

in these projects, be **uniquely upskilled in cross-domain knowledge and data analysis**. At the same time, the project partners **explore, define, and test processes and practices** (e.g., what environmental regulation is relevant for transmission-connected battery installation? How to best engage the local authorities? How to manage project which cuts across local authority boundaries? etc.) for replicating the ESO solutions in other locations. Thus, the project partners will **uniquely upskill their respective employees** (e.g., city planners, legal experts, project managers, etc.) and produce new processes and practices which could prove very relevant to other businesses wishing to replicate the ESO business models. To maximise the positive impact of the project, both the unique profiles of their ICT and data analysts and the novel business practices and processes should be made publicly available. Indeed, some of these “blueprints” are shared (as per E4), but a wider transparency of the relevant skills is relevant.

9 Local Authorities Subsystem: Findings from Data Analysis

Oxford City Council (OCC) is one of the core partners of the project and has a key position as ‘the landowner and the local authority for the centre of the project ... a fleet owner and operator... owns a reasonable amount of land in and around Oxford and a number of quite forward-thinking targets in terms of decarbonisation targets, net zero and things like the zero emission zone’ (E14).

OCC’s specific role in the project is around the electrification of some of its vehicle fleet along with associated infrastructure but it also has a wider role as indicated above as planning authority, and with ‘responsibilities for the Redbridge Park and Ride because we own the land’ for the EV CP installations.

Internally, OCC ‘already had a strategy to electrify 25% of our fleet by 2023 and this pot of funding is really helpful and supportive of all of that’ (E14). The city council operates its fleet through a wholly owned subsidiary organisation ‘Oxford Direct Services’ (ODS).

ESO therefore has a clear role in helping the council to meet its decarbonisation and air quality targets through accelerating EV uptake.

9.1 Barriers and enablers for the local government sub-system

Factors impacting the local government sub-system are summarised in Fig. 8 below.

As previously discussed, the **support of the local authority** makes SLES initiatives much easier to develop: ‘the city council I think sits at the heart of everything’ (E11). However, this comes with leadership responsibilities: ‘You really need that clear governance and that clear strategy at the outset You need the ... head councillors of the authorities to be really backing this to make it happen’ (E14).

A local authority is a wide-ranging operation, and a number of **different departments need to work collaboratively and consistently** towards initiatives that might originate from the sustainability team. For other parts of the authority, this is unfamiliar ground, dealing in areas that are not normally within their remit so ‘the biggest challenge is having a local authority with the skills and capacity and experience to pull everything together’ (E11). While council-wide “institutional knowledge and a team” (E11) working towards net zero are needed, there is **no ‘joined up thinking** at the Council... That is just an organisational issue’ (E3). This is because the local authorities are large organisations with **many priorities and tight budgets** so this connection and drive across

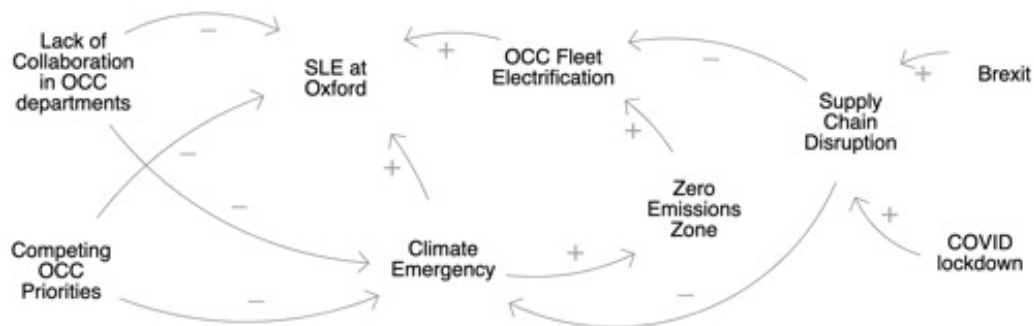


Figure 8: Local Government Driver and Barriers for ESO SLES

the different functions of local government is key to continuing to be at the centre and driving low carbon change.

Oxford, as with many other local authorities, has declared **climate emergency** and held an early Citizens Assembly in autumn 2019 with the agreement to create a zero carbon plan for the Council and city, with ‘decarbonisation targets, net zero ... zero emission zone – the **EV infrastructure** at Redbridge would be incredibly valuable for supporting that zero emissions zone’ (E14). And while the ‘local authorities ... don’t really want to go down the charge point route but unfortunately ... you’re just going to have to because you own a lot of car parks’ (E2).

