EnergyREV

Overcoming barriers to the upscaling of Smart Local Energy Systems: Insights from previous examples

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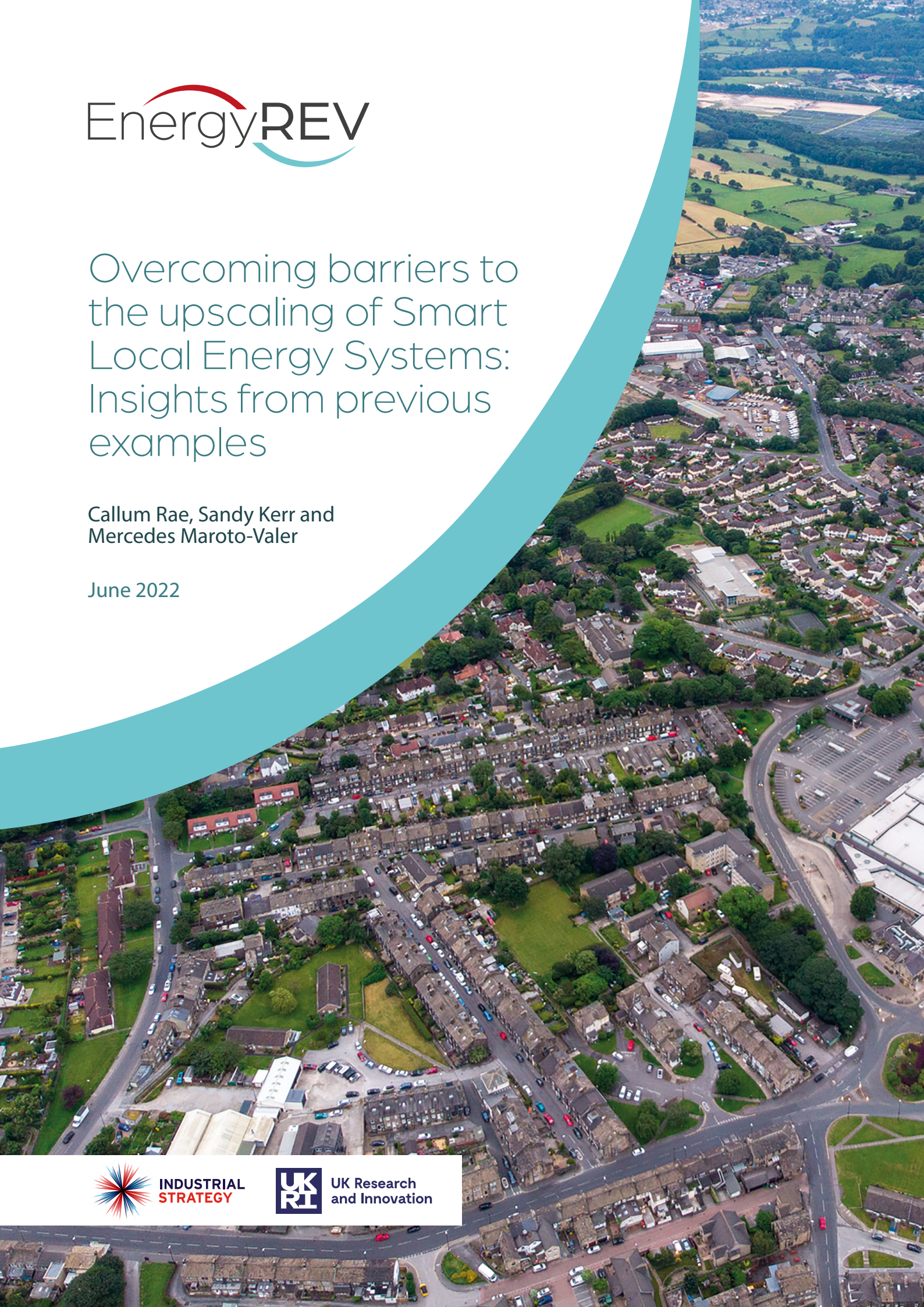

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Executive summary

Scaling up pilot and demonstration local energy projects is a key part of the drive towards a more sustainable distributed energy model. This report uses the experience of previous and existing Smart Local Energy Systems (SLES) to learn how upscaling occurs in practice, and how it can usefully be promoted or facilitated in future, with the aim of identifying barriers that work against the upscaling of SLES. Based on its findings it offers four overarching recommendations for policy makers and project funding bodies on how to remove these barriers to the upscaling and development of SLES in the future.

As the transition towards a more sustainable, distributed energy model has continued to gather pace, the number of SLES projects has increased. Ranging in age, size, location and complexity, these projects have faced a series of technical, social and economic challenges, with varying degrees of success.

As such, these projects – and the communities and organisations involved in their development and operation – represent a significant source of practical knowledge and expertise. Learning from the experience of previous and existing projects can help support innovation and continued development in the sector, while also helping industry and policy makers identify unsuccessful or ineffective technologies, designs, policy interventions and management and governance approaches. Existing and previous examples of local and community energy projects have an important role to play in informing the delivery and upscaling of successful SLES in future.

Despite often being cited as a key outcome of many pilot and demonstration projects, there is currently no widely accepted definition of upscaling in the context of local energy projects. As a result, upscaling can mean different things to different stakeholder groups, organisations, funding bodies etc. In order to best evaluate how upscaling occurs and what can be done to promote it in future, a more inclusive, holistic definition of upscaling that accounts for these diverse factors is required. This in turn means assessing scalability against a broader range of success factors.

