A framework for understanding and conceptualising smart local energy systems

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Frequently used acronyms

BEIS Department for Business, Energy & Industrial Strategy
DNO Distribution Network Operators
DSO Distribution Systems Operators
DSP Distribution Service Providers
PFER Prospering From the Energy Revolution
SLES Smart Local Energy Systems

Executive Summary

Countries around the world are embarking on energy transitions to decarbonise their economies. Decentralised and digitised solutions are becoming an increasingly prevalent part of the landscape, but what these smart local energy systems will look like, and the ways in which they will deliver benefits is unclear. Understanding the process by which both system and societal benefits can be delivered is key to make sure the full value of smart local energy systems can be unlocked.

This paper presents a smart local energy system framework, based on a systematic meta-narrative review of the literature, supplemented with expert interviews. The framework provides a structure within which smart local energy system stakeholders can explore how their projects might deliver value and in what context. It helps develop a collective and shared understanding of how smart local energy systems can leverage both “smart” and “local” elements, within a system boundary, to deliver additional value and co-benefits to that locality. It also aims to make explicit the potential unintended consequences that may be realised, as well as the impact on the wider system and the interactions that may be present with other technical, social, environmental, financial, and regulatory systems.

The paper provides an overview of how smart local energy system stakeholders could use the framework to support the design and development of smart local energy systems. It follows a four-stage approach:

(1) identify the overarching purpose or added value(s) that the smart local energy system is aiming to deliver, as well as the co-benefits that it hopes to realise;
(2) consider where and how to define the system boundary, and how hard or soft that boundary might be;
(3) identify the “smart” and “local” elements and interconnections that are required to enable the smart local energy system to deliver the anticipated benefits; and
(4) identify data needs and evaluation strategy to determine how the smart local energy system has been successful, for which stakeholders and users, and under what context.

Finally, the paper outlines where further work is necessary, and identifies some key mechanisms for facilitating continued development of the smart local energy system framework.

Contents

1 Introduction

Countries around the world are embarking on energy transitions to decarbonise their economies, and decentralised solutions are becoming an increasingly prevalent part of the landscape. In the UK this shift toward decentralised solutions can be seen in the industry (e.g. through the DNO-DSO transition [1]), policy (e.g. in the Local Energy Teams across government), and innovation (e.g. UK Government Industrial Strategy [2] challenges and the Prospering from the Energy Revolution (PFER) programme [3]) landscapes.

As part of the PFER programme, four large scale demonstration projects have been funded. While these projects all illustrate how integrated smart local energy systems can deliver power, heat and mobility to users in new and more effective ways, they are very different from one another in terms of the key local and contextual problems they are addressing, the actors involved, and the solutions they are delivering. This presents a challenge for policy makers, the wider industry, and private investors to understand how localised solutions align with the UK's broader energy vision, challenges, and opportunities.

This paper sets out a framework to support smart local energy system stakeholders in discussing and understanding how their projects can deliver value and in what context. The intention of this framework is not to produce one fixed definition of what a smart local energy system (project) is or should do, but rather to provide a consistent way for exploring questions such as: (1) what value or services is the smart local energy system (project) aiming to deliver?, (2) how is "smartness" understood and being delivered?, (3) what makes the system "local"?, (4) how are boundaries being drawn? (5) what aspects of the "energy system" are included?, and (6) how are these "smart", "local" and "energy system" elements enabling additional values and services beyond business as usual to be created?

It is also worth noting that this paper is not about identifying whether smart local energy systems are "better" than a centralised system. Rather, this work recognises that smart local energy system developments are happening, and will continue to happen, and aims to make explicit the potential benefits and consequences that could be delivered at both local and national levels, and the way in which "smartness" and "localness" contribute to this.

[1] Energy Network Association. Open Networks Project – DSO Transition: Roadmap to 2030. Downloaded from http://www.energynetworks.org/assets/files/electricity/futures/Open_Networks/DSO%20Roadmap%20v6.0.pdf. Accessed 11 October 2019.

