Institutional Landscapes for Local Energy Systems: Mapping England, Scotland and Wales

UKERC Briefing

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1. Introduction and key findings

Local energy systems (LES) are subject to increasing policymaker and industry attention (HM Government, 2017, 2020; Ofgem, 2017; UKRI, 2022). Whilst there is some debate about boundaries and components, such systems generally entail integration across heat, power and storage; involve both demand and supply, and aim to access multiple value streams including flexibility and balancing services (Arvanitopoulos & Wilson, 202; Ford et al., 2019; Energy Systems Catapult, 2020).

LES are expected to deliver whole system benefits in the form of flexibility, resilience and efficiencies in supply and use, as well as supporting place-based socio-economic priorities such as jobs, air quality and lower energy bills (Energy Systems Catapult, 2021; Wilson et al., 2020). Local integration could also encompass new business structures, including local ownership and equity shares, and more participative democratic control including local and regional government roles. Much activity to date has focussed on high level policy statements (see for example BEIS, 2021; Scottish Government, 2021b) and allocation of innovation funding for LES 'experiments'. There is, however, no consistent policy framework or regulatory strategy to support LES developments across Great Britain, and emerging evidence suggests there are differing policy approaches across England, Scotland and Wales (Wade et al., in press).

In addition, there is growing evidence about the barriers to local energy system operation and more localised business models[1][2], as well as the governance challenges[3][4]. Despite this wealth of activity there is limited assessment of how institutional frameworks, that is the formal organisations and relationships which shape the development of LES, are constituted or how they might differ between England, Scotland and Wales. The development of more locally optimised and place-based energy systems is likely to be closely influenced by the institutional frameworks in place to support them. This briefing therefore examines and compares the existing institutional landscapes for LES across England, Scotland and Wales. It draws on a documentary review and stakeholder interviews to establish how key organisations, powers and relationships[5] are shaping LES development across Great Britain.

1.1 Key findings

- The potential benefits of LES were widely acknowledged, but institutional frameworks to support development are fragmented and underdeveloped.
- Local energy planning was identified as a route to connecting the local and whole system benefits of LES. However, in England, a lack of a consistent and coordinated approach limits effectiveness. The stronger emphasis on local energy planning in Wales and Scotland was welcomed across stakeholder groups but

[1] https://www.energyrev.org.uk/outputs/insights-and-tools/overcoming-barriers-to-the-upscaling-of-smart-local-energy-systems-insights-from-previous-examples/
[2] https://www.energyrev.org.uk/outputs/insights-and-tools/privacy-and-data-sharing-in-smart-local-energy-systems/
[3] https://www.uk100.org/publications/local-net-zero-delivery-progress-reports
[4] https://es.catapult.org.uk/report/governance-framework-for-coordinated-local-area-energy-planning/
[5] A brief overview of devolved energy powers is provided, however other publications have reviewed local energy system powers in more detail, including: UK100 mapping of local authority powers on climate action (https://www.uk100.org/publications/power-shift) and Cowell et al.'s (2017) review of devolved government energy powers.

uncertainties remain about integration with regional and national planning and decision-making.

- Local authorities were consistently placed as central to LES development through their role in coordinating actors, planning across vectors, and their understanding of local challenges and benefits. However they are constrained by resources and capabilities.
- DNOs are critical resource holders but their relationship with other LES actors is not sufficiently institutionalised. There are particular challenges around data sharing and granularity.
- Regulatory uncertainty and the fragmented funding landscape promotes short-term experimentation rather than strategic planning.

1.2 Sources of divergence

- There is evidence of Scotland and Wales constituting their own approach to local energy systems but this is constrained by slow change in GB electricity regulation and markets. Scotland and Wales place more emphasis on demand-side change than the UK Government.
- Actor networks vary between England, Scotland and Wales. There was less diversity of actors in England, where central government played a key role in shaping relations. Scotland has a more diverse group of LES actors, based on long-term relationships between the Scottish Government and a range of NGOs. In Wales the Welsh Government is playing an important role in driving action at local level through centrally funded, but locally delivered, schemes.
- Institutional change in support of LES also differs. In England institutional change has been limited, with an emphasis on promoting LES through innovation support. In Scotland there was greater evidence of institutional development to support LES by establishing: a duty for local authorities to prepare Local Heat and Energy Efficiency Strategies (LHEES); a Public Bodies Climate Change Reporting Duty; a Just Transition Commission, and the forthcoming National Energy Agency. In Wales there was less institutional change with activity focussed around pivotal institutions, particularly the Welsh Energy Service, and Government support for the integration of local and regional energy planning.
- Wales and Scotland place stronger emphasis on heat, community energy and social objectives in their approaches to LES, partly as these are areas where they have formal powers to influence activity.