To gain relevant insight into previous and existing examples of SLES in the UK and the barriers they face(d), a case study-based approach was selected. This involved the selection and detailed analysis of a series of previous/existing examples of SLES, with the aim of developing a detailed and practical understanding of the barriers facing such projects, how they are experienced in real-world settings and their impact on upscaling.

Four case studies were conducted, in Fintry, Oxford, Mull and Levenmouth. Each combined in-depth desktop reviews with interviews with selected key stakeholders.

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A broad range of barriers and challenges that could have an impact on upscaling was reported. These spanned project funding, planning, design and operation.

- Reliable and affordable technology
- Data and communications
- Project teamworking and communication
- Funding and incentives
- Regulatory barriers
- Technical testing and development
- Engagement and recruitment of users/consumers

In addition to these specific areas, knowledge sharing and dissemination, primarily through project reporting, was found to be highly variable. Ineffective project reporting can constitute a significant barrier to upscaling when, for example, it is not completed or lacks sufficient transparency to allow valuable transfer of knowledge.

The recommendations based on this research have been developed with a view to mitigating and removing barriers to the development and upscaling of SLES in future. These are relevant to the entire sector, but are targeted specifically at policy makers and project funding bodies.

Recommendation 1

Adjust to the complexity of SLES.

Recognise the complexity of SLES and their resourcing requirements.
Project funding and resourcing should reflect the fact that SLES are likely to require more diverse skillsets, increased development and testing time, greater deployment complexity and greater levels of end-user/consumer engagement than other energy projects. This increase in scope should be reflected in the resourcing of SLES projects. Access should also be provided to specialist technical and legal expertise where required.

Place greater emphasis on project testing and development before projects begin.
Particular emphasis should be placed on the need for greater levels of project development, testing and simulation as part of resourcing requirements.

Remove regulatory barriers to enable peer-to-peer trading, smart tariffs etc.
The removal of existing regulatory barriers to SLES success would facilitate the increased levels of integration and interoperability that are needed for multi-vector projects. These represent a significant barrier at present.

Rigorously screen the technical side of project proposals.
In order to reduce project failure rates and reflect the greater technical complexity of SLES projects, more time and resource should be devoted to project screening and appraisal. Over-bearing review and interrogation has been found to be counter-productive when it takes place when the project has already begun, so it is crucial that this takes place at the pre-award stage.

Recommendation 2

Overhaul current project reporting, knowledge sharing and dissemination practices.

Adopt a project information standard for all local and community energy projects.
Adopt a project information standard across the sector and include it as part of funder requirements. As a minimum, this should include information on project location, start date, technologies used, project partners and funding organisations. Links to project websites and documentation should also be included as standard.

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Curate a centralised, combined and freely accessible project database.
Combine all existing project databases, adopting the project information standard described above. This includes a requirement for ongoing database maintenance. This would be best suited to a government department such as BEIS.

Require that examples of lessons learned from previous projects are included in the funding application process.
This would ensure that lessons learned by previous projects were acted upon, by requiring new projects (or funding rounds) to identify relevant examples and demonstrate how they will act upon the lessons they learned. This would be facilitated by the creation of a unified project database, as proposed above.

Enforce full and transparent project reporting, regardless of project outcome.
This involves a cultural change which prioritises transparency and accessibility of project findings over outcome. Requirements for project reporting format, content and dissemination activities should be stipulated by project funder bodies or lead organisations, with emphasis on transparency and communication of lessons learned. As described above, plans should also be made to ensure that project reporting outputs are (and remain) freely accessible.

Recommendation 3

Create a broader definition of upscaling and SLES project success factors.

Define SLES project success factors more widely.
This should include a range of project success factors that encompasses local benefits as well as commercial and technical performance indicators. This should also incorporate consideration of project models and governance, skills development and the establishment of project legacy e.g. through the creation of successful partnerships, behavioural change and the continuation of project aspects beyond the original project timeline.

Create a broader definition of upscaling.
This should reflect the broader set of project success factors described above and create a basis for the planning, operation and evaluation of SLES projects by allowing targets and performance to be measured and quantified.

Recommendation 4

Review how upscaling is promoted.

A review of how the upscaling of SLES should be promoted in future should address the following key questions:

How does upscaling occur in practice, and what does it involve?
This should be based on the broad-ranging definitions of project success and upscaling described in Recommendation #3. This should consider a variety of project types and sizes as well as different funding models and team compositions.

How successful have previous attempts to promote or facilitate upscaling been?
This should consider steps taken to promote/ deliver scalability across a variety project types and sizes as well as different funding models and team compositions. Evaluation of success should be based on a broad range of project success factors, as described in Recommendation #3.

1 Introduction

This report presents the findings of EnergyREV research into barriers to the upscaling of SLES. This forms part of ongoing work on 'Supporting Scale-up' – one of EnergyREV's six key research themes – and aims to utilise the latent knowledge and experience accrued by previous examples of SLES in the UK.

As the transition towards a more sustainable, distributed energy model has continued to gather pace, the number of SLES projects has increased. Ranging in age, size, location and complexity, these projects have faced a series of technical, social and economic challenges, with varying degrees of success. As such, these projects – and the communities and organisations involved in their development and operation – represent a significant source of practical knowledge and expertise.

The primary aim of this aspect of EnergyREV's ongoing research is to develop a detailed understanding of the barriers to the upscaling of SLES. This requires a primarily retrospective analysis of the local and community energy sector, which has been achieved through a review of UK local energy projects and a number of in-depth case studies of selected SLES.