A particular issue for ESO relates to the timing of the project in relation to both the **Covid pandemic and Brexit**: ‘the biggest obstacles and challenges so far, without a shadow of a doubt was being in COVID. To the **supply chain**, and ... unknowns about the first lockdown. Across the world, manufacturing went into lockdown as well.... We’re still waiting for some vehicles to come in, which have been delayed again, because in the second lockdown that was coming through the port. So it’s not just lockdown affected, but Christmas, we won’t have vehicles come across into this country. Yeah. Brexit has affected that too.’ (E19).

9.2 Skills for the local government sub-system in relation to ESO

In the below analysis of current and future skills needs and shortages, we have aggregated these into different generic skills areas, identifying specific types of skills required in local government to support SLES.

9.2.1 Energy skills for the local government sub-system

For local government, the energy skills required are all about knowledge, and understanding the energy system and how its constraints might impact on what is planned, for example in adding load to the grid.

- **Knowledge of how the energy system works** is at the heart of projects like ESO, along with how it is changing and will operate in the future, so it is important that this knowledge

is held across different parts of the council “...some sort of energy system, knowledge, understanding, training, by and across a whole range of different departments. You need it in housing, you need it in transport, you need it in procurement, you need it in legal. All those different bits of the authority that wouldn’t think of themselves as anything to do with the energy system” (E11). While the council will not require expertise in specific topics (e.g. high voltage infrastructure), which would normally be outsourced to the specialists, the general grasp of the overall energy system is essential.

- **Knowledge of the distribution network operator (DNO) processes** is linked to this - working with them to ensure that there is sufficient network capacity for proposed installations. In ESO, ‘we have spent a lot of time with SSEN our local DNO, just working out what kind of power we’re going to need and how we would facilitate that upgrade and whether we could get the right upgrade and how much that was going to cost’ (E14).
- **Understanding capacity of existing infrastructure:** ‘understand your infrastructure, because very often people are converting existing buildings or spaces. For electrification, it comes with some challenges, whether that’s local substation capacity, or just physical capacity on site. Commissioning an in-depth report on your current power consumption. You’re going to require your local provider to understand capacity in their area. I think this is really, really important ... what people need to understand, the implications on infrastructure first’ (E19). This is particularly relevant as the local authorities need to set up policies and strategies for additional load installs and electrification (e.g., for EV charging and heat pumps).

9.2.2 Engineering skills for the local government sub-system

While the local government is not an engineering organisation, as it transitions to the data-focused energy infrastructure, it needs to develop in-house skills for data analysis and a strategy for its own data management. Given that much of the household data can be sensitive, the local authorities may need to grow in-house skills on data platform maintenance as well. However, at this early stage of electrification, the following skills needs were noted:

- **Data management:** local authorities need to connect different sources of data and to optimise their operations. For example, new EV charging systems in the depot will provide data on vehicle charging to help overall management: ‘the data streams and the company charge points, that will be handled by Oxford Direct Services... we will [also] be getting some data from the charge points from the Superhub’ (E14) – all of this will both help facilitate future expansion and provide feedback on usage.
- **Data analytics (also referred to as telematics)** skills are presently acquired through outsourcing. E.g., in initiating the new EV fleet strategy “Oxford Direct Services paid for a consultant who did a load of work on the back of that telematics, that information we got out. Giving various options about which vehicles we should choose to electrify” (E14). Going forward, as the amount of data (on EV CP, heat pumps etc) held by local authorities grows, in-house data analytics skills would become more critical.

9.2.3 Trades skills for the local government sub-system

While the local governments rely on skilled tradesmen to deliver their SLES projects (like heat pump and EV charge point installations), these skills are normally contracted through procurement processes. However, with the OCC's vehicle fleet electrification, EV vehicle and charge point maintenance skills are likely to be grown for in-house use (e.g.: as stated by E14: 'ongoing maintenance of any charge points we've put into our depot ... Oxford Direct Services agreed that they would take on maintenance for those'). These skills are discussed in more detail under the Transport section of this report.

9.2.4 Management skills for the local government sub-system

A range of managerial skills were identified as key to local authorities being able to support and develop SLES initiatives within their council, as discussed below.

