

THE CHALLENGES AND OPPORTUNITIES FOR LOCAL AREA ENERGY SYSTEMS IN THE UK ENERGY SECTOR

AN ENERGY RESEARCH
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EXECUTIVE SUMMARY

In July 2019, the Energy Research Partnership brought together key industry and government stakeholders to conduct a 'state of the industry' review of the potential role of local area energy in future UK energy systems.

Historically the current energy system has been designed on the assumption that distribution and transmission infrastructure is essentially fixed, changes only slowly, and has little or no impact on competitiveness. It has in the past been assumed that the only economically viable generation assets are national in scale with local area energy projects limited to grid edge and niche applications. These assumptions more recently are being increasingly challenged.

Local authorities have, so far, played a relatively minor role in the UK's energy transition. Resources available to local authorities to carry out local area energy planning have been severely impacted by austerity measures⁷.

There is scope for them to do much more, with appropriate resource, to help bring decision-making about the direction of this energy transition closer to the local communities that could share the benefits as well as the costs.

Co-ordinated planning of a whole energy system coupled with transport, environmental initiatives and social care, offers significant opportunities for reducing costs and offering new value propositions to local communities, regions and cities¹². Combining this with optimised energy system infrastructure as a result of energy being generated closer to the point of consumption, presents a real potential to lower overall costs whilst supporting the 2050 Net Zero Targets^{10,3}.

Clearer communication of these benefits and costs of local area energy projects to communities, the wider general public, potential stakeholders and investors will enhance engagement, support and maximise the opportunities presented by local area energy schemes.

However, local area energy projects face two separate and equally fundamental challenges with energy market regulation from the perspective of a region seeking to develop a coherent and meaningful local energy strategy to deliver local economic, social and environmental objectives. One is the complexity of the system, and the other is the perceived structural mismatch between regulation and where the technical and economic opportunities lie¹.

The practical reality from a regional perspective is that this makes it challenging to take an integrated, market-based approach to energy systems and energy infrastructure planning at a regional level. This is because energy markets and energy infrastructure are primarily regulated, planned and managed nationally, whereas transport, waste and spatial plans are primarily planned and regulated regionally and locally¹.

Whilst the UK is making good progress towards achieving greenhouse gas emissions targets with the publication of the 2050 Net Zero targets¹⁰, there is significant policy uncertainty that threatens to slow down the rate of progress. If local area energy projects are to contribute to the more ambitious 2050 targets, as well as improve local transport and community wellbeing, a number of issues will require to be addressed.

Resilience of the UK energy system has been very topical particularly as a result of the 9th August 2019 transmission and distribution interruptions to the UK electricity system. Whilst these interruptions were relatively brief in duration and the protection systems of National Grid and the DNOs operated as designed, the impact on society was widespread and, in some cases, significant⁵. The potential development of local energy systems must at least maintain or even improve the levels of reliability and resilience that the UK has become accustomed to from the current electricity system⁴.

Data will be vital in maximising the opportunities presented by local area energy projects. The sharing of open structured data between parties likely to be involved in such projects will be essential to maximise returns and deliver benefits to local communities and urban projects⁸. Whilst some limited progress is being made significant further effort will be required to define open data systems for the energy system.



MAINTAINING THE RESILIENCE OF LOCAL AND NATIONAL ENERGY SYSTEMS

'Co-ordination between local energy service providers, National Grid and DNOs coupled with updated stringent design and security standards, must be agreed to ensure current levels of energy system resilience are at least maintained or improved with the potential growth of local area energy systems.'

The UK's centralised energy transmission and distribution systems have enjoyed very high levels of reliability⁴ and by defining and implementing effective security design standards, have resulted in very good levels of energy system resilience and stability.

The UK's energy system is undergoing several fundamental changes as a result of the increased penetration of renewable energy sources connected to the transmission and distribution system¹⁴.

The ambition of local authorities and communities to investigate a more integrated approach to local area energy schemes combined with low carbon transport and environmental projects, is resulting in a potential rethink of the principle of a centralised energy system.

The maintenance or improvement of the resilience of the UK energy system must be at the forefront of any new energy system design standards which will be required to integrate local area energy systems into a national infrastructure.

Recent National Grid and DNO incidents on the 9 August 2019⁵ continue to highlight the very large societal impacts that even short duration power outages cause on transport and critical infrastructure services.

It is conceivable that correctly designed local area energy systems may well enhance the levels of resilience particularly in high density urban and city areas where power outage impacts are the greatest.



THE MAIN DRIVERS FOR LOCAL AREA ENERGY PLANNING

‘Formulation of clear prioritised objectives, and the benefits of local area energy planning is required to help quantify costs and the societal improvements that may be achievable.’



Local energy projects have the potential to reduce upstream supporting network infrastructure costs, as energy is produced and consumed closer to the point of use reducing the need for upstream reinforcement of constrained networks.

Local area energy planning and the projects that are likely to result also have the potential to deliver value to the environment and communities in the form of, cleaner air and transport systems, better social care, all contributing to the 2050 Net Zero targets.

