



# Financing smart local energy systems in the British energy market: towards a framework

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# Financing smart local energy systems in the British energy market: towards a framework

Fabián Fuentes González, Janette Webb,  
Maria Sharmina, Matthew Hannon,  
Timothy Brauhnoltz-Speight

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## Authors

- **Fabián Fuentes González** | Department of Sociology, University of Edinburgh
- **Janette Webb** | Department of Sociology, University of Edinburgh
- **Maria Sharmina** | Tyndall Centre for Climate Change Research, University of Manchester
- **Matthew Hannon** | Strathclyde Business School, University of Strathclyde
- **Timothy Brauhnoltz-Speight** | Tyndall Centre for Climate Change Research, University of Manchester

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## About EnergyREV

The Energy Revolution Research Consortium (EnergyREV) is part of the Government-funded [Prospering from the Energy Revolution](#) (PFER) Industrial Strategy Challenge Fund. The PFER programme is investigating opportunities and challenges around policy, regulation, user engagement and digitalisation of energy systems to unlock the benefits of SLES. The PFER programme has invested around £100 million, matched by industry, in a range of projects to help businesses, researchers and local communities develop, test and prove SLES.

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## Highlights

- Financing Smart Local Energy Systems (SLES) in Britain remains challenging.
- Asset securitisation is a potential route to increasing the attractiveness of SLES for investors. Securitisation makes it possible to compare monetary transactions across the multiple energy assets that could be components of a SLES.
- A SLES-oriented governance and risk management framework is critical to minimising risks of securitisation of the kind encountered during the 'subprime' mortgage crisis. A suitable framework is proposed.
- Further steps needed include more detailed quantitative and qualitative assessments to determine whether securitisation can be advanced and adopted as a means of raising funds for SLES.

## Summary

SLES are expected to contribute to climate protection by providing systemic efficiencies, local socio-economic benefits and reduced greenhouse gas emissions. Development of these systems in the GB market entails technical, regulatory and financial challenges. One potential route to resolving financial challenges is asset securitisation. Securitisation enables diverse assets and associated cash flows to be pooled and aggregated for conversion into a security that is typically traded in a financial market as a means of raising funds. However, securitisation was a factor in the 2007/08 'subprime mortgage' financial crisis. Consequently, a robust corporate governance and risk management framework is needed to reduce the risks of any future crisis.

Seven elements are key to the organisation and operation of a securitisation mechanism. They are:

- Culture
- Leadership
- Structure
- Localism
- Cash-Flow-Lock
- Smartness
- Alignment.

In order to strengthen governance and risk management each of these elements is sub-divided into five questions to be addressed by a SLES board or senior management. Examples of robust governance practices are already established in local energy businesses and pilot projects, but there is scope for improvement. We identify the remaining uncertainties which need to be addressed to enable use of securitisation as a financing mechanism for complex SLES.

# Conceptualising SLES

SLES demonstrators and designs are being tested in the United Kingdom (UK), through the Prospering from the Energy Revolution (PFER) programme. The aim is to establish novel, investable and scalable local energy business models that provide cleaner and cheaper energy in a smarter, more integrated way.<sup>1</sup> A key example is the Local Energy Oxfordshire (LEO) project. This initiative is trialling a flexibility market, with local energy generation and trading (including residential heat pumps), digital systems, storage batteries and balancing services. LEO aims to understand pathways to a clean energy transition, which involve and benefit local actors. A cross-sector consortium manages the project.<sup>2</sup>

Figure 1 provides a generic conceptualisation of a SLES. Numerous energy assets, owned and/or managed by varied actors, such as a community group, university, local authority and a private company, are interconnected through physical and digital infrastructures for integrated, real time and locally accessible, energy services. Services may comprise electricity, heat, transport and storage, as well as clean energy sources for local use. The corresponding energy and cash flows are quantified and recorded.

## Some financial challenges

The implementation and operation of SLES entail challenges. Integrating varied energy provisions from multiple assets, potentially owned and/or operated by different actors with varying interests and experience, implies potentially complex socio-technical arrangements. The particular combinations and configurations of physical (pipes, wires, routers, etc.) and digital (software, artificial intelligence systems, firmware, etc.) infrastructures also entail technical challenges with uncertain resolution. Lastly, energy and cash flows within, as well as to and from, the SLES potentially add further economic-financial complexities. Varied energy assets, with potentially differing contributions to the cash flows of the system, can make the management of financial risks more difficult. Determining cash flows, assessing the resources (assets) and obligations (liabilities) of the SLES, may then be problematic.

These complexities and specificities hinder the attractiveness of SLES to investors. They could be addressed initially through effective interconnection and communication between assets, so that energy and cash flows are fully quantified and recorded, providing the critical foundations for appropriate finance and investment. Specific financial instruments may also be used to enable comparability of intricate cash-flow transactions, with the goal of easing investment decision-making.