2. Benefits of LES

A number of recent studies have assessed the potential benefits of place-specific and locally optimised energy systems as part of the route to net zero. A UKRI commissioned report in 2022 concluded that place-specific net zero plans and delivery achieved better outcomes than place agnostic, top down planning[6]. The analysis modelled the social costs and benefits of adopting low carbon measures under a place-based and place-agnostic scenario in several city-regions. The findings suggest that a place-specific approach requires less investment and achieves higher energy, carbon and cost efficiencies.

[6] https://www.ukri.org/publications/accelerating-net-zero-delivery/

Another EnergyREV study concluded that the UK could save over £8bn per year by 2040, if smart local energy systems accounted for 50% of energy use[7]. Assessments by BEIS and the CCC have similarly identified that local flexibility could provide significant system value for GB energy systems[8][9]. In addition to these potential cost savings, LES can deliver co-benefits in the form of retention of energy spend locally, jobs, improved public health outcomes, and local ownership of energy assets[10].

3. Devolution and policy for LES

Comparing approaches to decarbonisation across the devolved jurisdictions of Great Britain provides an opportunity to explore whether different approaches and actor networks are developing, and to provide learning about future governance priorities. The devolution settlements for Scotland, Wales and Northern Ireland[11] are all unique, providing scope for distinct approaches to decarbonisation. Additionally, while the UK, Scottish and Welsh Governments have all established net zero targets in legislation, in Scotland the target date is 2045, five years earlier than the UK or Wales. All three targets were based on advice from the Committee on Climate Change, who made clear the interdependency of UK, Scottish and Welsh actions (Climate Change Committee, 2020b, 2020a). The UK cannot reach net zero without action in Wales and Scotland, but equally Wales and Scotland cannot deliver net-zero emissions through devolved policy alone.

With regards to powers relevant to local energy system development, some key policy levers are devolved to both the Welsh and Scottish Parliaments, while others are reserved by the UK Parliament. In Scotland, partially devolved competencies include transport, buildings and infrastructure (see figure 1). The devolution of building and demand side policy, including efficiency, heat networks and heat pumps, gives the Scottish Government significant powers to develop policy to decarbonise heat. However many interrelated areas are reserved, such as the regulation of electricity and gas networks, energy markets and energy taxation.

In Wales the Senedd Cymru has only held primary legislative powers since 2011 and has developed a legislative framework to support decarbonisation since this point (Royles & McEwen, 2015). This included the establishment of the Well-Being of Future Generations (Wales) Act 2015 which requires public bodies to assess impacts of policies on people living in Wales in the future, and to maximise their contribution to the Act's seven well-being goals (Muinzer & Ellis, 2017). The Wales Act 2017 provided a new devolution settlement for Wales, based on the Reserved Powers Model which allows the Senedd to make laws on matters that are not reserved to the UK Parliament. The Senedd now holds similar powers to the Scottish Parliament with heat decarbonisation policy, and energy efficiency devolved, but electricity supply, regulation and licensing reserved.

[7] https://www.energyrev.org.uk/outputs/early-insights-into-system-impacts-of-smart-local-energy-systems
[8] https://www.ofgem.gov.uk/publications/value-baseload-capacity-low-carbon-gb-electricity-system-2018
[9] https://www.theccc.org.uk/publication/roadmap-for-flexibility-services-to-2030-poyry-and-imperial-college-london/
[10] https://www.passivhaustrust.org.uk/UserFiles/File/PH%20planning/2019.08_CAC-Chapters-all-FINAL.pdf
[11] This report is focussed on England, Scotland and Wales and does not assess Northern Ireland.