[2] HM Government, Industrial Strategy: Building a Britain fit for the future. Presented to Parliament by the Secretary of State for Business, Energy and Industrial Strategy, November 2019. Ref: ISBN 9781528601313, CCS1117470076 11/17, Cm 9528.

[3] https://www.ukri.org/innovation/industrial-strategy-challenge-fund/prospering-from-the-energy-revolution

2 Approach

The development of the framework is based on systematic meta-narrative review of the literature, supplemented with expert interviews from a multidisciplinary set of researchers. See the appendix for further details on the methods.

3 The Smart Local Energy System Framework

The goal of the smart local energy system framework (see Figure 1) is to provide a structure within which smart local energy system stakeholders explore how their projects can deliver value and in what context. It can help develop a collective and shared understanding of how smart local energy systems can leverage both "smart" and "local" elements, within a system boundary, to deliver additional value and co-benefits to that locality. It also aims to make explicit the potential unintended consequences that may be realised, as well as the impact on the wider system and the interactions that may be present with other technical, social, environmental, financial, and regulatory systems.

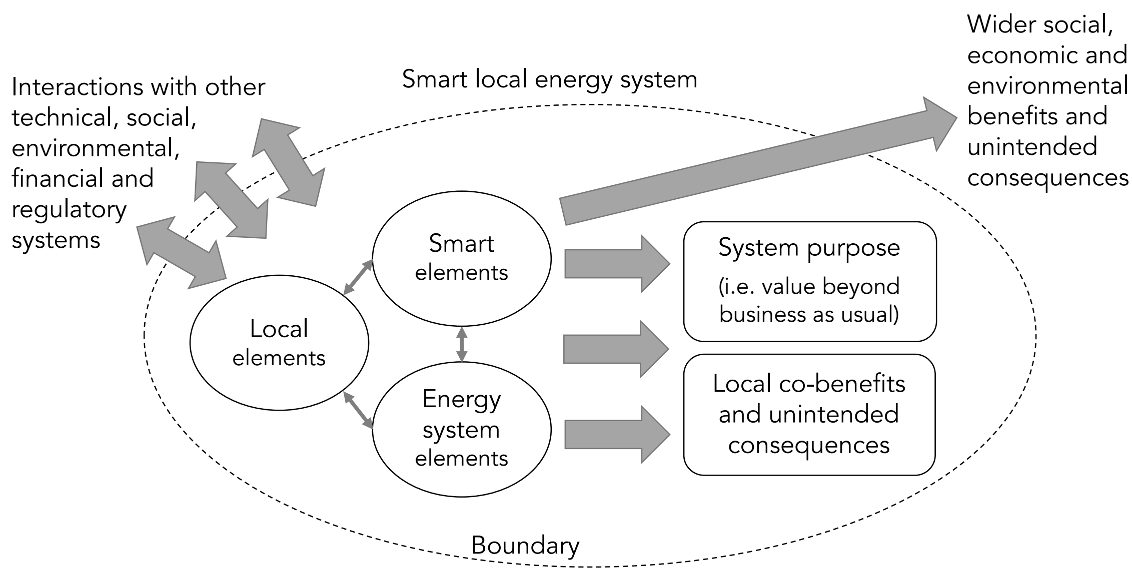

Figure 1: Smart Local Energy System Framework

3.1 System value, co-benefits and unintended consequences

This part of the framework guides users to think about the additional system value, co-benefits, and unintended consequences that could be created by smart local energy systems. This paper does not attempt to create an exhaustive list of options, however, a set of potential areas where value could be created is outlined in Table 1. While not all smart local energy systems may aim to deliver value in each of these areas (and some may identify additional areas beyond the seven identified in Table 1, where system or societal value can be created), the framework makes the consideration of system purpose and value explicit.

In addition to these value creation opportunities, further co-benefits resulting from the smart local energy system development could be delivered. These could include, for example, creating local jobs, strengthening local decision making, demonstrating local leadership within the UK, increasing awareness of environmental issues, building a sense of local community, etc. There could also be unintended consequences, such as negative impacts on bio-diversity due the land use change for solar farms, or inequitable distribution of financial benefits across homes in the region where the SLES is based.