1 See [Prospering from the Energy Revolution: Unlocking the potential of intelligent local energy systems for the UK](#)

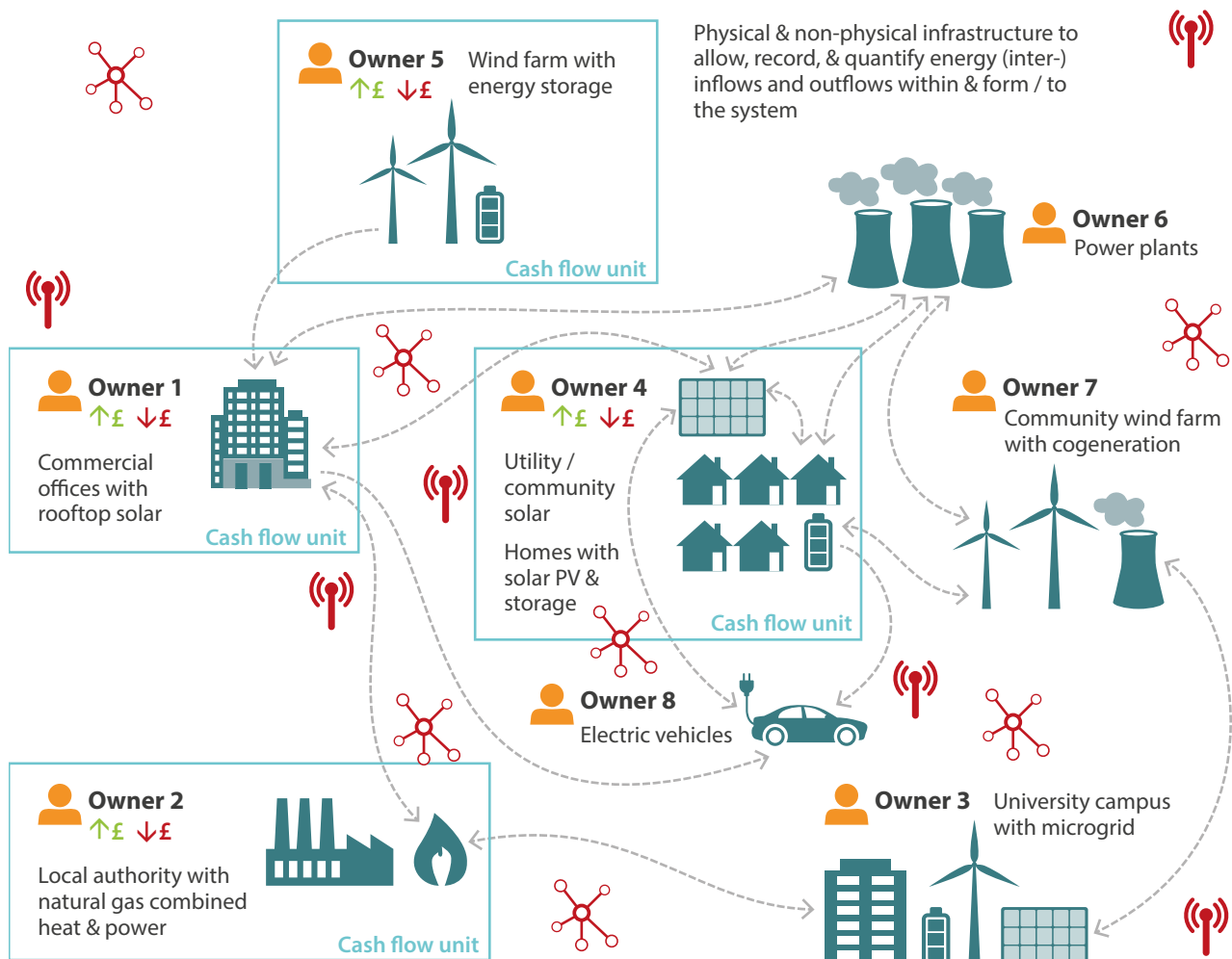
2 Partners are Scottish and Southern Electricity Networks, EDF Energy, Nuve, Open Utility, Origami Energy, Oxford Brookes University, Oxford City Council, Oxfordshire County Council, The Low Carbon Hub, and the University of Oxford.

# Asset securitisation as a tool to overcome challenges

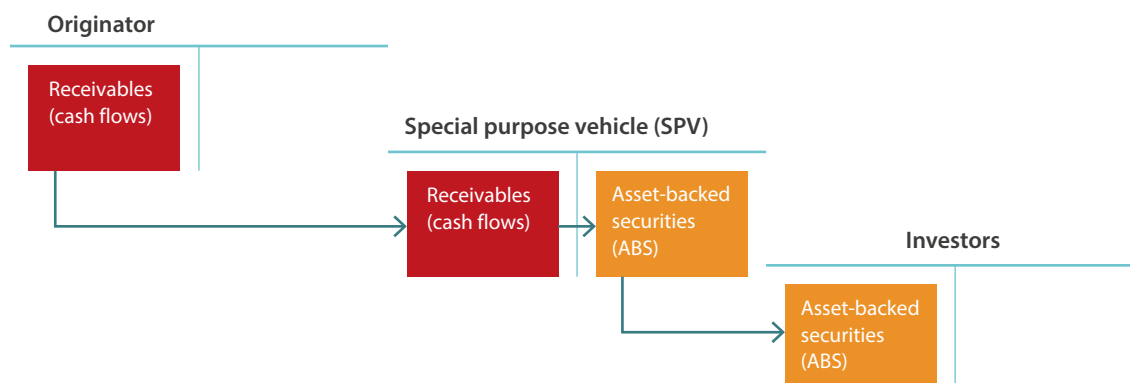
A financial mechanism suited to enabling such comparability of cash flows from diverse assets is securitisation. Asset securitisation consists of pooling and aggregating diverse assets and their cash flows, in order to convert them into an asset-backed security (ABS) that is typically traded in a financial market, as a means of raising funds.

