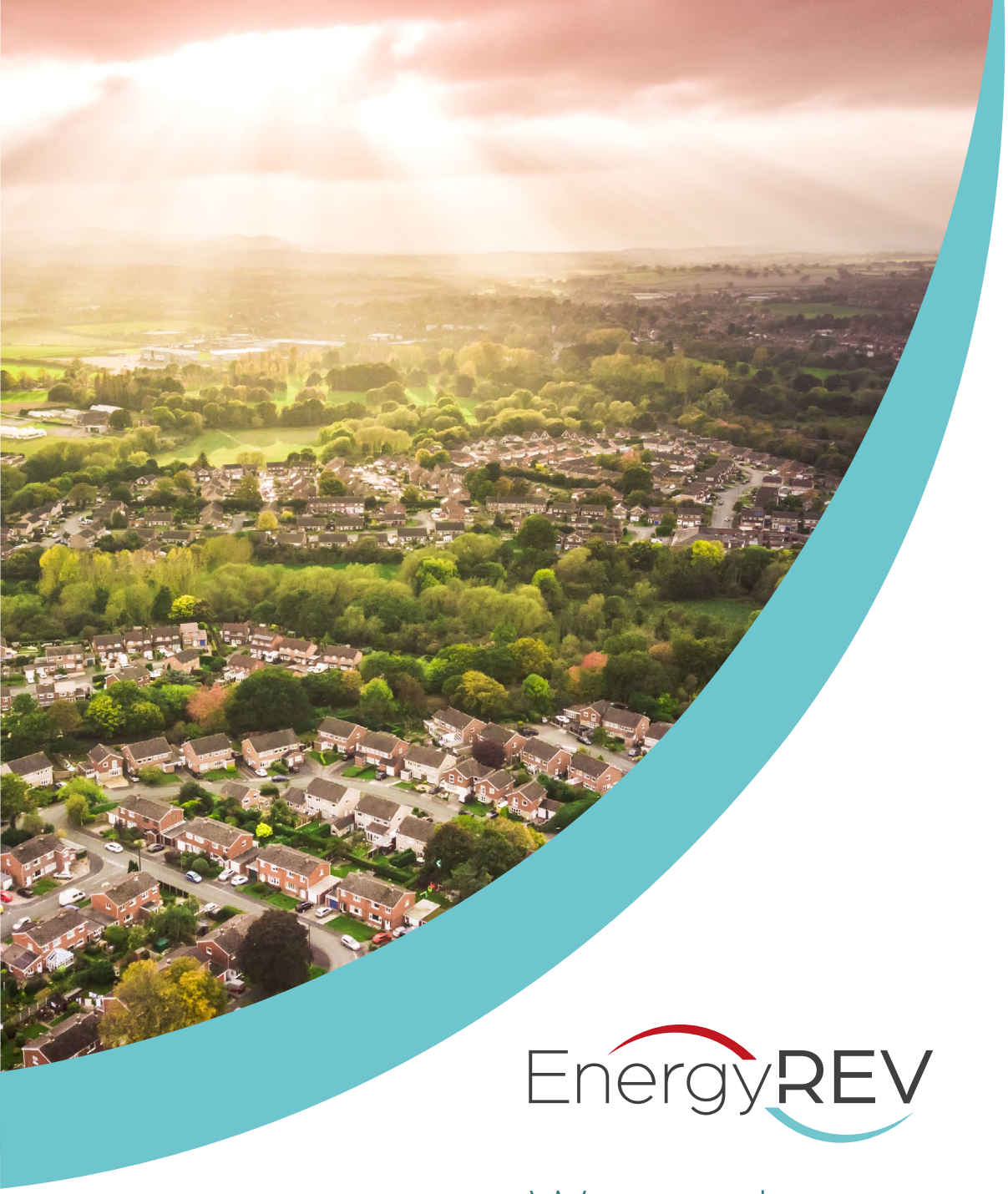

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About EnergyREV

EnergyREV was established in 2018 (December) under the UK's Industrial Strategy Challenge Fund Prospering from the Energy Revolution programme. It brings together a team of over 50 people across 22 UK universities to help drive forward research and innovation in Smart Local Energy Systems.

ISBN 978-1-909522-70-1

EnergyREV is funded by UK Research and Innovation, grant number EP/S031863/1.

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