Finally, it is important to consider how the SLES may interact with the wider energy system and other systems. This can help prevent negative impacts at the national scale due to changes within the locality, can help explore where regulatory (or other) barriers may exist, and can also help identify where additional wider system benefits could be delivered.

Table 1: Seven example areas of smart local energy system value creation

Effective provision of energy services

This includes the ability of the system to deliver energy services to users in more effective and efficient ways that reduce system costs and costs to users (e.g. reduced bills) and improve comfort and quality of life (e.g. reducing fuel poverty).

Enhancing environmental eco-system benefits

This includes the delivery of environmental benefits including and beyond carbon emissions reductions (e.g. biodiversity and other ecosystem services that could be delivered alongside renewable energy provision).

Maximising local sufficiency and independence

The ability to locally balance supply and demand was considered to be a key function of smart local energy systems, minimising the energy requirements from the national grid and maximising the use of local and low carbon resources.

Enabling flexibility within and across vectors

Flexibility across vectors and the ability to switch between different vectors to provide energy services was considered a key benefit of smart local energy systems, and a fundamental component of energy system integration for greater efficiency and resilience.

Improved resilience and ability to cope with failure

Smart local energy systems could be better equipped to cope with both local generation failure as well as grid outages, for example, through better use of real time data, enhanced decision making, or autonomous forms of control.

Social justice and energy equity

By engaging local and community actors in new ways, smart local energy systems offer the potential to deliver greater energy equity and benefits to the local community, if they are designed and delivered in the right way and with the right stakeholders.

Meets fundamental needs in context specific way

Smart local energy systems could be better able to serve communities or localities through delivering practical benefits (e.g. making it easier for locals to access and take part in the system), community benefits (e.g. boosting local employment), and wider values based benefits (e.g. addressing desires to reduce global environmental impacts).

3.2 Energy system elements

Before outlining what makes an energy system smart or local, it is helpful to be clear about how the term 'energy system' is commonly understood. From a systems perspective, the elements of an energy system include all components (e.g. hardware, software, processes, procedures, governance structures, and people) that are required for the operation of that system to enable it to deliver its purpose. This is inherently socio-technical in nature, and could include technical energy infrastructure from generation to consumption (including networks and storage) as well as institutional infrastructure (including market structures, regulations, rules, industry codes, business models and so on), which are necessary for the system to operate and deliver energy services to end users.

The key findings emerging from the current work (i.e. the literature review and interviews undertaken) related to energy system elements cut across four themes:

- Multiple vectors
- From generation to consumption
- A socio-technical system
- Incorporates institutional infrastructure

Table 2 provides more information about each of these themes.

Table 2: Energy systems elements
Multiple vectors
The energy system incorporates all energy vectors, and not just electricity. Discussion about energy system purpose and services should be in terms of all the energy related services delivered by the system, including heat and mobility.
Generation to consumption
An energy system covers everything from production, conversion, transmission, storage, distribution, and consumption.
Socio-technical system
This theme acknowledges that the energy system is more than simply its technical components and includes the social and human aspect. It outlines that political, economic and social dimensions are also included in the energy system, and if these non-technical elements were excluded, the word "energy infrastructure" would be a more accurate description rather than energy system.
Institutional elements
Finally, the market structures, regulation, rules, industry codes, contracts, and other institutional elements are a key aspect of any energy system. It is the interaction of the socio-technical elements with these institutional elements that enable the energy system to meet its primary purpose of delivering energy services to end users. Without these elements, the system would not be able to function, and would be incomplete.

Importantly, while these were outlined as key elements of energy systems, the way in which the local energy system boundary is drawn will impact on whether all these energy system elements are part of the local energy system, or whether they represent interactions between the local and wider energy system. For example, the local energy system may not incorporate all generation assets, so depending on where the boundary is drawn there may be significant interaction (technical and non-technical) with the wider system.