A basic example of an asset securitisation scheme is provided in Figure 2. For instance, cash flows from numerous mortgages can be packaged and offered to investors through a Special Purpose Vehicle (SPV), as a bond or mortgage-backed security. The resulting financial instrument, solely backed by such cash flows, is then traded in a financial market. Subsequent aggregated cash flows from the pool of assets (alternatively, from the debtors) enable timely repayments to investors.

Figure 1: SLES generic conceptualisation.



**Figure 2:** Securitisation basic scheme.



Following the above example, numerous, different energy assets and their cash flows, within a SLES, could be packaged and securitised. As illustrated in Figure 1, a community-owned solar farm may generate cash flows, along with network and digital assets owned by other, non-community, actors. These network and digital assets should also be remunerated for the services provided. In this vein, securitisation can help to standardise and simplify transactions entailing multiple, and distinctive, cash flows, even when the means of cash flow generation from network and digital assets are likely to differ from the means available to a solar farm (transaction-based remuneration versus power purchase agreements or PPAs). Associated procedures for estimation, generation, collection and utilisation of revenues for the entire SLES could then be made feasible.

Since an asset-backed security comprises a financial instrument designed to produce a consistent stream of cash flows, the particularities of how such a stream is generated by each SLES asset may then be less important for investor decisions. Cash flows must therefore be properly estimated for each SLES asset, including accounting for, and assessing, the associated risks. The resulting pool of ABS cash flows must be consistent and uniform.

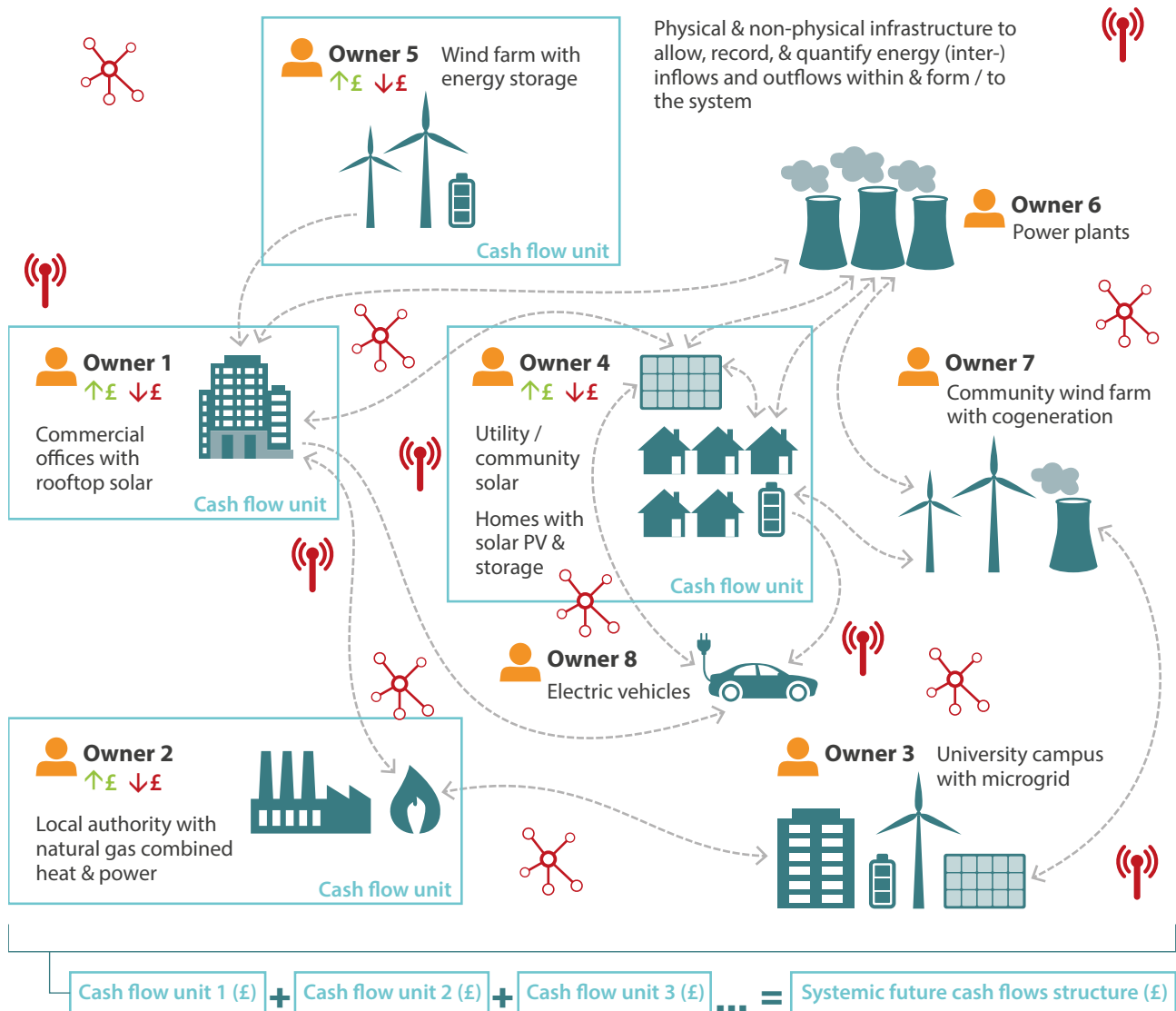
Such securitisation could help increase the likelihood of raising finance for SLES through financial market offers to attract investors. Diverse SLES (and resulting securities) with different levels of risk and return could be offered to investors. Alternatively, a subset of SLES assets, with common levels of risk and return, could be securitised. Resulting risk assessment for the whole SLES would however differ in complexity.