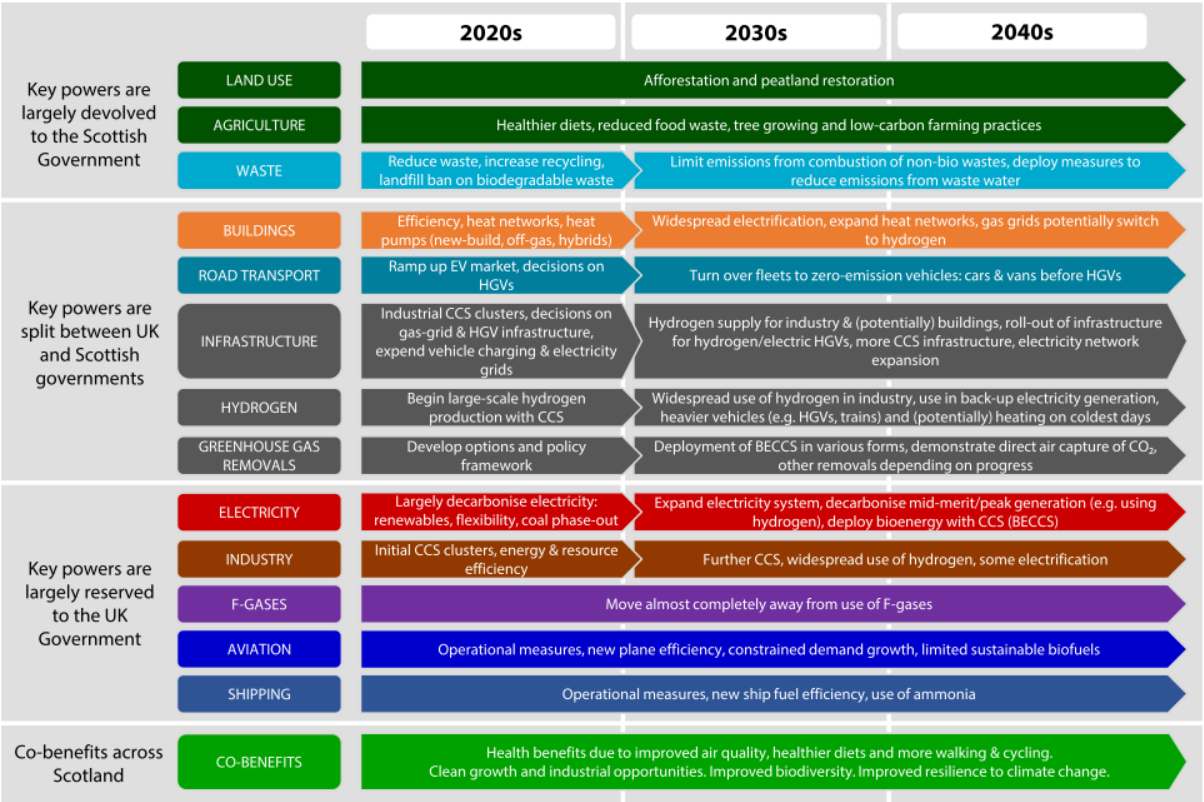


Figure 1: Actions to achieve net zero by 2050 in Scotland and key powers (source: Climate Change Committee, 2020b).

4. Method

Institutional mapping explores functional relationships and powers relevant to decision-making. It focuses on the key actors, their interactions, where power is located, who has the ability to influence and make decisions, and sources of funding (Mcfadden et al., 2010). The objective is to create a (simplified) 'visual representation of the different groups and organizations within a community and their relationships and importance for decision-making' (Aligica, 2006).

In order to explore the governance frameworks and actor networks for LES in England, Wales and Scotland governance mapping was carried out for the three jurisdictions, following the approach summarised in table 1[12].

Stage	Approach
Action arena:	Local and regional energy systems: defined as energy systems organised at a scale from local council area to regional. Incorporating energy systems across electricity, heat and transport.
Focus:	Formal institutions and interactions between them.
Timeframe:	Static assessment of current arrangements (with follow up interviews to discuss likely future developments).
Interactions:	Formal competencies and rules (with follow up interviews to discuss informal norms).

[12] Drawing on the Institutional Analysis and Development (IAD) Framework developed by Ostrom (2011) and Chilla et al., (2012).

Table 1: Institutional mapping approach

The mapping then involved:

- Desk-based review of key organisations, (formal) institutions, rules, relationships and decision-making power based on a database of LES relevant strategy documents and policy instruments[13].
- Drafting of institutional maps for England, Wales and Scotland.
- Validation interviews to discuss the emerging maps, evaluate accuracy, and explore informal agenda setting power, future policy needs and governance gaps.
- Revision of maps based on interview outputs.

Interviews were carried out with a total of 21 people, across 18 organisations, as detailed in table 2. Eight interviewees were with England/UK focussed stakeholders, seven were Scottish stakeholders and six were Welsh stakeholders.

Category	Number
Central and devolved governments	4
Local governments	5
DNOs	2
Academia	1
Non-governmental public bodies/advisory organisations	4
NGOs and advocacy organisations	5
Total	**21**

Table 2: categories of interviewees

Institutional mapping can be a useful way to interrogate the key interactions and power dynamics within a policy area, however visual representations of complex energy systems are only ever partial; they simplify the multifaceted dynamics of institutional relationships. The links between organisations represent different sorts of relationships and we have not sought to categorise these into rule setting, information provision, partnership and so on. Instead the institutional maps were used as discussion tools to elicit stakeholder views on the key actors, organisations, and relationships for LES development.

5. Institutional landscapes

This section presents the institutional maps and summarises the key themes emerging from the interviews with LES stakeholders in each jurisdiction.

5.1 England

5.1.1 Innovation focus but lack of knowledge sharing from LES experiments

In England the institutional landscape for local energy systems centres on UK government and its innovation agencies, particularly Innovate UK (IUK), and the network of Catapult centres.

[13] The full database of 50 strategy documents and 105 policy instruments will be published separately as part of an Open Access journal article (Fade et al. forthcoming).