3.3 Smart elements

Across the literature reviewed and the expert interviews, four key areas of "smartness" emerged (see Table 3). These include:

- Information and communication technologies
- Automation and self-regulation
- Ability to learn system dynamics
- Smarter decision making

Ultimately, smartness is layered into energy systems by collecting and using more and different forms of data, allowing SLES objectives to be met in more effective ways. This data may be used to support autonomous management of the system, or it may be coupled with data or boundary conditions input by users, applying machine learning and artificial intelligence techniques to improve performance. All of this new data and learning may also be used in new processes to help improve evidence-based decision making for end users (e.g. providing more useful information to help them make more informed decisions about how they use energy), planning, or governance processes.

Table 3: Four aspects of smartness
Information and communication technologies
This refers to the information and communication technologies that are layered onto energy systems, enabling data to be gathered and consumed in real or near real time to optimise its performance against some key criteria (e.g. to deliver greater security).
Automation and self-regulation
This element of smartness refers to the ability of the system to respond to its environment, automatically adjusting its operation to provide services in an optimal way.
Ability to learn system dynamics
This implies some degree of machine learning or artificial intelligence embedded in the system, whereby the energy system is able to regulate itself in accordance with wider dynamics and user set preferences. This perspective couples people with technology in defining the smartness; users set parameters, and technology learns and adapts based on revealed preferences.
Smarter decision making
While there was generally consensus around smartness relying on the generation and use of data, a broader discussion emerged around the location of that smartness, and the ability of smart local energy systems to engage people in more effective decision-making, planning, and governance processes.

3.4 Local elements

When considering local energy system elements, it's important to consider two key issues: (1) how processes, procedures, governance structures, and stakeholders (i.e. the energy system elements) make an energy system local, and (2) where the boundary is drawn around the energy system elements. This section explores both these issues.

The literature review and expert interviews revealed three main ways in which energy system elements make that energy system "local". These include:

- Local and community stakeholders
- Decision making
- Asset ownership

See Table 4 for further information about these local elements in smart local energy systems.

Table 4: "Local" energy system elements
Local and community stakeholders
This acknowledges that community and other local actors have a role to play in the delivery of smart local energy systems. While historically, community energy solutions have typically been more about civic or grassroots organisations and citizen driven change, local energy seems to be more focussed on local authorities working with private sector, placing more emphasis on the role of existing public sector institutions. The involvement (or lack thereof) of community or other local actors could impact on the wider value realised from smart local energy systems. Further evidence is required to gain a clear view as to what value could be gained by local and community involvement (or what value could be lost by their lack of involvement) to explore this issue fully.
Decision making processes
Decision making at a local level is likely to affect how favourable conditions are for local energy systems. This can vary from one local authority to the next, though relationships between authorities can sometimes be forged due to shared energy needs. Recent recommendations from the IGov project suggest that a new entity of Distribution Service Providers (DSPs) become coordinators of local energy systems, market facilitators and balancers. This, they argue, would shift energy systems to place customers at their focus, and drive value creation around efficiency, flexibility and sustainability.
Asset ownership
A degree of control of local energy systems can be maintained through local ownership of assets. Such arrangements can help to foster engagement and enable profits to be kept within communities rather than channelled elsewhere by private companies, which can be further leveraged to effect greater and continued change. Beyond financial gain, such an approach can also support the delivery of local environmental and social benefits in line with local values.

The second issue explores how boundaries might be drawn around smart local energy systems. Making this aspect of the local energy system explicit is important because it could have an impact on the resources or capacity available, and ultimately on the realisation of system or societal value.

Local energy system projects described in the literature vary wildly in scale, from single building systems to anything below the level of national energy infrastructure. However, when determining scale, the following ways of drawing boundaries might be useful:

- On a map
- By generation resource
- By network infrastructure
- Socially

These boundaries are not necessarily contradictory, although they do provide different ways of thinking about what (and who) is or isn't part of a smart local energy system, which can be useful under different circumstances. If a key objective of the smart local energy system is around alleviating issues on the network, then following network infrastructure boundaries may be appropriate. However, to successfully engage users and legitimise new and innovative ways of delivering energy services, a social perspective that enables more subjective ways of determining where the lines are drawn (and how soft or hard those lines may be) might be more appropriate. Table 5 provides further information about these boundaries.