This report describes the resulting findings and presents a number of recommendations intended to help mitigate and remove the identified barriers to scale-up for current and future SLES.

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2 SLES case studies

To gain relevant insight into previous and existing examples of SLES in the UK and the barriers they face(d), a case study based approach was selected. This involved the selection and detailed analysis of a series of previous/existing examples of SLES, with the aim of developing a detailed and practical understanding of the barriers facing such projects, how they are experienced in real-world settings and their impact on upscaling. Case studies consist of a combination of individual projects and clusters of projects, with selection being informed by the technical characteristics of the project(s) and their relevance to future SLES.

This approach builds upon an academic review of barriers to upscaling of SLES conducted during the early stages of this research (Rae et al, 2020).

2.1 Case study selection

The case study selection process was based upon an extensive review of local energy projects in the UK. This review identified over 750 individual local and community energy projects, which were then catalogued in EnergyREV's UK Local Energy Map and the associated database. More information on this review and the resulting database can be found on the EnergyREV website (Rae et al, 2021).

A number of screening criteria were then applied to the list of projects in order to highlight the projects and locations which best reflect (and have the greatest relevance to) current and future SLES. These criteria were intended to ensure that the selected case study locations would be most relevant to current and future SLES and included the involvement of local energy generation/storage, multiple energy vectors and 'smart' characteristics.

The following projects and locations were selected for inclusion in the list of case studies:

- Fintry, Scotland
- Project ERIC, Oxford
- Mull ACCESS project, Scotland
- Levenmouth hydrogen project cluster, Scotland

The selected case studies represent a mixture of island, rural, urban and industrial settings, with differing aims and priorities. The technologies used include electrical and thermal generation, on-site storage and various monitoring, metering, billing and control strategies, and also vary in terms of their maturity.

They combine highly relevant individual projects - ERIC, Mull ACCESS - with local project clusters -Fintry, Levenmouth - that have developed over time. This is intended to provide additional scope for comparison and insight into barriers and challenges.

2.2 Research approach

Each case study consisted of a three-step process:

- **Desktop review**. This phase involved the compilation and review of all relevant documentation surrounding the project(s) involved. This included project reports, press releases and articles, presentations and academic publications. Research was also conducted into the various parties and organisations involved.

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- **Stakeholder interviews**. Interviews with key stakeholders helped to expand upon the findings of the desktop review and to help develop a more practical, detailed understanding of the case studies and the barriers they faced.
- **Analysis**. This helped to characterise each case study and identify key findings from each. All completed case studies were then analysed collectively, allowing key themes and similarities/differences to be identified.

In order to broaden the relevance of our case study findings and improve their representativeness of the sector as a whole, a targeted online survey was circulated among local energy projects stakeholders and related organisations. This served to validate the findings of the case studies, whilst also providing respondents with the opportunity to contribute any additional key barrier areas not previously identified.

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3 What is upscaling?

Although often cited as a key outcome of many pilot and demonstration projects, there is currently no widely accepted definition of upscaling in the context of local energy projects (Rae et al, 2020). As a result, the term can mean different things to different stakeholder groups, organisations, funding bodies etc. (Ford et al, 2019). This can contribute to a host of negative effects, such as tension between project partners, or between project teams and funding bodies or other stakeholder groups. Our research has found the term 'upscaling' to be synonymous with other related terms, such as replication, scaling, growth, roll-out and expansion.

The lack of a common definition of upscaling also means that the term comes to be associated with the specific aspects of upscaling which are most commonly prioritised by SLES projects - typically focused on financial or commercial viability. This serves to narrow the definition of what is a broad ranging topic with a host of varied contributing factors. Relevant factors which can be less quantifiable or are under-prioritised are neglected. As a result, potentially positive but less tangible outcomes risk being omitted from the project review and evaluation process and reporting.

In order to best evaluate how upscaling occurs and what can be done to promote it in future, a more inclusive, holistic definition of upscaling is required which accounts for these factors. This in turn demands the adoption of a similarly broad range of project success factors against which scalability can be evaluated.

3.1 Project success factors

The first and most fundamental prerequisite for upscaling a project or concept is that the original/source project has been successful. If the basis for this judgement – often pre-determined Key Performance Indicators (KPIs) – does not include upscaling-specific data then there is a risk that opportunities for upscaling are lost as a result, or that decisions are made upon partial or even misleading results.

The intrinsic link between project success and scalability means that a more holistic view of project success will provide a more comprehensive basis upon which scalability can be evaluated. Therefore, broadening the scope of commonly referenced project success factors to include, for example, a more comprehensive evaluation of local social and economic impacts and perceptions would serve a dual purpose.

Case study insights: Upscaling & project ERIC

The results of Project ERIC did not provide sufficient evidence for the continued operation or future scale-up of the concept. This was due largely to the limited impact of the project upon the energy bills of participating households, due to a number of contributing factors.

However, a number of positive significant outcomes were achieved:

- The combination of battery storage and building-mounted PV was used again locally shortly after Project ERIC. This was in a different format, which is suggestive of knowledge exchange and the learnings from Project ERIC being used.
- The project resulted in the formation of a number of partnerships between participating organisations, some of whom went on to apply successfully for funding of other energy related activity.
- The project raised the profile of – and provided momentum for – the local sustainability volunteer group and other energy projects and initiatives, including a drive to become a 'zero carbon estate'.
- The experience and profile of the project and its partner organisations played a significant role in Rosehill's inclusion in Project LEO - a larger scale PFER-funded SLES demonstration project.