A significant initiative testing the prospective benefits of LES is the Prospering from the Energy Revolution (PFER) programme (2018-2023), managed by IUK, with £104m UK Industrial Strategy funding. The programme seeks to develop world-leading local smart energy systems across the UK and is investing in twenty-five project consortia, each of whom have raised matched funding: 11 concept designs, 10 detailed designs and 3 demonstrators (UKRI, 2022). There is considerable learning from these projects, however interviewees reported that findings were often not shared widely, partly due to commercial sensitivity and intellectual property concerns.

The PFER programme was funded under the 2017 Industrial Strategy, which in 2021 was superseded by the *Net Zero Strategy: Build Back Greener* and *Build Back Better: Our Plan for Growth* with more emphasis now on large-scale energy infrastructure investment rather than local or community energy systems. It is, as yet, unclear what innovation support will follow the PFER funding, and there was a shared concern that a lack of policy certainty is limiting further LES innovation.

Outside of the innovation space there was limited evidence of institutional change to support LES. An exception is ongoing support for the network of five Net Zero Hubs in England and the recently established Net Zero Forum which aims to enhance central-local collaboration. There was a great deal of support for these networks, however the Net Zero Forum is yet to meet and there were concerns regarding the ability of the Net Zero Hubs to provide the necessary support given that cover large geographical areas, comprising multiple Local Enterprise Partnerships and local authorities[14]. A long-term commitment to funding the Hubs is also lacking.

5.1.2 Action focussed at the electricity distribution level

The potential local and system-wide benefits of LES are articulated in policy and by a range of stakeholders, however interviewees indicated that much policy attention is focussed at the electricity distribution level, for example through innovation funding for distribution flexibility or the DSO transition. This emphasis on smart, flexible, distribution system operation was welcomed, however interactions between DNOs and local actors, including local authorities, are not yet sufficiently formalised.

In addition, interviewees suggested that current institutional structures do not support the integration of energy efficiency and demand reduction into LES planning. The local delivery of energy efficiency programmes has been limited since 2013 by reductions in Energy Company Obligation (ECO) funding. There was some optimism that the administration of various energy efficiency programmes[15] by the Net Zero Hubs would help to accelerate delivery, however the funding for these schemes does not yet meet the level of ambition set out in the 2021 Heat and Building Strategy and the relatively short-term nature of the funding does not support a strategic approach to demand reduction as part of a smart, flexible energy system.

5.1.3 Local government and energy planning but lack of formal coordination

The important role of local government in coordinating and de-risking LES planning and development was a strong theme across interviewees, as were concerns about the lack of clarity over central-local interactions and responsibilities for net zero. The Net Zero Strategy identified BEIS as taking overall responsibility for improving coordination with

[14] The five hubs cover all 38 LEP and 333 local authorities in England.

[15] Such as the Green Homes Grant: Local Authority Delivery Scheme and the Social Housing Decarbonisation Fund.

local government and other local actors on net zero, and identified the key priorities for supporting local action. However, as described in the Climate Change Committee's 2022 Progress Report it 'remains unclear how central, devolved and local government will operate coherently towards the Net Zero goal' (Climate Change Committee, 2022, p. 15).

