

Starting to join the dots: An interim review of EnergyREV insights

Carol Vigurs, Michael Fell, Chris Maidment & David Shipworth | September, 2021

Executive summary

Introduction and purpose of this report

Many of the actions needed to achieve the United Kingdom's carbon reduction targets are highly place-based – homes and offices will need to be retrofitted, with low-carbon heating systems installed, and electric vehicle charging infrastructure nearby. These activities can only be done in the place to which they apply, not elsewhere. This, combined with wider trends of digitalisation, decentralisation and democratisation in energy, has focused attention on the role local solutions could play in helping the UK achieve net zero carbon and other societal objectives.

The UK Government launched the Prospering From the Energy Revolution (PFER) programme at the end of 2018 with £100m in funding. Its objectives were to accelerate growth in integrated energy systems and services by proving scalable local business models and unlocking private investment. EnergyREV is a consortium of over 60 researchers from 22 institutions investigating the ways and conditions under which the PFER objectives can be met. EnergyREV is characterised by a strong systemic focus – on the actors, technologies, institutions (and so on) that make up systems, the interactions between them, and the interactions between systems themselves.

This report outlines the findings of a review of the outputs published by EnergyREV up to the end of 2020. The aim was not to provide a comprehensive summary of the work to date but to give a snapshot of the project at this interim stage. We used systematic review methods to explore and better understand the scene that has been set by our researchers' initial investigations and to identify the issues that they are grappling with. This briefing note highlights common findings across a number of key themes as set out below. It also points to practical implications and recommendations of this work, and lists tools and resources the consortium has created. It is accompanied by an [interactive visualisation](#) showing how EnergyREV findings apply to the necessary conditions we think are needed for smart local energy systems to emerge.

Key themes and findings

EnergyREV researchers are examining smart local energy systems (SLES) from a range of perspectives. Some work packages focus on specific aspects – cyber-physical systems, businesses and finance, policy and regulation, user engagement. Others take a whole systems approach – developing a theory of change, and evaluating and supporting the scale up of SLES.

Our review of the outputs produced by EnergyREV so far (up to the end of 2020) identified the following key cross-cutting themes.

A central role for local authorities

For SLES to flourish there is likely to be a need for devolution of responsibility from central government to local authorities, albeit with continued central coordination. This should be combined with resources to increase local authorities' capacity to fulfil valuable roles such as providing technical assistance, project aggregation, and building on the trust they have locally to enhance engagement.

Driving investment

EnergyREV work has shown that public funding has had a key role in underpinning local energy projects -- but that if smartly directed (such as into technical assistance and project aggregation), such funding has the potential to leverage much larger external sums. There are also a range of regulatory barriers that will need to be addressed if substantial new entry into the SLES space by actors from other sectors is to be addressed, such as around licensing suppliers and the magnitude and predictability of income from providing flexibility services.

Connecting and coordinating technologies

A large part of EnergyREV's work has been examining how separate technologies and actors can interoperate and coordinate in a system that produces more value than the sum of its parts. EnergyREV supports existing initiatives to improve availability of energy data and standardisation and has proposed new microgrid computing architectures to support interoperability. There are, however, challenges around the uniformity that standardisation can lead to (especially in an area where local context is likely to be very important), and the privacy challenges associated with extreme data availability.

Flexibility, storage, and resilience

One of the main anticipated benefits from well-coordinated SLES is their potential to unlock energy system flexibility.

Extensive work has been conducted in EnergyREV

on how this might be delivered, mainly through a combination of energy storage and demand response, potentially mediated by local energy markets. EnergyREV modelling studies demonstrate the substantial value that such flexibility could have for the national energy system – value that should be taken into account in the design of SLES themselves (for example in the sizing of storage). However, it also points to complex dynamics whereby increased flexibility could provide sufficient benefit that it dampens investment in new decentralised generation because that is perceived to be less valuable. A range of regulatory barriers to realising the full value of flexibility from SLES are also highlighted.

Direct economic benefits for SLES participants

EnergyRev has looked at the conditions under which SLES can lead to financial savings or increased revenues for participants; for instance, how they are expected to benefit financially from participating in peer-to-peer trading. The main focus has been on how local electricity networks can be managed and charged for in order to minimise costs for users while also avoiding challenges such as curtailing renewable generation.

Who's who: citizens, consumers, prosumers, market actors?

Benefits for participants are affected by the different ways they are treated or framed, for example as consumers, prosumers, citizens, owners, etc. A special focus is put on the distinction between local projects that are spatially defined, and community energy projects that engage the community – a distinction that is likely to be important as SLES continue to emerge across the UK.

Recommendations

While most EnergyREV outputs produced practical recommendations specific to the aspect of SLES they investigated, some broad areas of alignment were found in the advice for policymakers, practitioners and researchers. Many of the recommendations that EnergyREV has produced for policymakers concern engagement strategies to promote local involvement in, and acceptance of, SLES.

These issues are mirrored in the EnergyREV recommendations for SLES providers which include engaging with communities via local actors to ensure that SLES address local priorities and building on this engagement and trust to promote these benefits alongside providing support, transparency and control to energy users. These recommendations are discussed in more detail in the main report.

Practical tools and resources produced by EnergyREV

Work packages across EnergyREV have developed new frameworks, guidelines and tools for those involved in SLES, including SLES planning and provision:

- A [framework for understanding and conceptualising SLES to support design and development](#) (Ford et al., 2019b). In this four-stage approach, the framework aims to provide a structure for SLES stakeholders to consider how and in what ways SLES projects could deliver value in their local context and within the wider technical, social, environmental, financial, and regulatory systems.
- Verba et al. (2020a) have designed a [demonstrator design analysis framework](#), consisting of a two-stage, 10-step process to give organisations a method to analyse SLES projects based on their Cyber Physical System (CPS) components and develop a future-proof energy system.
- A [research portal](#) is being developed to provide access to the range of existing research evidence on SLES (Maidment et al., 2020a)
- From an in-depth literature review of evaluation tools and stakeholder analysis, Francis et al. (2020) propose a [taxonomy to measure the performance of SLES](#) which fall into 10 clusters of themes: Data Security, Data Connectivity, Technical, Transport, Economics, Business and Finance, Governance (Socio-Political), People, Living and Environment.
- [Pattern-IT](#) is a novel, co-created participatory method, using card sorting and sentence mapping (Devine-Wright, 2020) that aims to illuminate the relationships between people, technologies and concepts in complex systems.

In this study, 13 steps in the process are described that correspond to the three research phases: preparation, implementation and interpretation.

- Morstyn and team present [Open Platform for Energy Networks](#) (OPEN), an open-source platform for developing SLES applications (Morstyn et al., 2020) addressing the current challenge of software tools to model, control and simulate distribution systems with embedded distributed energy resources being divided between multiple tools. OPEN is [available for download](#).
- [Insights and recommendations](#) (Maidment et al., 2020b) draw from evidence of the guiding principles of services design that address [customer privacy concerns](#) about sharing energy use data into recommendations for action for SLES data using stakeholders.
- A [theory of change](#) is ongoing work, mapping the evidence for SLES, how they work and how SLES could support prosperous UK communities (Fell et al., 2020b). This includes [a set of worksheets](#) that SLES operators can use to think through the necessary conditions for SLES to come about; the necessary conditions for good outcomes to result; key assumptions that need to be tested; and key risks to watch out for.

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.

EnergyREV is funded by UK Research and Innovation, grant number EP/S031898/1.

 www.energyrev.org.uk

 [@EnergyREV_UK](https://twitter.com/EnergyREV_UK)

 [EnergyREV](#)

 info@energyrev.org.uk