Table 5: Ways of drawing boundaries around smart local energy systems
On a map
In this sense local is based around physical, map-based geography, that can be used to put a circle around energy system. This could reflect local authority areas or some other delineation between different regions (e.g. Parish boundaries) that are evident on a map.
By generation resources
Proximity to energy generation can enable a sense of connection in customers, even where the supply is not directly or exclusively connected to the demand. More commonly though, where supply is located close to demand to take advantage of the close physical connection. This can involve building a local energy system around a single nucleus or a network of multiple energy sources.
By network infrastructure
Local can also be considered in terms of the physical networks and infrastructure that enable energy to flow. As a key purpose of smart local energy systems is local energy balancing, boundaries are often defined by network segment; e.g., all those connected to the low voltage network beneath a particular electricity substation or beneath a known supply bottleneck.
Socially
Local is also defined according to the people who benefit from or participate in their local energy systems. This could also refer to the social context driven by place and identity, where the boundary can vary from a single street or estate up to a county or region, depending on the sense of engagement.

4 Using the Framework

The Smart Local Energy System framework provides a structured way to engage stakeholders in discussing and making explicit key issues related to smart local energy system development. This is important to ensure that these projects are designed and developed in such a way, and with the right range of stakeholders, to deliver the value and benefits that are expected to be achieved through energy system transition in the context of the Climate Emergency.

The framework is designed as a tool for supporting cross stakeholder discussion, to collectively address questions such as: What benefits will the smart local energy system deliver? How should boundaries be drawn around the system? How can “smart” and “local” elements help deliver the anticipated benefits? Within the locality? Beyond the locality? And how can evidence be built to support and refine further development?

This section provides and overview of the 4-step approach for how stakeholders could use the framework to support a collaborative approach for designing smart local energy systems. However, it is also recognised that further work needs to be done to support the full use of this framework, and a discussion around the issues arising and next steps needed is provided in the following section.

4.1 Step 1: Identify the purpose and co-benefits

Identify the overarching purpose or added value(s) that the smart local energy system is aiming to deliver, as well as the co-benefits that it hopes to realise. This likely to be highly context specific; while all projects are likely to have higher level goals around delivering cost, security, or carbon benefits, there may be more specific issues at play within specific regions. For example, some projects may have their primary focus on reducing fuel poverty in homes and creating more equitable and affordable energy systems, while other projects may have a stronger focus on alleviating network constraints and enabling greater connectivity of renewables into the system. While it is likely that most projects will want to realise the maximum set of potential benefits, in practice this may be difficult, for example, if some of the outcomes are linked together such that when one increases the other decreases. In this first stage it is important to identify which outcomes are essential to the project, and which are “nice to have”. Making this explicit helps bring together different stakeholders around a common set of goals, and can also help to develop a way to track progress against all potential outcomes (see Step 4).

Having understood the value creation opportunities, it is then possible to explore how smart and local elements can be brought together, within a specified system boundary, to realise this potential.

4.2 Step 2: Consider the system boundary

Consideration of where the boundary is drawn around a smart local energy system is critically important in terms of understanding how the system may deliver value beyond business as usual. For example, if the goal of the system is to deliver a zero-carbon local energy system (within the system boundaries) there are certain implications on the ability to generate enough clean energy to meet demand within the locality, which in turn has implications on the size of the system (e.g. and how it is situated around a generation site). However, if the primary objectives are around delivering flexibility to enable greater efficiency with which local resources can be used, then the boundaries may not require generation assets to be included. Instead they may require greater consideration of network constraints, which provides an alternative way to define the scale of local. Understanding the relationship between the local energy system values and the system boundaries is therefore a critical step in developing a successful smart local energy system.