In this way, ABS can provide opportunities for market segmentation and improved financial attractiveness. By pooling and aggregating SLES assets (and their cash flows), with distinct levels of risk and return, and trading in well-established financial markets, the chances of reaching a significant number of willing investors could be increased.

### Towards a specific securitisation mechanism for SLES

A specific securitisation scheme, based on the potential future cash flows to be received by the SLES, could be set up to raise funds. The diverse energy assets, owned and/or managed by varied actors, need to quantify and record energy inflows and outflows, in relation to pricing mechanisms. Such flows must be based on explicit agreements derived from the energy services, such as PPAs, pay-as-you-go plans, annual or monthly subscription plans, etc.

**Figure 3:** SLES conceptualisation and systemic future cash flow structure.



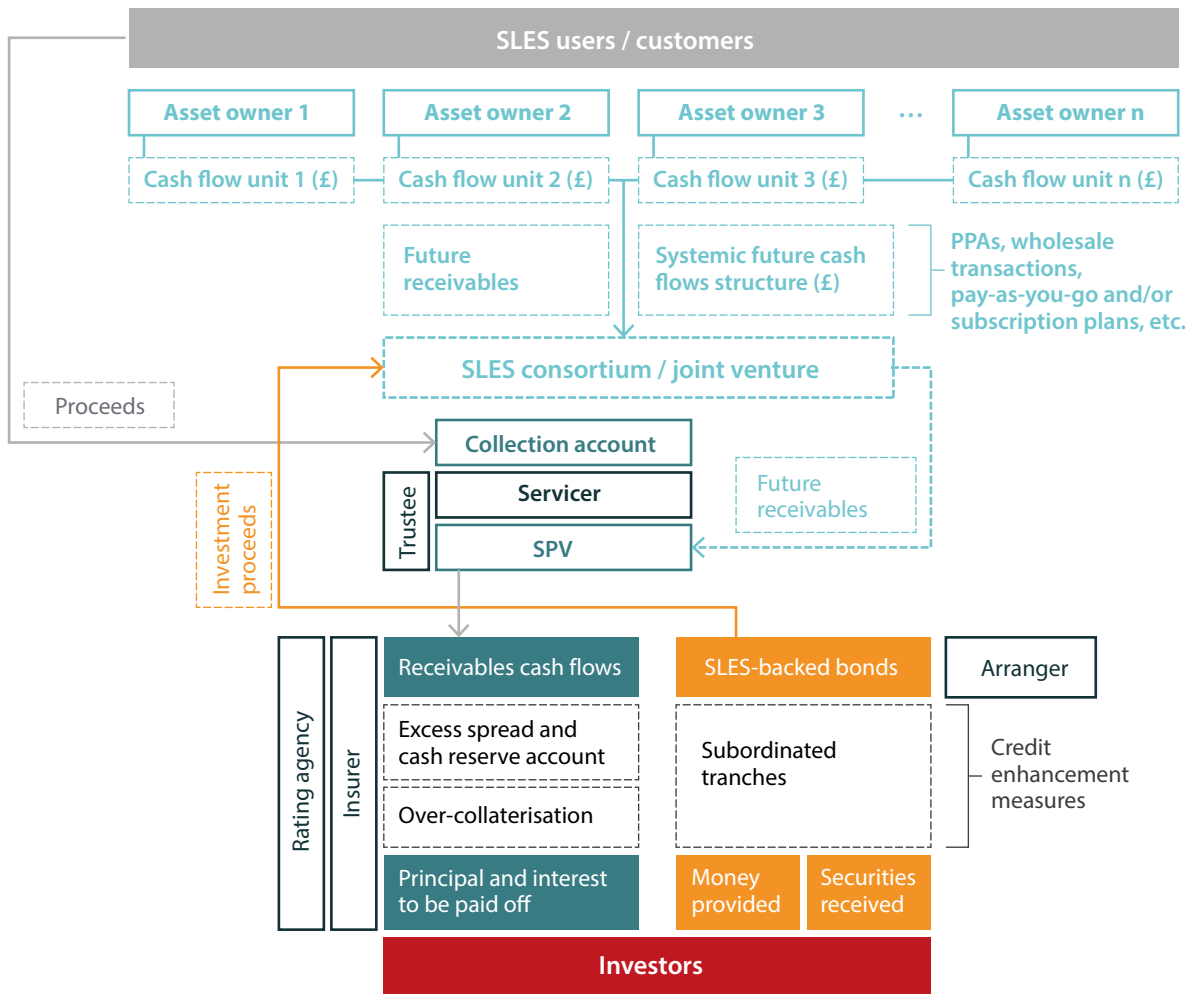
The resulting contracts and associated cash flows will be the fundamental part of the future receivables and income rights or assets to be sold to the SPV.