The findings of the Project ERIC case study exemplify the variety of relevant but indirect forms of upscaling which can result from a SLES project. This case also illustrates the range and variety of success factors which exist in projects such as this, and the importance of recognising this when presenting results and evaluating project success.

3.2 Towards a broader definition of upscaling

In order to fully understand how upscaling occurs - and by extension, how it can best be facilitated in future - it is necessary to capture all relevant project outcomes and include them in the reporting process (as discussed in more detail in Section 6). This requires a broad working definition that can be applied to all local energy and SLES projects. The purpose of such a definition is to:

1. Include all project outcomes which can significantly influence scalability
2. Reflect the variety of ways in which scalability can be achieved
3. Provide clarity to all stakeholders and prevent siloed or limited definitions being perpetuated

Developing such a definition is a complex task which requires an understanding of project success factors and performance indicators which could influence upscaling from across a number of fields including technical context and performance, financial and economic indicators, environmental impact, legal and regulatory context and social and societal impacts. It also requires an understanding of the patterns and drivers that result in upscaling.

A key requirement for a suitably broad definition of upscaling is the need to distinguish between the commonly-used terms that are used synonymously with it, such as replication and roll-out. The framework illustrated in Figure 1 (adapted from Naber et al, 2017) illustrates some of the ways in which the upscaling of sustainable energy innovations can occur, and differentiates between some of these terms.

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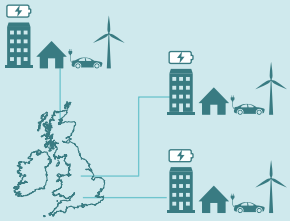
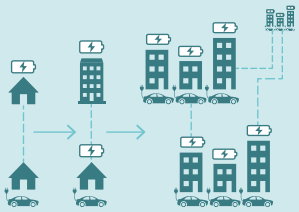
Growth	Replication	Accumulation	…Transformation
			Transformation doesn't refer to geographical or physical scaling, but to the contribution of project(s) in shaping best practice, policy and industry focus
Where an existing project of initiative is expanded to include more participants	Where a project concept is replicated in another location	Multiple projects are linked, physically or organisationally (often via intermediaries)	This sees the associated innovation become the norm

Figure 1: Typology of patterns of upscaling, adapted from Naber et al, 2017.

This represents a step in the right direction by distinguishing between different forms of upscaling. Frameworks such as this also help prompt consideration of the differences and similarities between different forms of upscaling, namely:

- The importance (and variety) in the relationships between different projects under each pattern of upscaling.
- the processes by which these routes to upscaling occur, and the prerequisite conditions that are likely to be in place for upscaling to be deemed viable or appropriate.
- The importance of knowledge sharing and dissemination. This is relevant to all forms of upscaling and is discussed in more detail in Section 6.

3.3 Defining barriers to upscaling

Just as with the examination of upscaling, the identification of barriers to upscaling requires a working definition. For the purposes of this research, barriers to upscaling can be defined as any factor which limits the ability of potential for a SLES, or elements of it, to follow one or more of the aforementioned patterns of upscaling i.e. growth, replication, accumulation and transformation.

Barriers to upscaling can be defined as any factor which limits the ability or potential for a SLES (or elements of it) to follow one or more patterns of upscaling i.e. growth, replication, accumulation and transformation.

4 Key case study barrier areas

The SLES case studies identified a broad range of barriers and challenges, both from project documents and from interviews with key stakeholders. This section provides an overview of the key barriers identified.

Reliable and affordable technology. 58% of survey respondents reported experiencing a lack of reliable or affordably technology options.

Technological barriers can be attributed to both a lack of familiarity/experience on the part of the project team and to reliability issues stemming from technological immaturity. In some cases, technological barriers can arise from particularly novel or complex combinations of mature/established technologies.

Notable among the specific technological barriers identified and reported during the case studies were those involving data and communications technology, such as that used for data monitoring, transfer and processing. This issue was experienced in areas of both the Fintry and Mull ACCESS case studies and is particularly relevant given the likely reliance of future SLES upon real-time communication and the high levels of data collection and processing involved.

Project teamworking and communication. 45% of survey respondents reported experiencing this barrier – the joint lowest of the key barriers identified. However, many local energy projects combine organisations and stakeholders of differing sizes, cultures and locations, and with different project priorities. This creates potential for tensions to arise, which can be further exacerbated by already constrained project budgets and timescales.

In the Mull ACCESS case study, the appointment of a dedicated project manager was found to help mitigate this issue and was regarded by several stakeholders as playing a key role in the project's success.

Funding and incentives.

> "Upscaling - moving technologies from niche to mass-scale - is a huge barrier and some effective technologies are unlikely to reach this scale without increased funding."
>
> Survey respondent.

The relevance of funding and incentives to SLES is clear and can pose a number of barriers to both the success and perceived scalability of a project. 76% of survey respondents reported experiencing this barrier. Of these, 40% rated the likelihood of this barrier being experienced by other projects similar to theirs as 'Very High', with 56% estimating the likely resultant impact to be 'Very High'.

Two of the case studies experienced the loss of project funding mid-project, resulting in the loss of project momentum and the abandonment of projects which had upscaling potential. While the reasons behind the loss of funding differed, neither occurred because the concept or project was found to be fundamentally non-viable. This suggests that potentially scalable solutions are being lost.