Within the project management area, bringing together the range of people and skills needed for project delivery, the following specific skills are noted as critical, and requiring some upskilling, though not entirely new:

- **Managing stakeholders and partnerships** – with external organisations of different types, and internally across departments of the council, bringing people together is an essential and much needed skill '...a good example of a multi agency partnership working between Innovate, Pivot, ourselves, council... trying to do this in, you know, worldwide pandemic...' (E19). The upskilling here relates to working with many partners at the same time.
- **Managing conflicting priorities internally across local government responsibilities:** for example: 'If you want to get a traffic regulation order done to put designated parking spots or an EV charger, then you need to talk to the highways team and those people are kind of going, well why do I care about your project?' (E11). While this skill is relevant in government in general, all SLES project require cross-departmental collaboration and re-prioritisation of governmental objectives.
- **Knowledge across energy systems** and functions e.g. EVs, EVCPs, infrastructure capacity and upgrading: 'the project manager skills, they're going to need to be energy infrastructure experienced, charge point infrastructure experienced... electrically, not just project qualified.... If they drive an electric vehicle, added bonus' (E2).
- **Understanding and managing the complexity and risks** associated with untried project approaches, 'with innovation projects there's always more risk. There's also a lot of complexity and a lot of technical information that a lot of people aren't that comfortable with or don't know or don't understand ... generally councils are fairly risk adverse so that's quite difficult and quite challenging (E14). Here an upskilling for appreciation of technology and SLES ecosystem related risks and complexities is needed.
- **Tendering and recruiting for use of consultants** as necessary, where internal resources are unable to deliver project needs due to capacity or inexperience. A grasp on what skills and qualifications to look for in SLES projects are necessary: 'a list of potential consultants you might want to use, or these are the kind of people, you might want to look for these qualifications or this kind of background or knowledge. If you would rather get a consultant

to do this for you or try and get some expertise to do this for you. I think those kind of things would be really helpful for future skilling' (E14).

9.2.5 Finance and Business skills for the local government sub-system

The development of energy projects is a new area for local authorities and 'the two other departments who definitely need knowledge in energy infrastructure and charge points is procurement and finance' (E2) '... we've got to deploy EV charging, how are we going to do that? How are we going to fund it? How do we bring investment in? How do we make it attractive for investment to come in? How can we use our own infrastructure? (E18). This requires additional skills.

- **Whole life costing and knowledge of other (non-financial) drivers** which might override a simple financial calculation are necessary, e.g.: 'if you're doing it from a finance perspective, then you will aim for your smaller vehicles because you can make a saving just because they can be more cost effectively run as an electric vehicle... the larger the electric vehicle is, the more expensive it is because the battery is so expensive and so heavy, so they become incredibly expensive' (E14). However, bringing other drivers such as climate emergency commitments into the calculation can change the business case.
- **Procurement** requires upskilling in the local authorities, as procuring some of the SLES technologies and skills are 'all relatively new problems' (E11). Thus the teams need to get to know what 'detailed specifications' (E14) should be looked at for each SLE-related procurement. Another issue is that with the new technologies, such as EVCP there are "small innovative companies who turn things around quite quickly who aren't well known in the credit arena and so they have poor credit scores, haven't been around very long. And they don't fit very well with council processes for looking at previous backgrounds" (E14). Thus, a review of such established processes may be necessary.

9.2.6 Legal skills for the local government sub-system

Within ESO, our respondents suggested that the OCC 'legal department were the ones that really struggled in understanding it' although 'that's not the legal system's fault, it's just everybody is trying to catch up whether it be planning, legal, property' (E2). From a local authority perspective, the legal needs fall into a number of areas, encompassing different forms of contractual agreements:

- **Energy infrastructure and system knowledge** is a whole new area for many LA legal teams, e.g., E2 notes that the OCC legal team "... got to a point where they were actually, we can't support you because we don't have enough understanding of the energy infrastructure and charge point industry to advise you and support you legally on this project. You need quite a bespoke industry or bespoke lawyers to do this". Similar issues were reported for high voltage network connections (by E8) as well as setting up 'private wire' connection (by E2).
- **Contractual experience for renewable energy technologies** is lacking. E.g., in relation to chargepoints, E2 reports that 'even within the legal system there is a gap there for lawyers with renewable energy and charge point experience'. The approach in ESO is to set up the chargepoint agreements as concessions but our interviewees 'don't think that the standard

goods and services contract is fit for purpose when it comes to charge points because it is so complex and you may not want to own the charge points, you'd rather do a concession.' (E2) There is no standard approach here so relevant contractual experience is key.

- **Legal agreements for land use for renewable energy projects** is another area where LA legal teams require upskilling, as noted earlier, the council owns much of the land but there are complex agreements required. E.g., in ESO 'the public wire going onto OCC land into a Pivot Power owned substation that feeds into somebody else's transformer, including one for the council, but it's on their land. That's a very complex, heads of terms, easements, who does what, who has rights of access (E2)

9.2.7 Policy skills for the local government sub-system

Policy areas relevant to ESO / SLES and within the skills required at local government level are discussed below.