This is equivalent to an energy consortium or company providing diverse energy services to customers, with its costs, benefits and risks.

When a SLES needs financing in its entirety, its energy assets should contribute to aggregated cash flows (Figure 3) for the complete system. This could enable standardisation, pricing and securitisation activities for the SLES as a whole. In this case, risks are assumed to be similar for all energy assets of the system, so that the level of risk (and return) offered to investors is consistent. In this vein, any SLES could operate as a homogenous, uniform organisational, business and financial unit.



**Figure 4:** Initial securitisation mechanism for SLES.



As detailed in Figure 4, a SLES consortium or joint venture (the issuer) that is responsible for development and operation could establish a SPV and sell the SLES assets and cash flows to this vehicle in order to issue bonds to investors. The process of configuring bonds and placing them in the market may require financial engineering via a specialist (or arranger, in technical terms). Likewise, in order to support future income rights and receivables, and timely cash flow collection, a third-party servicer has to be considered in the scheme, so that investors are paid back on time.

Compared to other underlying assets, such as mortgages, SLES may entail more uncertainty and risks for investors. This could be addressed through significant demand for energy services from local and wider customers (via the wholesale market, for example). Other means of managing risks and uncertainty include credit enhancement measures via a cash reserve account set up by the SPV, and extra money (over-collateral) directly transferred to the SPV by SLES consortium members with stronger finances.

These measures can be used if debt servicing becomes difficult. As in other financing mechanisms, senior and junior tranches of debt could be set up in order to disaggregate and prioritise obligations to investors.

Covenants could also be put in place, such as any excess of cash flows collected, over and above debt to be repaid; such indicators help monitor the performance and debt servicing capacity of the securitisation mechanism throughout its lifespan. Default insurance underwriting would require specialised evaluation and decision-making, due to the complex nature of such securitisation schemes. As in any other future cash flow securitisation scheme, credit rating agencies should assess SLES against diverse indicators. These would test the issuer's liquidity and credit rating; business continuity plans; cash flow collection and recovery mechanisms; money recovery volume and legal/regulatory dimensions.

### Securitisation: some cautions

But in order to succeed, such asset securitisation must be properly managed. Following the 2007/08 'subprime' financial crisis, several factors were identified as in need of governance reforms: permissiveness in the culture of many financial companies; overrated risk management tools; inappropriate compensation mechanisms; ineffective governance arrangements and weak internal controls. The lessons suggest that corporate governance and risk management standards will be critical to any SLES securitisation scheme.

# Supporting securitisation: a corporate governance and risk management framework for SLES

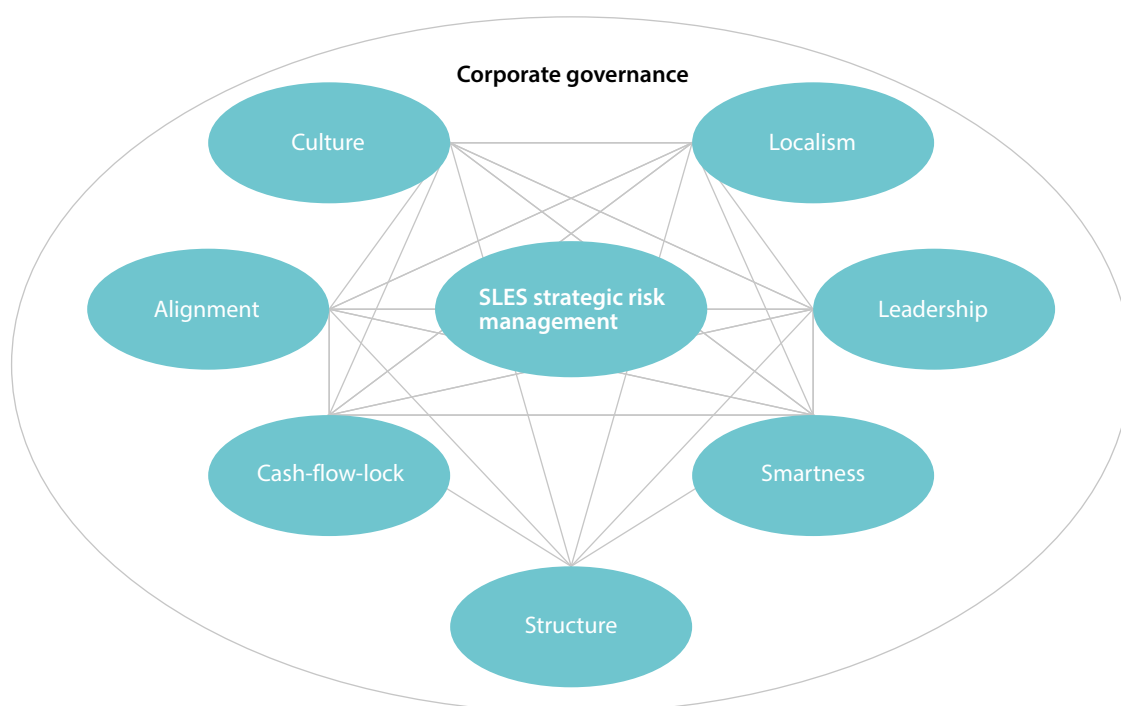
Corporate governance and risk management practices help to build trust, transparency and accountability for all parties to financial investments. Elements to be considered in any robust framework are:

- proper disclosure of business and financial activities
- clear definition of roles and responsibilities
- appropriate monitoring and feedback
- fluent communication with stakeholders
- orientation to organisational longevity and growth

A robust framework needs to anticipate and mitigate risks to strategic goals. This helps the SLES board and senior management to act with integrity in line with strategic objectives.