A further question to consider relates to how hard or soft system boundaries should be. While some boundaries (e.g. network boundaries) are very clearly defined, other boundaries such as social boundaries are far more subjective. However, these are critically important to ensure the right set of stakeholders and users are engaged in the smart local energy system development. Social identify and connection to place doesn't stop at the end of a road just because the local authority region ends or because of how the network infrastructure is configured. Allowing people and communities to self-identify with a locality, rather than having it imposed upon them, may be key to delivering a socially equitable system, and this raises a question of how and when other, more rigid boundaries should be crossed

4.3 Step 3: Consider system elements and their interconnections

Both the smart and local energy system elements must be present and interconnected in such a way as to enable the system to deliver on this purpose. Considering how these elements are interconnected – i.e. the relationship between system elements and outcomes – can be formalised into a causal model. This is a set of hypotheses that explain how smart and/or local elements can be brought together to deliver system value. Figure 2 depicts this for how certain "smart" elements might be linked to each other, and to key system outcomes (as identified in Step 1).

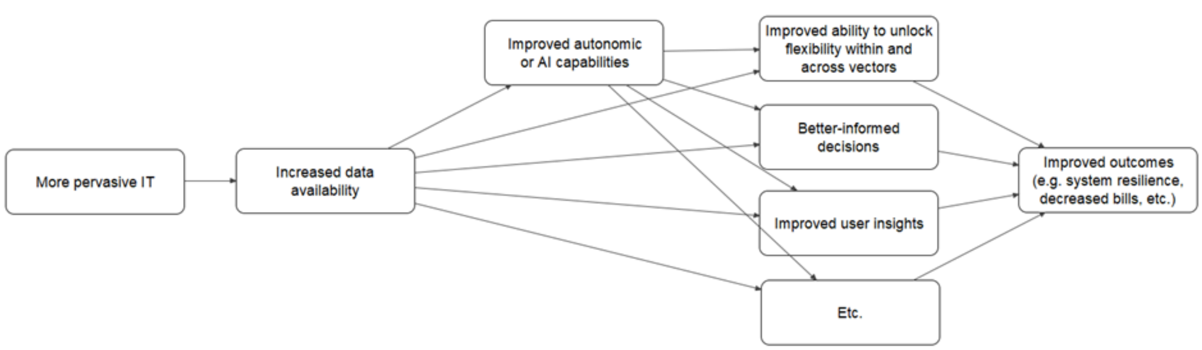

Figure 2: Causal model illustrating how more pervasive information and communication technology in a smart local energy systems might be expected to lead to certain outcomes (please note this is for illustrative purposes only)

The causal model can be developed through consideration of on historical data and evidence as well as expert elicitation. It outlines the expected relationships that may be observed as the system is implemented, and highlights where additional evidence (and data) may be required.

The importance of the causal model – i.e. the way in which elements are interconnected – is illustrated in Figure 3. This simplified schematic depicts how different dynamics of ownership between the same elements might affect the outcomes achieved through a local energy system. Of course, this is just one dynamic interaction for illustrative purposes: a smart local energy system is likely to be a more complex picture with many more elements and interconnections.