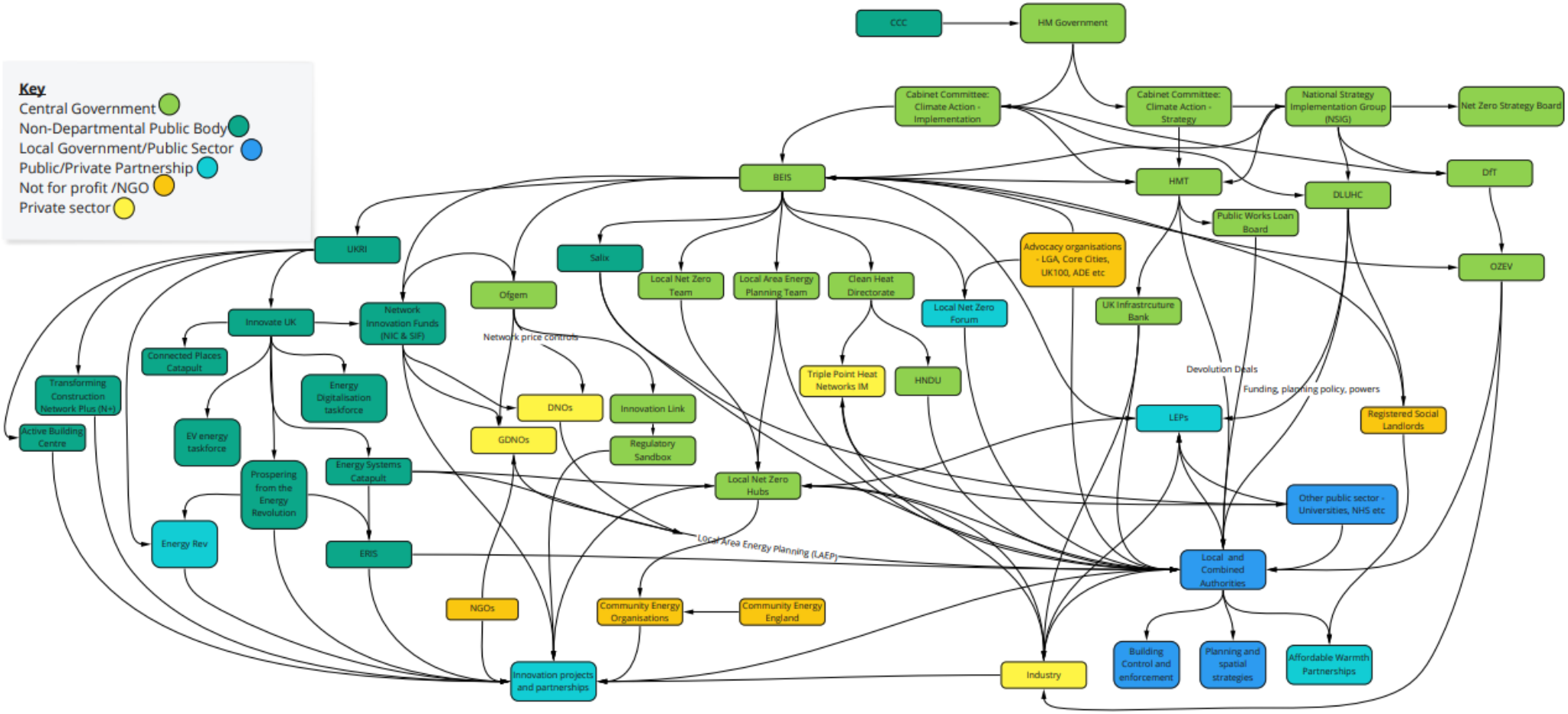
In particular interviewees were critical of the short-term competitive funding environment for local government on LES and advocated for more devolved funding and a clear governance framework for net zero at local level. Stakeholders also consistently advocated for a more formalised role for local energy planning; with local government leading a process of visioning, modelling and analysing options to decarbonise and meet a range of local priorities[16]. Whilst various guidance on LAEP methodologies has been developed by the Energy Systems Catapult and the Centre for Sustainable Energy[17][18] no mandatory requirement for local areas to complete a LAEP is in place and there is no formal *requirement* for DNOs to integrate the outcomes of LAEPs into their business planning.

5.1.4 Key organisations and relationships

Overall the LES institutional landscape in England displays less diversity of actors than in Scotland and Wales, with a key role for central government in shaping relations, as shown in figure 2.

[16] https://es.catapult.org.uk/report/the-future-of-local-area-energy-planning-in-the-uk/
[17] https://www.cse.org.uk/projects/view/1369
[18] https://es.catapult.org.uk/guide/guidance-on-creating-a-local-area-energy-plan/,

Figure 2: Local Energy Systems institutional map for England



5.2 Scotland

The 2017 Scottish Government's Energy Strategy[19] outlined its vision for a future energy system, with a target to generate 2GW of locally owned energy by 2030. In 2021 a local energy policy statement[20] set out the role of LES in the future Scottish energy system and detailed 10 key principles for delivery, under five themes of People**,** Places**,** Networks and infrastructure**,** Pathway to commercialisation, and Opportunity. These principles, amongst other things, guide the support allocated under the Community and Renewable Energy Support (CARES) programme, which offers finance and advice to local energy projects. The Scottish Government is currently developing a new Energy Strategy and Just Transition Plan (ESJTP) for publication in late 2022.

The LES institutional framework in Scotland is illustrated in figure 3.

5.2.1 Diverse actor network and NGO role

Scotland has a more diverse group of LES actors than in England or Wales, with not-for-profits and NGOs such as the Energy Saving Trust, Change Works, SCARF and the Energy Agency developing long-term relationships with the Scottish Government to deliver advice and financial support to local energy projects[21]. Stakeholders advocated this approach as developing strong institutional capacity and trust between agencies. It was, however, criticised by some as resulting in an overly complex and 'busy' delivery environment.

5.2.2 Institutional change to support LES

In Scotland there was greater evidence of institutional change to support LES, in the form of: a duty for local authorities to prepare Local Heat and Energy Efficiency Strategies and delivery plans (LHEES)[22]; a new Public Bodies Climate Change Reporting Duty[23]; the definition of energy efficiency of buildings as an infrastructure priority[24]; the ongoing work of the Just Transition Commission[25] and the forthcoming National Energy Agency.

In particular there was optimism from stakeholders that the combination of a statutory basis for LHEES and the development of a National Public Energy Agency would provide an evidence-led, and participatory, underpinning for the development of local energy systems. As the Agency is established, it will be important to clarify its role in co-ordinating national, regional and local government delivery of heat decarbonisation and energy efficiency, and in streamlining access to the accurate building-level data necessary to develop LHEES. There was strong emphasis on LHEES supporting both long-term planning and local energy innovation.