Taking Drew et al. (2006) as a starting point, we propose a framework (Figure 5) addressing the key governance and risk management elements for SLES. The framework takes seven elements into account. Leadership shapes business culture (e.g. customs, beliefs, behaviours, etc.). The smartness of a SLES affects the requirements for its structure for effective operation in the market. Elements of leadership, culture, smartness and structure help to establish local engagement plans. Furthermore, these define methods for estimating and securing cash flows (Cash-Flow-Lock), to strengthen the finances of the SLES.

**Figure 5:** Governance, risk management framework for SLES.



When Leadership, Culture, Smartness, Structure, Localism, and Cash-Flow-Lock are aligned, the SLES commitments and strategies to achieve those are coherent. All the elements in this framework are therefore mutually reinforcing and inter-dependent.

In the suggested framework each element is further broken down into five questions (Tables 1 to 7), which SLES can use to make sure that they achieve strategic goals and minimise the risks of securitisation.

The framework consists of these elements:

**1. Culture** refers to the key ideas and pathways governing SLES energy services, business practices and conduct of employees or partners. This includes:

- explicit inclusion of ethics
- beliefs and values articulated in mission statements
- a commitment to success
- grievance procedures which protect the complainant
- avoidance of short-termism
- disciplinary codes.

**Table 1: Questions for Culture**

1. Are the SLES consortium beliefs and values openly articulated in mission statements, and do these include ethical concerns?
2. Does the culture in the SLES consortium or its members temper a drive for success with a tolerance for occasional failure?
3. Do SLES consortium members, employees feel free to bring problems to senior executives, or even to the board, without fear of adverse consequences?
4. Are the SLES consortium or its members not unduly concerned with meeting short-term earnings or benefits targets, and are fear and extreme pressure not associated with missing financial, technical goals?
5. Do incentive plans of the SLES consortium or its members (in any way) discourage unacceptable, unethical and illegal behaviours?

**2. Leadership** refers to the characteristics for effective leadership needed to manage the SLES. This includes:

- effective team building and communication skills
- realistic perspectives on opportunities and limitations
- commitment to the highest standards
- independent thinking and challenge
- sensitivity to the needs of localities and other interested parties
- motivations beyond financial and operational metrics.

**Table 2: Questions for Leadership**

1. Is the SLES consortium leadership overly/too charismatic or powerful?
2. Does the SLES consortium leadership show enough reflection and realistically assess opportunities and limitations in the business environment?
3. Are the leaders of the SLES consortium and its members committed to developing the highest standards of corporate governance, managerial judgement and independence of mind in their followers?
4. Does the SLES consortium leadership show sensitivity to the needs of (local) stakeholders?
5. Are leaders at all levels measured and motivated not only by financial or operational metrics, but also by longer-term strategic and ethical considerations?

**3. Structure** refers to the requirements for key roles, responsibilities and functions for governance and risk management. This comprises:

- formal separation between the CEO and Chairman roles
- management of conflicts of interest
- diversity of the board
- acknowledgement and management of local interests
- an effective system of checks and balances
- formal internal auditor and risk manager roles
- explicit responsibilities for internal control assessments

**4. Localism** refers to how a SLES engages with localities and other interested parties, following good practices of governance and risk management, including:

- clear decision-making processes engaging with local representatives
- disciplinary procedures
- management and monitoring of benefits to localities
- long-term engagements with localities
- engagements with localities, including procedures for managing conflicts of interest
- a means to offer a local ownership share.

**Table 3: Questions for Structure**

1. Are the roles of chairman and CEO combined? If so, are conflicts of interest managed properly?
2. Are outsiders on the board and is there an appropriate degree of diversity? If so, is the diversity of the board aligned with the local stakeholders' interests, concerns?
3. Does the organisational structure provide an effective system of checks and balances for governance and strategic decision-making?
4. Are there strong roles for internal auditors and risk managers, with an appropriate structure of reporting to senior executives and board committees?
5. Is the responsibility for assessment of internal controls structured throughout the organisation?

**Table 4: Questions for Localism**

1. Are decision-making processes that involve participation of local stakeholders clearly defined, widely-known and orientated to discourage unacceptable, unethical and illegal behaviours?
2. Are benefits delivered to localities properly characterised, quantified (if possible), authorised and audited on a regular basis?
3. Is the engagement with local stakeholders aligned with a long-term vision that prioritises the SLES's longevity and growth, rather than short-term, particular interests or returns?
4. Are the nature and extent of engagements with local stakeholders explicitly established and focused on avoiding conflicts of interest?
5. Are mechanisms to allow local actors to have a stake in the SLES widely-known, clear and reasonably simple?