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How funding is administered and the conditions imposed by funding bodies was also reported to be a barrier. This was reported to be over-bearing and a drain on already tight budgets and resources, thereby increasing the risk of key project deliverables being delayed or undelivered. In some cases issues were found to stem from the lack of contingency built into project budgets, which is particularly problematic for highly innovative projects or those with a high degree of uncertainty. This reduces a project's ability to cope with unforeseen obstacles or difficulties and increases the risk of project failure.

The loss of incentives such as the Feed-In Tariff has posed a significant barrier to local energy projects in the UK (Community Energy State of the Sector, 2021) and is indicative of a policy landscape that is seen as uncertain and unsupportive by stakeholders.

Regulatory barriers. Our findings suggests that there is a widespread view among stakeholders that the current regulatory environment serves as a significant barrier to both project success and upscaling. This is supported by the fact that 82% of survey respondents reported experiencing regulatory barriers – the highest of all the identified barrier areas.

> "Innovation is stuck in a vicious circle - the thing that could help regulations change (proof of performance/robustness of that device in-situ) is being hampered by the regulations themselves."
>
> Survey respondent.

Regulatory barriers are particularly prevalent and impactful in projects involving variable energy tariffs or peer-to-peer trading, neither of which are fully facilitated in the current regulatory environment. This effectively constrains solutions or approaches which are otherwise viable, and contributes to the view that regulation is not reflective of the demand and capability of the sector.

Technical testing and development. The majority of survey respondents (55%) said they had not experienced this barrier, with the 39% who did report experiencing it estimating the likelihood of the barrier arising in similar projects to theirs (and the likely severity of the resulting impact) to be lower than in other barriers.

However, given the levels of technical and operational complexity likely to be involved in future SLES, the role of testing and development can still be seen as a key barrier. Case study findings suggest that projects which conducted the greatest levels of testing and development in the planning and design stages experienced less unforeseen challenges during deployment and operation. This is attributed to the ability of testing and development to reduce uncertainty by helping project teams to identify potential obstacles through the testing of various design options, configurations and scenarios.

Engagement and recruitment of users/consumers. Given the likelihood that future SLES will require greater user/consumer interaction and impact than more conventional, single-vector or generation-only projects, engagement is seen as being of crucial importance to project success and subsequent upscaling.

45% of survey respondents reported experiencing this barrier – the joint lowest of the key barriers identified. This may suggest that engagement is being managed effectively by the majority of local energy projects. However, a lack of effective engagement was also identified as a major contributing factor to the failure of one case study project. This highlights the potential impact of poor engagement practices and the need for continued improvement during the upscaling of SLES.

4.1 Understanding barriers to upscaling

The previous section summarised the key barriers to success reported during our selected case studies and by survey respondents. This section provides some relevant distinctions and differences between some of the key themes and barriers identified.

4.1.1 Project and context specificity

SLES are generally highly site and context specific. This is due to the potential variation in energy demands, technologies used, location, partner organisations involved etc. This in itself can be seen as an inherent barrier to upscaling, as it limits the relevance and applicability of individual project findings and outcomes and of specific measures intended to facilitate upscaling. It also limits opportunities for direct upscaling of successful projects through replication.

In order to help overcome this selective relevance, comprehensive and accessible project reporting must ensure that relevant findings and outcomes can be identified and accessed by those who could benefit from them. This is expanded on further in Section 6.

4.1.2 Interaction of barriers

There is a natural tendency to categorise identified barriers as a way of providing structure and distinguishing between those which are primarily social, technical, financial etc. However, the nature of the barriers identified during the case studies mean that they are often closely linked, which makes categorising them difficult. Categorisation also risks neglecting the complexity of some of the barriers and the extent to which they interact with each other.

Case Study Insights: Technical and non-technical barriers during Smart Fintry

In the Smart Fintry project, the greatest technical challenge faced by the project team involved voids in the coverage of the communication and metering system used. This interrupted the flow of vital information between participating households and the monitoring and billing systems used and resulted in delays to the project programme, with additional resource required to address the issue.

During the interviews with key stakeholders, it became clear that this seemingly highly technical issue has a number of root causes which were non-technical. The excessive distances between participants – the main cause of the technical difficulties - was attributed primarily to the lower-than-anticipated participation rate among households in the village. This, in turn, was attributed to a general lack of understanding and engagement, resulting in uncertainty among householders as to the benefits, processes and intended outcomes of the project.

This example shows the extent to which technical and non-technical barriers are interconnected and illustrates the need to treat technical and non-technical barriers collectively.

4.1.3 Project vs upscaling barriers

Another important distinction is that which can be drawn between project barriers and upscaling barriers.

Project barriers relate to factors which limit or impede the ability of a project to succeed in delivering its stated objectives and outcomes. These include unforeseen challenges with specific project elements or phases, from minor obstacles to insurmountable barriers. As such, their impacts can also vary widely.

To an extent, project barriers can be considered an unavoidable part of local/community energy projects, particularly in highly innovative and demonstrator-style projects.

Upscaling barriers, on the other hand, include those that limit the ability or potential of any efforts to upscale a project or particular elements of it. These can include project barriers which are not likely to be avoidable or surmountable during upscaling and barriers which impact scalability but do not negatively affect an individual project e.g. a lack of similar viable contexts or locations in which to replicate or expand a project; a lack of demand/market/potential participants to grow or replicate a project, or; the lack of available technology or skills needed to implement upscaling.

The key distinctions between project and upscaling barriers can be summarised as follows:

- Not all project barriers are upscaling barriers, but a project barrier may become an upscaling barrier if it is deemed unlikely to be avoidable or surmountable in future similar projects.
- Project barriers do not necessarily impede upscaling and vice-versa.