[19] https://www.gov.scot/publications/scottish-energy-strategy-future-energy-scotland-9781788515276/
[20] https://www.gov.scot/publications/local-energy-policy-statement/
[21] Through the Home Energy Scotland and Local Energy Scotland programmes.
[22] https://www.legislation.gov.uk/sdsi/2022/9780111053935
[23] https://www.gov.scot/publications/public-sector-climate-change-duties-annual-reports-template-2020/
[24] https://www.gov.scot/publications/infrastructure-investment-plan-2015/documents/
[25] https://www.gov.scot/groups/just-transition-commission/

5.2.3 Heat decarbonisation and social objectives emphasised

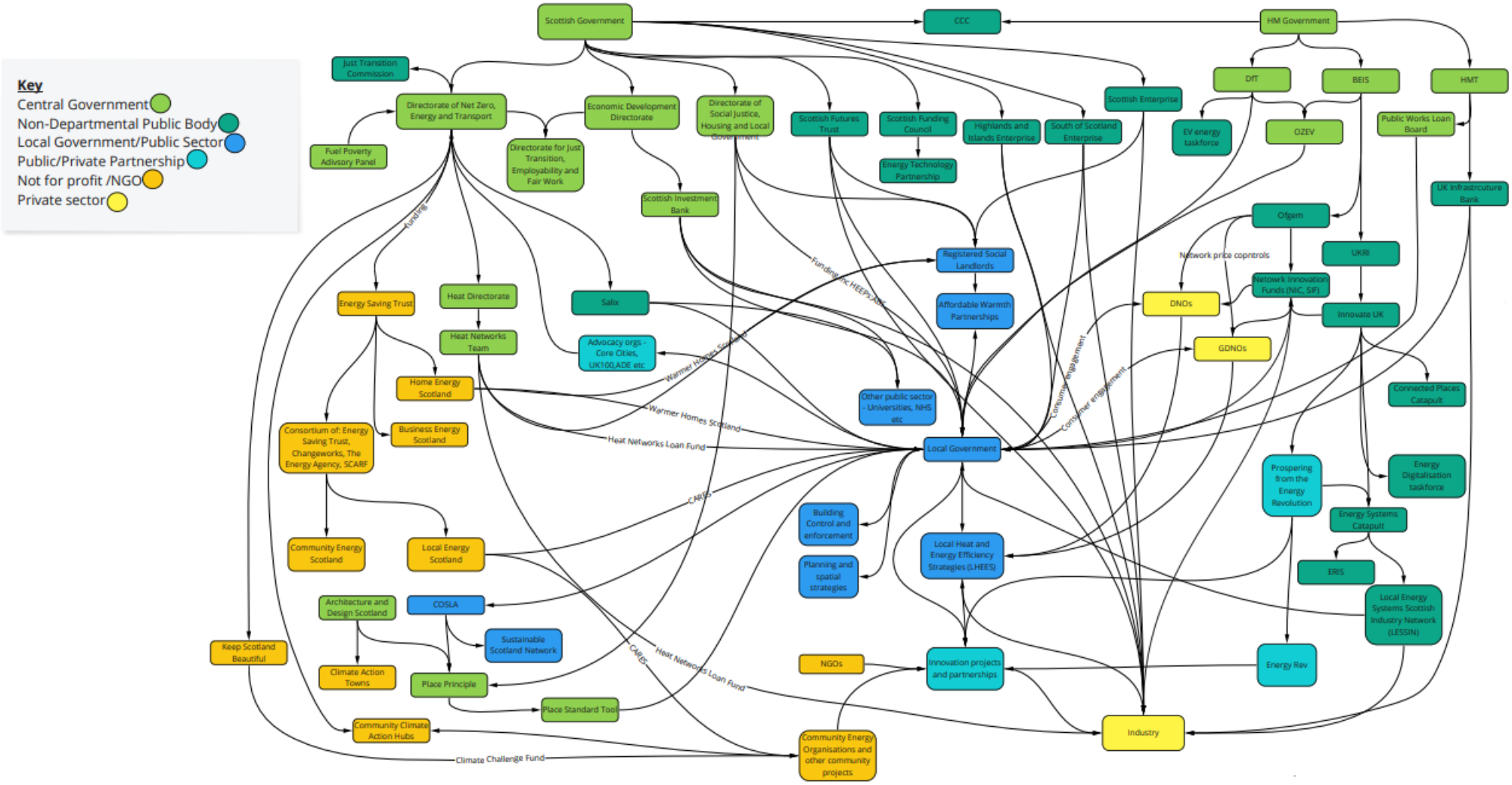
Scotland emphasises heat, community energy and social objectives in the approach to LES, partly as these are areas of devolved powers, which enables influence over activity. The integration of priorities relating to social inclusion and justice across national and local policy, for example in the Scottish Energy Strategy, Heat in Buildings Strategy and the Local Energy Policy Statement, was framed as supporting community energy projects and local actors to have a stake in future energy systems. In contrast, there was less emphasis on electricity system optimisation and innovation at distribution network level in Scotland.