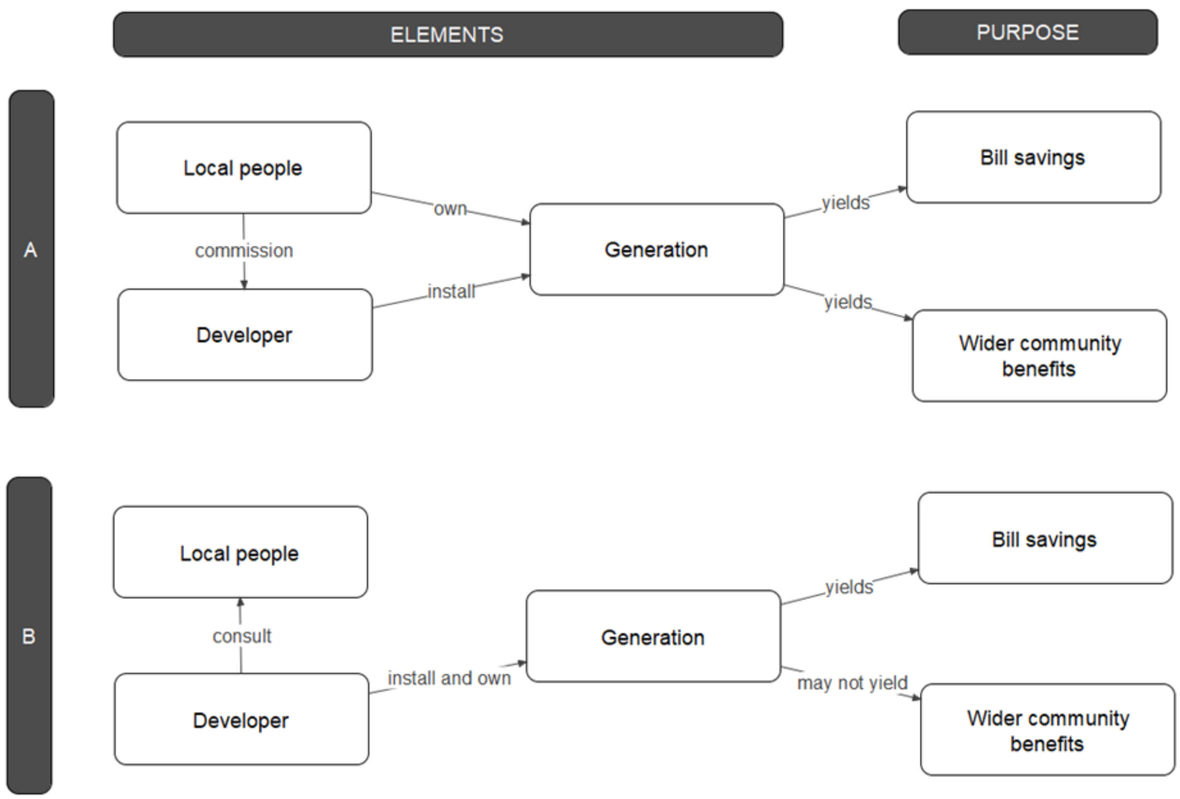

Figure 3: Different dynamics of ownership (for illustrative purposes only): The elements are interconnected (represented by arrows) differently in arrangement A and B, leading to potentially different outcomes becoming viable.

4.4 Generate evidence to test your model

Finally, the smart local energy system development should identify data collection needs required to test the causal model and provide evidence to support or refute the links in the chain connecting smart and local elements to measures of success. By identifying data needs early and baking these key learnings into the project from the start, it is possible to refine the causal model developed in Step 3, and improve the system outcomes identified in Step 1, over the duration of the project. This facilitates an agile approach that will support greater leaning about how success can be driven in smart local energy systems. This will provide insight that can ultimately help identify pathways for replicating or scaling successful solutions.

5 Discussion and Next Steps

Although the smart local energy system framework provides a structured way of considering how value will be created in different contexts, as it stands there are no clear guidelines as to what types of value smart local energy systems could, or should, create. The opportunities for value creation identified in this report are by no means a full list of all the ways that smart local energy systems could deliver value, nor do they consider the potential unintended consequences from smart local energy system development. There is need for further research to provide a structure within which smart local energy system value can be considered, which would allow different projects to be compared in some consistent manner. This wouldn't deem it necessary for all projects to deliver value in all areas, but rather for projects to be clear about the areas in which they are creating value, versus the areas they are not addressing. Furthermore, it would provide a way to benchmark these wider areas of value creation potential to ensure that no negative impacts occur due to a lack of consideration.

A further key consideration for future work should also be around the objective, as well as subjective, importance of different SLES goals and benefits. If setting SLES goals is left solely to those involved in developing the SLES there is the potential for misaligned objectives when it comes to the interplay between national and local goals. Understanding which stakeholders are – or should be – involved is critical, as the starting point for developing a smart local energy system could have a significant impact on the legitimacy of the solution, and on the outcomes achieved. Further, the Climate Emergency context raises questions about whether some benefits (e.g. carbon reductions in line with UK targets) should be a mandated goal, while other benefits and co-benefits could be more context specific with different areas of focus emerging in different projects.