4.1.4 Specific vs generic barriers

The barriers experienced in the case study locations included a broad-ranging and eclectic variety of issues and challenges. Some of these challenges were highly specific to the case study projects, their context, specifications and stakeholder groups. Others can be seen as more 'generic' project barriers, which are not specific to individual SLES, or even to SLES in general (Seyfang et al, 2013).

Generic barriers are likely to be more common and widespread, which suggests that they are difficult to overcome. However, the frequency with which they occur means that the impact of mitigating or removing a common barrier would be significant in comparison to removing one which only affects a smaller number of projects.

4.1.5 Reducing project 'failure' rates

Projects which have been found to be unsuccessful do not, unsurprisingly, make compelling candidates for upscaling. In this way, project failure can be seen as the biggest barrier to upscaling, and the reduction of project failure rates as the most effective way of promoting upscaling.

There are two ways of addressing this issue. The first involves addressing the broader challenge of mitigating project failure rates in general, thereby increasing the pool of successful projects from which upscaling opportunities can be identified.

> "[Support] is there… the issue on these types of projects is that it's so very light touch."
>
> Case Study Interviewee

> "…a major, major problem was the whole legal expertise and the contractual arrangements. It's very difficult for a small organisation, and it would be so for community organisations."
>
> Case Study Interviewee

The second approach to this issue centres on the question of whether there are successful elements of unsuccessful projects that are worthy of upscaling. This requires distinguishing between project and upscaling barriers, which could prove culturally challenging and would require a more involved, nuanced approach to project evaluation.

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5 Reporting, knowledge sharing & dissemination

Effective project reporting and knowledge sharing and dissemination plays a central role in summarising and analysing the successes and outcomes of local energy projects. It is the principal method of recording the experience and knowledge accrued by the project stakeholders and – when done well – provides a valuable point of reference and source of information regarding the barriers and challenges faced by a project. The ability to learn from past examples is vital to the progress and development of the sector and to the innovation process in general. Project reporting and the sharing and dissemination of knowledge is therefore seen as being highly relevant to upscaling.

The ability to learn from past examples is vital to the progress and development of the sector and to the innovation process in general.

5.1 Current practice limitations

Our research – and in particular our review of UK local energy projects – has found the quality and quantity of project reporting and knowledge sharing to be highly variable.

There are a number of contributing factors behind this. Firstly, the reporting requirements imposed by the various funding bodies and support organisations vary according to their own priorities and the types of projects they support. As such, larger and more complex projects with larger project teams are likely to undertake greater levels of project reporting than smaller, less complex projects.

In the case of projects which end prematurely or do not achieve their intended outcomes, project reporting is often abandoned altogether. The fact that project reporting is typically the last phase of project delivery to take place also means that even if a project ends in success with good relationships maintained across the project team and other key stakeholders, motivation and available resources for reporting are both likely to be low.

Funding bodies could address this by imposing reporting requirements as a condition of funding. This would ensure project reporting is delivered regardless of outcome.

The accessibility of project reporting was also found to be varied. In some instances, outputs from historic projects are no longer available due to the closure of project websites or because documentation is not retained by funding or support organisations. In other instances, project outputs are retained but are not made publicly available. This severely limits the potential for the dissemination of project outcomes and learnings. This is particularly problematic where projects have been publicly funded.

Another issue affecting current project reporting practices is the tendency to focus on the more successful project aspects or outcomes, with less, or even no, focus given to unsuccessful aspects. In some instances, project reports are so brief that key project learnings and details are not fully conveyed.

> "if you're going to try anything then you're going to have to fail at some things. But the problem is, you've got to be quite careful about how you present that."
>
> Case Study Interviewee

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> "…commercial organisations don't want to admit when they get something wrong, because it would put them in a bad light and they may not get funding the next time. Leads for the project… might not want to admit that maybe other people have spent the money better."
>
> Case Study Interviewee

Case Study Insights: Key outcomes dissemination from Levenmouth Community Energy Project (LCEP)

The LCEP involved the expansion of the existing hydrogen-based energy system to include a local private wire electricity network and the supply of renewably produced hydrogen to Fife Council for use in their fleet of hydrogen vehicles. The project represented a highly innovative advance in the use of hydrogen technology deployment, with potentially hugely informative implications for SLES, both in the UK and beyond.

As part of the case study process, the research team reviewed all available project documentation (project report, websites, presentation materials), some of which were produced after the project had concluded, in an effort to understand the project's design and operation. However, it was only during the stakeholder interview phase that it emerged that the project had to be mothballed after approximately two months of operation due to unforeseen operating costs. Efforts were made by the project team both to address this issue and to capture the lessons learned for the purposes of knowledge sharing and dissemination, but neither ultimately occurred.

This illustrates the tendency to focus on positive outcomes and highlights the importance of transparent reporting regardless of outcome.

This lack of transparency restricts the ability of others to learn from the challenges faced by a project and the project team, and risks mistakes being repeated. Both of these effects slow the rate of adaptation and innovation within the sector.

There is some evidence that the need for improved knowledge sharing and dissemination is acknowledged at policy level (Scottish Government, 2021) and renewed emphasis on the format, content and dissemination of project reporting would go a long way towards addressing the issues identified above and enacting the change required. This is the basis for one of the recommendations made in Section 8.