5.2.4 Frustration at limits to powers and influence

The emphasis in Scotland on heat decarbonisation was partly driven by the links between domestic heating and social equity concerns, however heat and energy efficiency is also a policy area where Scottish Government has devolved powers, enabling development of distinctive policy. Stakeholders expressed frustration that many of the areas critical to heat decarbonisation, such as electricity and gas network regulation or retail energy markets, are not within Scottish Government's remit. This uncertainty over the scope of devolved powers is an increasingly important feature of LES governance in Scotland[26].

[26] https://ukerc.ac.uk/news/heat-decarbonisation-in-scotland-and-the-uk-ambition-and-divergence/

Figure 3: Local Energy Systems institutional map for Scotland



5.3 Wales

The *All Wales Plan 2021-25 Working Together to Reach Net Zero*[27] re-committed to a 2030 renewable energy target of generating 70% of electricity demand in Wales from renewables and to 1 GW of locally owned energy generation. There is a strong focus on a place-based approach to decarbonisation to deliver a fairer and more equitable society. The *Prosperity for All Strategy*[28] (2019) identifies 'a place-based approach to deliver better results at the local level' as one of three national priorities for managing natural resources. In addition the 2021 *Deep Dive into Renewable Energy*[29] recognised the need to develop local solutions that involve communities.

5.3.1 Limited institutional change and a central role for the Welsh Government

Despite strong policy commitments to LES there was limited institutional change to support development. Instead the Welsh Government played a central role in driving action at the local level through a small number of long-term, pivotal programmes. In particular the Welsh Energy Service and the integration of local and regional energy planning were framed as key influencers of LES.

5.3.2 Local Government and local energy planning

Welsh stakeholders emphasised the important role of local authorities in developing and delivering LES but highlighted that many authorities lack capacity or in-house skills. To address this there are various capacity building programmes at local government level, including support to prepare a Local Area Energy Plan in all authority areas. Recognising the need to integrate local and regional energy planning, the Renewable Energy Deep Dive also committed to the 'scale up local energy plans to create a national energy plan by 2024'. Currently this involved the development of regional energy plans that will integrate local plans to identify interactions and complementarities.

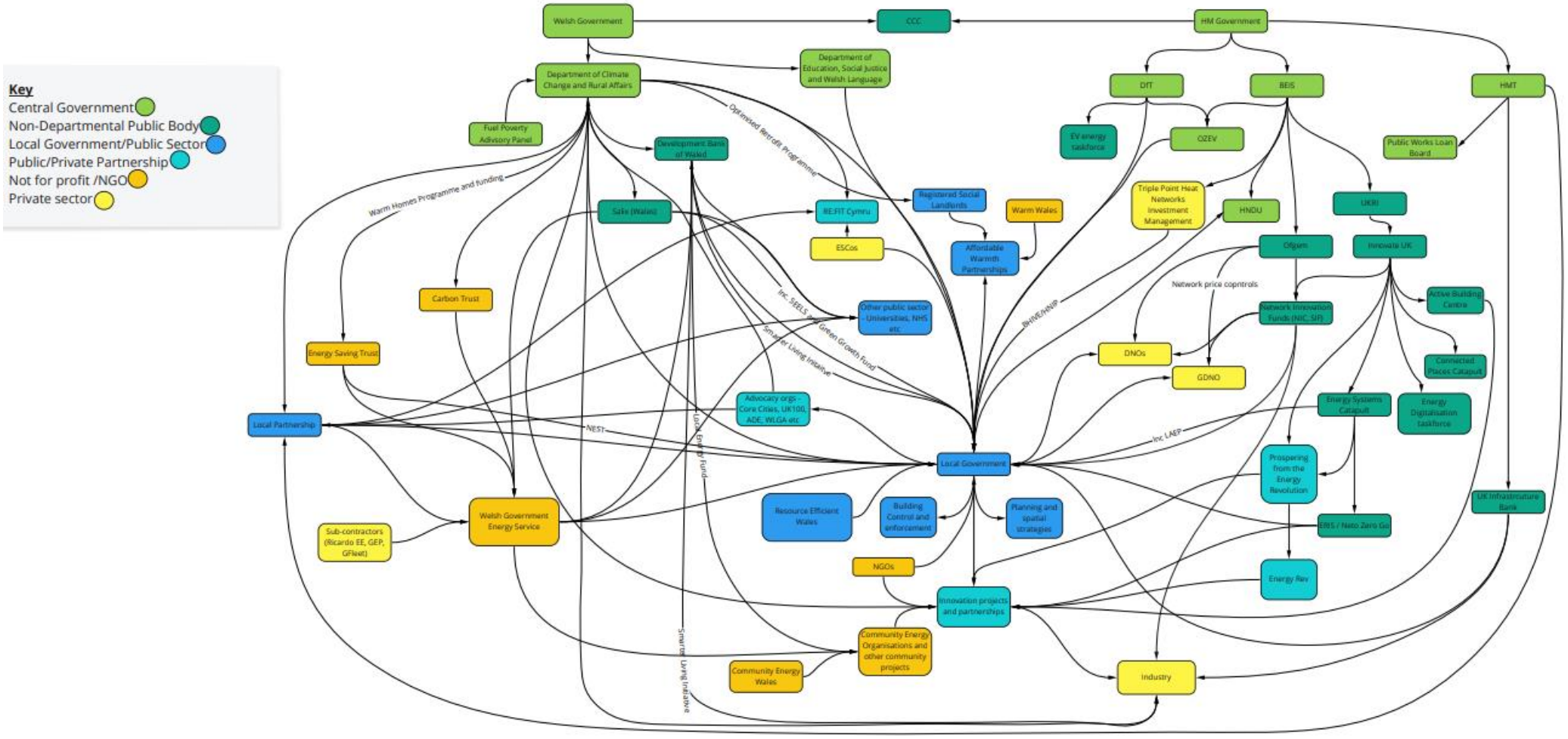
Additionally the Welsh Government is working with the Welsh electricity and gas network operators, Ofgem and the Energy Systems Catapult to develop a long-term plan for energy networks which will integrate local, regional and national planning[30]. Stakeholders expressed frustration, however, at a perceived lack of ability to influence wider UK energy reforms and called on the UK Government to work with Welsh Government and Ofgem to agree a coherent approach to data and LAEPs, and to require Ofgem to allow anticipatory investment where necessary.[31]