**5. Cash-Flow-Lock** refers to fundamental risk management and governance activities to secure robust cash flows that ensure that investors are paid back on time. This element comprises:

- widely-accepted and well-communicated levels of investment, risk exposure and expected returns
- legal formalisation of energy provision agreements
- cash flow estimation mechanisms
- prudent assumptions and supporting documentation for cash flow estimation and collection
- financial risk management models
- monitoring of market conditions

**Table 5: Questions for Cash-Flow-Lock**

1. Are the SLES consortium members satisfied with the project’s estimated levels of required investment, expected return and risk exposure for investors? Are these levels clearly determined and communicated to interested parties?
2. Are all future energy provision agreements (e.g. PPAs, pay-as-you-go plans, subscription plans, etc.) properly established, documented, known by all members and aligned with the applicable legislation/regulation?
3. Is the cash flow estimation mechanism reasonably intuitive, transparent, supported by prudent assumptions and documentation, and widely known by all SLES members and actors involved in the monitoring of internal controls?
4. Are financial models used by the SLES consortium capturing and assessing risks, including the utilisation of proper collateral, if necessary, in an accurate, intuitive and transparent way?
5. Are SLES consortium monitoring activities also focused on assessing market conditions that potentially threaten cash flow generation and collection? If so, are there regular discussions about relevant findings and mitigation plans?

**6. Smartness** refers both to the operation of the SLES digital infrastructure and minimising risks. Such activities are mainly related to:

- an effective and standardised internal control system
- recurring assessment of business and regulatory/legal changes
- implementation of a risk governance framework aligned with legal/regulatory requirements
- links between risk management systems and business activities.

**Table 6: Questions for Smartness**

1. Does the SLES consortium have an effective and standardised system of internal controls, including advanced controls for activities based on machine learning and/or artificial intelligence, and financial reporting?
2. Are changes in the business and regulatory/legal environments that have an effect on internal control systems regularly assessed?
3. Are the SLES consortium and its members constantly attempting to link implementation of specialised risk management frameworks with business activities to improve strategic risk management?
4. Are there systems in place to identify, assess and mitigate risks across the SLES consortium and its projects?
5. Are the SLES consortium members attempting to implement a framework and systems for IT governance that will comply with regulatory/legal requirements?

**7. Alignment** refers to the consistent and coherent use of governance and risk management best practices.

**Table 7: Questions for Alignment**

1. Do the SLES consortium's recent actions and performance show evidence of focused and aligned priorities?
2. Do the leadership at all levels in the SLES consortium and its members collectively have an understanding of the best practices in corporate governance, risk management and internal reporting, and how these may be aligned?
3. Have the responsibilities of senior executives and governance, audit and risk management committees of the SLES consortium or its members been properly aligned to ensure compliance with regulations?
4. Is there regular communication between internal auditors, external auditors and senior executives concerned with risk management?
5. Do strategic planning and risk management processes encourage an appropriate balance of conservatism with action plans, and risk avoidance with opportunity seeking?

## What has been done

SLES projects and demonstrators already use some or the governance and risk management principles consistent with asset securitisation. For example, LEO explicitly states principles, values and beliefs, and uses a range of metrics beyond finance, to evaluate performance. A Stakeholder Advisory Board, and clarity about the characteristics and potential influence of stakeholders, as well as communication strategies, demonstrate LEO's commitment to localities.<sup>3</sup> Other governance principles are a foundation for a smart/IT-based management framework. Examples are implementation and use of certified shared datasets, a data sharing agreement, and a 'corrupted data' fixing tool. There is scope for future development, drawing on the framework suggested in this report, for development of a securitisation mechanism.

### Key issues and uncertainties

This report has suggested some ways forward to facilitate appraisal and possible adoption of securitisation for SLES, although further evaluation of feasibility is needed. In Britain, SLES projects and demonstrators have not yet reached commercialisation stage, and their organisational structures tend to be tightly coupled to funders' requirements and needs. Financing and investment options, including securitisation, remain uncertain. The particular consortium managing strategic development of a SLES will also shape the investment and finance strategies and opportunities. For a SLES operating as a subsystem embedded in a centralised system, and governed by actors with little local knowledge, investment and financing strategies may be different.

Most importantly, a SLES remuneration scheme needs to be sufficiently robust to manage the fundamental financial requirements, as well as integration of new assets and their financing. The GB-wide review of system charges may influence the structure of such remuneration schemes, and future cash flow potentials. If resulting regulations help to secure predictable income and increase cash flow receipts, however, the attractiveness of future cash flow securitisation could improve.

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<sup>3</sup> See [Local Energy Oxfordshire Annual synthesis report Year 2](#).



## Conclusions and further steps

Securitisation provides opportunities for raising funds for SLES by enabling similarity and comparability of cash-flow transactions between numerous energy assets. A specific SLES securitisation mechanism would rely on the future cash flows derived from the diverse formal energy service agreements between the business and its customers. Examples of such agreements are PPAs, pay-as-you-go plans, and annual or monthly subscription plans.

Asset securitisation was however implicated in one of the most important financial crises that the world has faced, i.e. the 'subprime mortgage' crisis. A range of factors have been identified as causing the crisis, and this has also highlighted the importance of a robust corporate governance and risk management framework.