5.2 Impact on upscaling

Ineffective project reporting practices such as those described above can have a series of negative effects on upscaling:

- Project learnings are not captured/made widely available outside the project team.
- Project barriers risk becoming upscaling ones.
- Responsibility for knowledge sharing and dissemination falls to intermediary and support organisations, although this is not their primary function.
- The sector-wide ability to learn from experience (both positive and negative) is constrained.
- Increased risk of repeated funding for similar concepts due to lack of awareness, which slows the rate of innovation in the sector.
- Increased risk of project barriers and mistakes being unnecessarily repeated.

This underlines the important role that project reporting, and knowledge sharing and dissemination play in the development and progression of the sector in general, as well as on upscaling. This is therefore the subject of one of our recommendations (see Section 8).

6 Facilitating upscaling

The findings reported above provide a number of valuable insights into how upscaling occurs in practice, and how it can usefully be promoted or facilitated in future.

6.1 Key upscaling enablers

Following our review of UK local energy projects and the case study findings presented above, a number of key traits and characteristics which lend themselves to scalability are observable. These key enablers are shared by projects and organisations that have achieved upscaling in some form. They are:

1. A project team that has relevant and transferable knowledge, skills and experience.
2. Alignment of proposals with current policy drivers and funder priorities.
3. Committed (preferably influential) project partners.
4. Identifiably scalable project elements or concepts with clear links to future opportunities.
5. Knowledge of the successes and limitations of related previous/existing projects.
6. An element of local momentum. This includes, but is not limited to:
    * Established, trusted skills networks and partnerships.
    * Knowledge and awareness of funding opportunities and processes.
    * Successful track record of similar/relevant project delivery, which lends credibility to subsequent projects/proposals.

When considering these key enablers within the context of the barriers discussed earlier in this report, it is clear that they address many of the key barrier areas either directly or indirectly. It follows that many of these upscaling enablers can also be seen as being enablers of project success more generally.

7 Recommendations

Based on the research findings presented above, a number of recommendations have been developed with a view to mitigating and removing barriers to the development and upscaling of SLES in future. These are sector-wide in their relevance but are targeted specifically at policy makers and project funding bodies.

7.1 Recommendation #1: Adjust to the complexity of SLES

Recognise the complexity of SLES and their resourcing requirements.
Project funding and resourcing should reflect the fact that SLES are likely to require more diverse skillsets, increased development and testing time, greater deployment complexity and greater levels of end-user/consumer engagement than other energy projects. This increase in scope should be reflected in the resourcing of SLES projects. Access should also be provided to specialist technical and legal expertise where required.

Place greater emphasis on project testing and development before projects begin.
Particular emphasis should be placed on the need for greater levels of project development, testing and simulation as part of resourcing requirements.

Remove regulatory barriers to enable peer-to-peer trading, smart tariffs etc.
The removal of existing regulatory barriers to SLES success would facilitate the increased levels of integration and interoperability that are needed for multi-vector projects. These represent a significant barrier at present.

Rigorously screen the technical side of project proposals.
In order to reduce project failure rates and reflect the greater technical complexity of SLES projects, more time and resource should be devoted to project screening and appraisal. Over-bearing review and interrogation has been found to be counter-productive when it takes place when the project has already begun, so it is crucial that this takes place at the pre-award stage.

7.2 Recommendation #2: Overhaul current project reporting, knowledge sharing and dissemination practices

Adopt a project information standard for all local and community energy projects.
Adopt a project information standard across the sector and include it as part of funder requirements. As a minimum, this should include information on project location, start date, technologies used, project partners and funding organisations. Links to project websites and documentation should also be included as standard.

Curate a centralised, combined and freely accessible project database.
Combine all existing project databases, adopting the project information standard described above. This includes a requirement for ongoing database maintenance. This would be best suited to a government department such as BEIS.

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Require that examples of lessons learned from previous projects are included in the funding application process.
This would ensure that lessons learned by previous projects were acted upon, by requiring new projects (or funding rounds) to identify relevant examples and demonstrate how they will act upon the lessons they learned. This would be facilitated by the creation of a unified project database, as proposed above.

Enforce full and transparent project reporting, regardless of project outcome.
This involves a cultural change which prioritises transparency and accessibility of project findings over outcome. Requirements for project reporting format, content and dissemination activities should be stipulated by project funder bodies or lead organisations, with emphasis on transparency and communication of lessons learned. As described above, plans should also be made to ensure that project reporting outputs are (and remain) freely accessible.

7.3 Recommendation #3: Create a broader definition of upscaling and SLES project success factors

Define SLES project success factors more widely.
This should include a range of project success factors that encompasses local benefits as well as commercial and technical performance indicators. This should also incorporate consideration of project models and governance, skills development and the establishment of project legacy e.g. through the creation of successful partnerships, behavioural change and the continuation of project aspects beyond the original project timeline.

Create a broader definition of upscaling.
This should reflect the broader set of project success factors described above and create a basis for the planning, operation and evaluation of SLES projects by allowing targets and performance to be measured and quantified.

7.4 Recommendation #4: Review how upscaling is promoted

A review of how the upscaling of SLES should be promoted in future should address the following key questions:

How does upscaling occur in practice, and what does it involve?
This should be based on the broad-ranging definitions of project success and upscaling described in Recommendation #3. This should consider a variety of project types and sizes as well as different funding models and team compositions.

How successful have previous attempts to promote or facilitate upscaling been?
This should consider steps taken to promote/deliver scalability across a variety project types and sizes as well as different funding models and team compositions. Evaluation of success should be based on a broad range of project success factors, as described in Recommendation #3.