5.3.3 Just transition and local economic benefits

Although there are no institutions specifically set up to advocate for just transition in Wales there was a strong emphasis on justice and the local economic benefits of LES from stakeholders and within policy documents. The combination of an established and embedded community energy sector and an underpinning framework in the Wellbeing of Future Generations Act (2015) was reported to have institutionalised an emphasis on communities and the wider social benefits of LES.

[27] https://gov.wales/working-together-reach-net-zero-all-wales-plan
[28] https://gov.wales/prosperity-all-economic-action-plan
[29] https://gov.wales/written-statement-outcome-deep-dive-renewable-energy
[30] https://es.catapult.org.uk/project/welsh-future-energy-grid-for-net-zero/
[31] https://committees.parliament.uk/writtenevidence/23071/pdf/

Figure 4: Local Energy Systems institutional map for Wales



6 Conclusions

6.1 Institutions for Local Energy Systems

- Findings reveal different approaches to LES development across GB. The LES framework in England focuses on central government programmes and innovation experiments. There is a complex framework in England with regards to local government structures. The patchwork of Combined Authorities, Unitary and two-tier authorities, Local Enterprise Partnerships and devolution deals, along with differing resources and skills, results in a great deal of diversity in local approaches to decarbonisation (Tingey & Webb, 2020). Current institutional frameworks do little to create a common basis for action.
- There is evidence of more diverse LES institutions in Scotland with emphasis on heat and energy efficiency, and considerable institutional development in favour of LES in recent years. The Welsh framework centres on Welsh Government programmes but there is an ongoing commitment to create structures to connect local and regional energy planning and to prioritise the local economic benefits of decarbonisation.

6.2 Strategic Planning and local government

- There was a common emphasis (across interview type and location) on the role of local energy system planning in accelerating LES projects and in ensuring system and local benefits are maximised. There is considerable current policy debate about how local energy planning should develop (Energy Systems Catapult, 2022; Hardy & Morris, 2022) but enduring questions about governance frameworks, resourcing, and integration with regional and national planning and decision-making.
- Local energy planning has been institutionalised in Scotland through the development of a statutory basis for LHEES development and delivery planning. Whilst not fully institutionalised in Wales, support to integrate local and regional energy plans in Wales has the potential to provide important learning about the challenges and benefits of regional coordination.
- Whilst there is consensus about the importance of local energy planning, the ability to translate plans into action is limited by a range of pending energy system reforms. This includes ongoing uncertainty regarding the evolution of the Distribution System Operator (DSO) role, the formal integration of energy planning into the gas and electricity network price control frameworks, and reforms to the energy retail market. In Scotland and Wales many actors feel unable to influence UK wide reforms to the energy market and institutions.

6.3 Next steps

- Questions remain about how varying approaches to LES across Great Britain will shape decarbonisation trajectories and substantive changes in energy systems. Which institutional and policy frameworks most successfully deliver local energy systems and what sorts of local and system-wide benefits are achieved?
- The next stage of our research will consider these questions through analysis of a range of case studies across England, Scotland and Wales.

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