Combining these benefits may well deliver lower costs of energy and infrastructure along with new services which are of greater value to local communities, local regions and cities.

A number of reports¹ and calls for evidence¹² have outlined the potential benefits that local area energy projects may realise. However, the defining of specific, quantifiable financial and non-financial objectives and benefits resulting from local area energy projects, requires more detailed analysis.

This analysis may assist in the creation of supporting regulatory frameworks, and improve the identification of societal, transport and environmental opportunities which further improve the business case for local area energy investment.

Clear and concise presentation of these tangible costs and benefits will also assist in community and end user acceptance and adoption.

BUSINESS AND REGULATORY MODELS SUPPORTING LOCAL AREA ENERGY SYSTEMS

‘Business and Regulatory model frameworks that will allow more confidence in securing the financial closure of local area energy systems from third party investors, will be critical for the provision of capital to fund local area energy projects.’

The policy and regulatory environment in the UK regarding electricity markets can potentially be a barrier to the development of new local energy markets at the distribution level. Barriers can be in the form of existing policies and regulations, or a lack of enabling policies and regulations¹¹.

The energy market in the UK is currently undergoing rapid change, which is recognised by many key stakeholders. Change can be attributed to energy sector decarbonisation targets combined with the emergence of new technologies in generation, demand and control systems³.

Much of this change is happening at the distribution network level. Distribution has traditionally been seen as the ‘junior’ partner to transmission, fed from the much larger arteries of the transmission network and operated passively.

As system flexibility will be the key enabler in delivering this transformation, Government needs to ensure that independent flexibility markets are made more accessible for small energy providers, by removing regulatory barriers, and ensuring value for flexibility.

There are several areas where significant policy and regulatory development processes are currently underway that would likely impact the development of local resources and local energy markets¹³.

- DNO/DSO transformation
- Market-wide half-hourly settlement reform
- Network charging reforms
 - ▶ Access and forward-looking charges
 - ▶ Residual charges and embedded benefits
- Future of retail supply and the supplier hub model
- Governmental support for renewable energy

Whilst work in these areas is on-going within the industry, the pace may not be sufficient to provide confidence to innovators and investors in local area energy projects

These changes in the energy market may well be capitalised on by smaller generators and distributed energy resource providers, but only if the correct market conditions are established to enable their successful entry¹¹.

LOCAL AREA ENERGY PLANNING IS COMPETING FOR VERY LIMITED RESOURCE AND CAPABILITIES

'Local area energy planning will be limited in its success and constrained in its roll-out by the current availability of skilled planning and engineering resource. Pooling of resource and the sharing of best practice knowledge needs to be considered for progress to be made with the resources currently available.'



Integrated planning systems which will involve energy, transport, the environment and heating systems for social housing will require new specialist planning skills, many of which do not fully exist or are in very short supply⁶.

Austerity in local government funding has made it difficult to free-up resource for local area energy planning. A survey by the consultants Arup for Royal Town Planning Institute (RTPI) (North West) found that by 2015, there had been a reduction of one-third in planning staff overall since 2010, including a decrease on average of 37% in planning policy staff and 27% in development management staff⁷.

The lack of skills and resources within local government is a barrier to development and action of Local Area Energy Plans¹⁵.

The utilisation of existing and new skilled resource in the area of local area energy planning will have to be shared between local authorities, whilst the shortage of resource is addressed.

The establishment of a central resource to support local authorities involved in local area energy projects will reduce the impact of these shortages⁶.

Pooling of knowledge and best practice will allow early demonstration projects to be effectively costed, efficiently designed and planned, avoiding the learning curve delays of an uncoordinated approach.

Organisations such as the Energy Systems Catapult or regional clusters could play an active role in the establishing of shared best local area energy planning practice, along with access to experienced planning staff for the early projects.

SHARING OF CROSS SECTOR DATA SETS WILL BE ESSENTIAL

'Good quality open data systems, available to planners, entrepreneur's, investors and innovators will be essential to optimise local area energy planning for cost, resilience and efficiency.'

Increasingly, energy assets are distributed, with homes and businesses able to generate and store electricity and provide demand response services. Suppliers are offering smart time-of-use tariffs that give consumers greater control of their energy bills. And the electric vehicle revolution will put new demands on our energy networks⁹.

Data is fundamental to the future of our economy, which is why it is the focus of one of the Grand Challenges in our Modern Industrial Strategy. In the power sector, it is the key to unlocking system and consumer benefits and managing the fast-approaching challenges of flexibility, resilience and costs in the most efficient way.

Effective storage, sharing and management of data will allow the markets to develop that will put consumers at the heart of this change, while allowing networks to support the proliferation of new business models and technologies⁸.

Co-ordination of the planning of local area energy, transport and environmental projects will require open access to clearly defined data sets.

The Energy Data Taskforce⁸ has identified three key Building Blocks that need to be established for the Energy System.

- **Data Catalogue:** A single, searchable location that provides visibility of Energy System Datasets
- **Asset Registration Strategy:** A coordinated approach to new asset registration
- **Digital System Map:** A digital representation of the Energy System

Similar data system building blocks for other major infrastructure assets that will form part of a local area energy project also need to be established ensuring open access to innovators, investors and suppliers.