If these recommendations are acted upon effectively, future SLES will be better able to utilise the significant amounts of latent knowledge and expertise that has been accrued in the local/community energy sector in recent decades, and adapt to the rapidly changing requirements of the sector and its stakeholders in order to fulfil their role as a key part of a just and sustainable energy transition.

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References

Community Energy State of the Sector, 2021. Community Energy England, Community Energy Wales, Community Energy Scotland. Sheffield: Community Energy England.

Ford, R., Maidment, C., Vigurs, C., Fell, M. and Morris, M. 2019. Smart Local Energy Systems (SLES): A conceptual review and exploration. *Technological Forecasting and Social Change*, **166**: 120612. doi: 10.31235/osf.io/j4d57

Naber, R., Raven, R., Kouw, M. and Dassen, T. 2017. Scaling up sustainable energy innovations. *Energy Policy*, **110**: 342–54. doi: 10.1016/J.ENPOL.2017.07.056

Rae, C., Kerr, S. and Maroto-Valer, M.M. 2020. Upscaling smart local energy systems: A review of technical barriers. *Renewable Sustainable Energy Reviews*, **131**: 110020. doi: 10.1016/j.rser.2020.110020

Rae, C., Kerr, S. and Maroto-Valer, M.M. 2021. The EnergyREV UK local energy map: User guide & summary. University of Strathclyde Publishing: Glasgow, UK.

Scottish Government, 2021. Local energy policy statement. Edinburgh: Scottish Government.

Seyfang, G., Park, J.J. and Smith, A. 2013. A thousand flowers blooming? An examination of community energy in the UK. *Energy Policy*, **61**: 977–89. doi: 10.1016/j.enpol.2013.06.030

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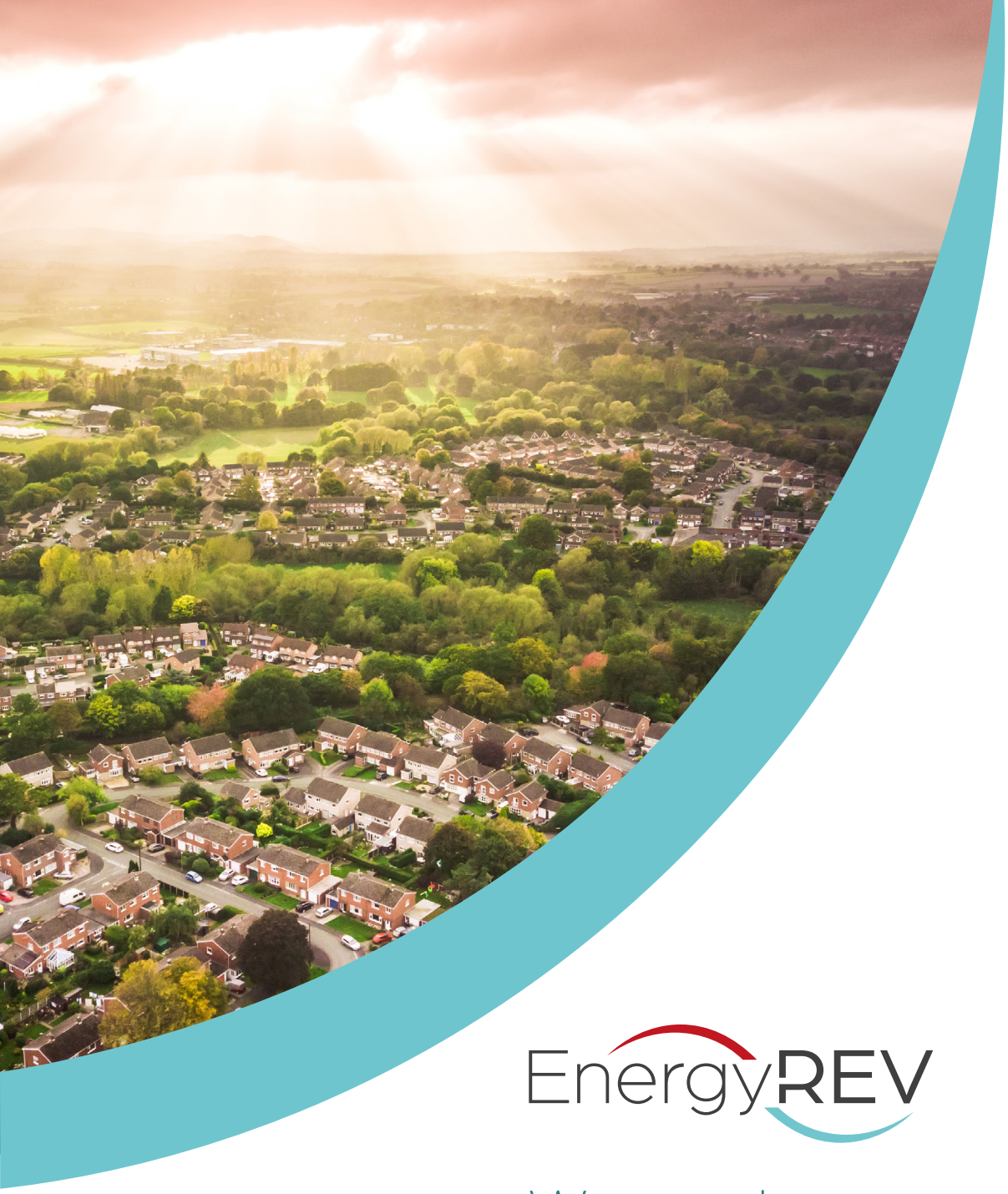

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About EnergyREV

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