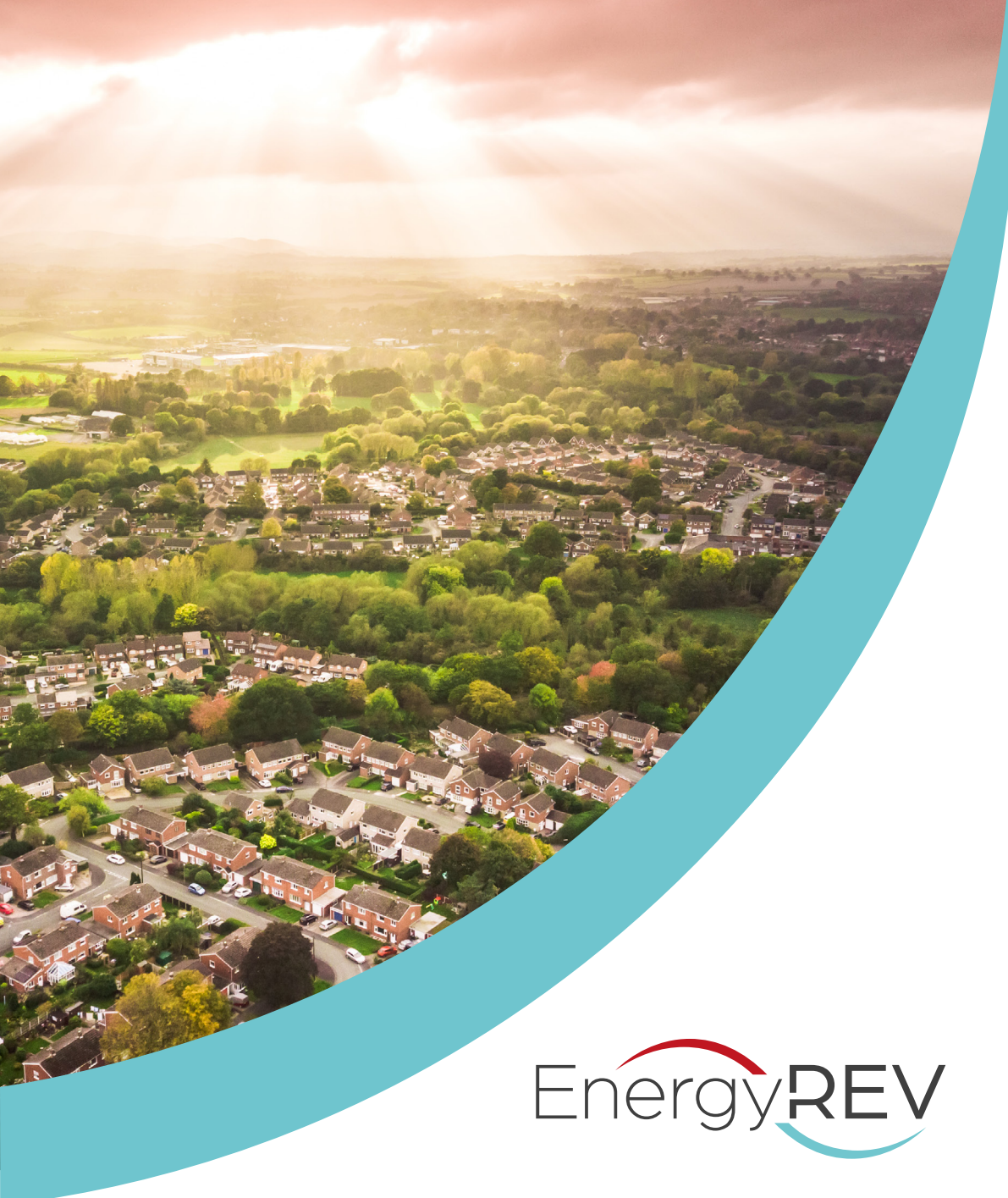
A framework incorporating diverse elements of Culture, Leadership, Structure, Localism, Cash-Flow-Lock, Smartness and Alignment, is proposed as fundamental to governance and risk management for SLES. Although some work has been done to address these constituents of governance and risk management, there is ample scope for improvement. By addressing the governance elements directly, the potential for successful securitisation to support SLES is enhanced.

Further steps to test feasibility of securitisation, as a means of raising funds for scaling-up and replicating SLES, are as follows:

1. The framework proposed in this report needs to be tested further using quantitative and qualitative data and tools. The main goal is to test robustness of this exploratory work.
2. More quantitative work is needed in order to design and evaluate the best way to pool/aggregate energy assets to raise funds through a securitisation mechanism.
3. Assessment of the traditional discounted cash flow method is necessary to determine its relevance to valuing SLES assets, which are subject to diverse sources of uncertainty; asset pricing methods are key for investment/financing purposes.
4. A comparative quantitative evaluation of securitisation and other financing mechanisms, e.g. equity, project finance, etc., is needed to explore the costs and benefits of different financing options for SLES.
5. Qualitative studies are needed to estimate investors' willingness to participate in a securitisation mechanism, as well as to identify the challenges of implementation.
6. The regulatory and legal implications of a securitisation mechanism for SLES need to be investigated.

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### About EnergyREV

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

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