TRANSPORT MUST BECOME AN INTEGRAL PART OF LOCAL AREA ENERGY PLANNING

‘Future transport systems will have significant influence on both decarbonisation and the air quality of cities and local communities. Transport systems must be more tightly integrated with the planning and deployment of local, regional and national energy systems.’



By the 2030s, electricity is likely to play a much greater role in decarbonising both transport and residential heat energy through electric vehicles and heat pumps respectively. This will create demands on local power networks, with greater seasonal and daily variability and more intense peaks⁹.

Transport is now the largest source of UK Green House Gas emissions (23% of the total) and saw emissions rise from 2013 to 2017¹⁰.

Cities and local authorities are well placed to understand the needs and opportunities in their local area, although there are questions over whether they have sufficient resources to contribute strongly to reducing emissions.

Local authorities have important roles on transport planning, including providing high-quality infrastructure for walking and cycling, provision of charging infrastructure for electric vehicles, and ensuring that new housing developments are designed for access to public transport.

Local authorities can improve health outcomes for people who live and work in the area by implementing clean-air zones that discourage use of polluting vehicles and other technologies¹⁰.

Transport system planning at a local level will need to form a very close integral part of a local area energy strategy to help release the full benefits of clean air, reduced carbon impacts and overall energy system cost reduction opportunities.

PUBLIC AWARENESS AND EDUCATION OF THE POTENTIAL VALUE OF LOCAL AREA ENERGY SYSTEMS

‘For local area energy projects to contribute significantly to decarbonisation targets whilst providing improved cost-effective local services and transport, awareness of the public about its potential benefits will be key. Failure of the public to understand and accept the key aspects, along with the potential costs of local area energy systems may result in the failure to realise its full benefits.’

Public support and engagement with local area energy planning and the resulting projects will be key to ensuring that the anticipated benefits to transport systems, environmental targets and societal wellbeing are fully realised.

The involvement of communities and the wider general public in local area energy projects will help to raise awareness about important energy issues such as energy security, decarbonisation and energy efficiency, that may not be “top of mind” for many people¹².

This will not only help to increase participation and engagement with policy debates but could also boost the effectiveness of other initiatives like smart metering and time-of-use tariffs, because individuals will have a better understanding of the relationship between energy supply and energy use.

Local area energy projects also have the potential to broaden public understanding of energy issues, encouraging energy-conscious behaviour and greater engagement in carbon reduction initiatives at community level.

Having a more proactive engagement with communities and end users at the planning stage, may well stimulate new innovation and investment from groups and parties new to energy systems planning, bringing new business models and improvements to community living standards.



LOCAL AREA ENERGY PLANNING ACTIONS

‘The Energy Research Partnership considers that local area energy planning will progressively form a larger part of whole system energy planning. New benefits and opportunities will emerge to improve air quality, provide better local social care, and more targeted cost-effective energy solutions for local communities whilst helping achieve the Net Zero 2050 targets.’

Further actions required:



RESILIENCE DESIGN STANDARDS

The maintenance or improvement of the resilience of the UK energy system must be at the forefront of any new energy system design standards which will be required to integrate local area energy systems into a national infrastructure.



THE LOCAL ENERGY BUSINESS CASE

Formulation of clear prioritised objectives, and the detailed tangible benefits of local area energy planning is required to help quantify costs and the societal improvements that will be achievable.



BUSINESS AND REGULATORY MODELS

Clarification of Business and Regulatory frameworks that will allow more confidence in securing the financial closure of local area energy systems from third party investors, will be critical for the provision of capital to fund local area energy projects. New models must be trialled on local area energy projects and not constrained by existing approaches.



LIMITED RESOURCES

Local area energy planning will be limited in its success and constrained in its roll-out by the current availability of skilled planning and engineering resource. Pooling of resource and the sharing of best practice knowledge needs to be implemented for progress to be made with the resources currently available. The Energy Systems Catapult or resourced regional clusters should be approached to establish and provide initial skilled resource support to local authorities for early local energy pilot projects.



OPEN DATA SYSTEMS

Good quality open data systems, available to planners, entrepreneur's investors and innovators will be essential to optimise local area energy planning for cost, resilience and efficiency. Pilot local energy projects should be allowed full access to all relevant energy system and infrastructure data with a view to build on the recommendations of the Energy Data Taskforce.



INTEGRATION OF TRANSPORT WITH ENERGY SYSTEMS

Future transport systems will have significant influence on both decarbonisation and the air quality of cities and local communities. Transport systems must be more tightly integrated with the planning and deployment of local, regional and national energy systems to ensure full value from local area energy planning is realised.

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ABOUT THE ENERGY RESEARCH PARTNERSHIP

ERP is a public private partnership which brings together a diverse range of participants from across the energy sector, with senior level representation from industry, academia and government. Its primary purpose is to offer a consultative forum, which aims to accelerate innovation in the energy sector through enhanced dialogue and communication across industry and government. It is an independent, not for profit organisation whose activities are funded by Member contributions.

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