Next steps:
EnergyREV is working with researchers within the consortium, the Prospering from the Energy Revolution projects, and the wider sector and sets of stakeholder groups to develop a structure for considering smart local energy system success, and for identifying which values or benefits are considered imperative to achieve, and which are considered "nice to have". This can form the basis of a set of potential metrics for considering and capturing value creation opportunities.

A further implication arising relates to the capacity requirements around developing a set of causal relationships between smart and local elements and system outcomes. Given the body of evidence that already exists, it is possible to develop an overarching theory of change that brings together hypotheses and evidence around these sets of causal relationships as they relate to the various potential areas of value creation. This could then be reviewed and adapted or added to on a project specific basis through additional data and evidence being generated in the project.

Next steps:

EnergyREV is working with researchers within the consortium to develop an initial set of causal relationships (based on a series of expert interviews) that link smart and local element to the value creation opportunities. This overarching theory of change will be validated and refined using evidence provided in the literature.

Finally, there is the potential to use the framework to explore how smart local energy system development could impact on policy frameworks. There are a number of immediate implications, and others likely to emerge as smart local energy systems are further developed and understood. The first relates to value creation opportunities and the ability to realise these within current markets and regulatory paradigms. The second is due to the new "smart" technologies that might be integrated into existing systems to support autonomous decision-making processes – there are no clear governance structures that define where or with whom responsibilities may lie under autonomous operation. Finally, there remain questions around the data required to support enhanced decision making (autonomous or otherwise). This data could come from multiple sources, and it is not clear whether this data is available to those entities requiring it to make decisions, whether it would be in the right format so that it can be understood, and whether additional protocols or processes might be needed to ensure its security. Furthermore, there is no clear guidelines around how this data, or the evidence emerging from the many smart local energy system developments, could be used by a wide variety of stakeholders to support more effective and evidence based planning processes.

Next steps:

EnergyREV are conducting a series of policy and regulatory reviews to consider different key aspects of policy and regulation in a smart local energy system context. Findings from these will be available via the EnergyREV website, and any key issues arising will be brought to a Policy Contact Group, convened by EnergyREV with membership including representatives from BEIS, Scottish and Welsh governments, and Ofgem. EnergyREV researchers are also exploring cyber-security and data standardisation issues, building on the work done by the Energy Data Task Force.

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Appendix: Methods

Meta narrative review

Relevant papers were identified from bibliographic searches for usages of key terms such as "smart energy system" and "local energy system". The search strategy was an iterative process, as understandings of smart, local, energy systems concepts developed from the literature. Titles and abstracts of the documents, and, where necessary, full papers, were screened for relevance against inclusion/exclusion criteria. Screening was undertaken by two coders and, while blind double-coding was not employed, the coders conferred extensively early in the process to ensure that criteria were being interpreted in the same way.

Studies were assessed for inclusion based on the following criteria:

— Inclusion of substantive consideration/discussion of the meaning of smart/local in context of energy systems

— Description of a project or characteristics of energy system projects that are referred to as being smart/local

Included studies were coded according to descriptive categorisations (e.g., geographical location, keywords, study aims). In addition to these categorisations, the text was inductively coded to capture concepts relating to the characteristics and functions that authors attributed to smart and/or local energy systems.

Expert Views

Expert interviews were conducted with thirteen academics researching a wide range of SLES topics. Interviews were semi-structured, balancing a standardised set of questions with the flexibility to dive into topics as appropriate. Interviews were designed to elicit information related to interviewee's perceptions of SLES. Examples of questions include:

— What do you think about when you hear the term "smart local energy system"?

— How do you draw a boundary around a "local" energy system?

— How is "local energy" different from 'community energy'?

— What do you mean by "smart"?

The interviews were transcribed verbatim texts were read and re-read by two reviewers to familiarise themselves with the scripts, and then inductively coded in the same way as the literature review material.

Analysis

The codes emerging from the interview data were compared to those applied in the literature for similarities and differences. From the descriptive themes identified, two reviewers looked for patterns across all the studies and interviews to identify emergent analytical themes. These were then used to identify the key attributes of the smart local energy system framework.

About EnergyREV

EnergyREV was established in 2019 under the UK's 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.

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