- **Planning policy** is a key aspect of local government, both in setting out the strategic level spatial plan for the local area and then in enacting this plan. **'Planners need to have a greater understanding of the different technologies and their implications**, else planning causes delay and confusion for the renewable energy projects, for example in ESO all aspects of project had met difficulties with planning:
 - in relation to **transport** '... the planning team ... need to understand the transport industry and where transport is going in the future' (E2);
 - with **heat pump** installation, 'planning has been a problem ... Oxford City Council ... were so confused by our applications ... when all we're putting in is a heat pump and a ground array...' (E3);
 - from the **private wire** perspective, planning was further complicated by 'trying to get planning permission ... from three local authorities, because ... it goes across three local authorities ... so three authorities had to give consent for it ...' (E14);
 - **batteries** too 'don't fit comfortably into renewable energy development or any other type of industrial development, [and] cause a little bit of a problem within ... planning policies...' (E17).
- **Balancing policy needs:** at a local level, as noted previously, climate policy does not necessarily accord with other local drivers. For instance, whilst installing heat pumps delivers carbon savings, they cost more to install than gas boilers and where council properties already have gas heating there is no financial benefit, however, ... as the carbon agenda, or the decarbonisation targets are hitting home a bit more in Oxford, there would be a realignment (E14). Similarly with EVs, electric refuse vehicles 'the actual cost is twice. Currently, twice the cost of standard drcv ... it's difficult, but you just need to try and understand the whole holistic impact' (E19). Thus, upskilling in impact understanding is needed to be able to balance the policy needs.
- **Project evaluation and knowledge sharing** is important in demonstrator projects so the project team will 'start thinking about evaluation, we'll be able to start working on providing some documents to help other authorities with these kind of projects... how we make things

business as usual afterwards, then I think that's going to come out as part of the evaluation... how you transfer that skills and knowledge to it becoming business as usual' (E14)

- **Lobbying** to central government and government bodies such as ofgem is an important skill to keep innovation projects on track and to recognise the role of LA in supporting local needs: 'we've been doing a lot of lobbying.... to Ofgem and to BEIS and to Kwasi Kwarteng to the government just to point out if they make the wrong decision here what the impact will be on the project. ...it comes better if it comes from the City and this is what's going to happen to the City as opposed to Pivot who are part of EDF and obviously trying to make some money. (E14)

9.2.8 Soft skills for the local government sub-system

- **Internal communications** across departments and with neighbouring authorities are an important part of the project: 'as much as it is technical, it's also very much about people and bringing those people onboard and along with us for the journey, if we can.' (E17). It was suggested that internal project staff had "an unenviable task of educating and leading the council through this." (E8).
- **Communication and engagement** to 'raise public awareness, this is where the local authorities could really shine' (E2), 'engagement across all the stakeholders is really important' (E19). Engagement also includes working with press and social media 'this is where Oxford has been so good, we've done the EV superhub, local papers it's right on the front page'(E2).

9.3 Training for the local government sub-system in relation to ESO

9.3.1 Training needs

The key areas for training identified by interviewees focused around knowledge of energy systems, policy and planning.

- **Knowledge of energy and its implications** is needed across all departments and levels of local and national government, a basic understanding of how the energy system and infrastructure is changing and its implications for the operation of LAs. We noted in particular how legal and procurement teams need new knowledge to support these developments: "education comes back down to educating the policy makers in order for them to make policy to enable the development to happen. Or to at least make the development happen in an easier manner" (E17).
- **Understanding the changing nature of transport** is another key area where upskilling is needed, eg in developing EV adoption strategies:
 - from a fleet perspective, educating the operational teams in development, management and maintenance of the EV fleets;
 - from the infrastructure perspective, learning from previous experience of EVCP infrastructure development, understanding electrical load implications, land use, CP competition, etc.

- **Policy** teams need to learn how to connect energy with other policy aims (e.g. housing, land use, transport, air quality): where ‘training would have to extend to local authorities to be more sympathetic and understand not only their own policies but government policy as well’ (E6).
- **Planning team upskilling for energy developments** is critical, else planning teams struggle to evaluate and process new types of development and their needs in relation to existing planning and other local policy.
- **Management** is another important area for upskilling so that project managers not only understand LA processes but can deal with a range of new stakeholders and collaborators and manage multi-stakeholder projects. These managers also need to understand SLES technologies and principles.

9.3.2 Modes of training

- **Building on higher education knowledge:** It was recognised that young people might have the most current knowledge but not the experience ‘you’ve got loads of students coming through that are now down in environmental policies and sustainability, but they don’t have the experience’ (E12). Thus practical training provision is needed to better support utilisation of theoretical knowledge (e.g., through placements, internships, projects with industry etc.).
- **Learning on the job:** bringing new knowledge from graduates together with more experienced colleagues can be a way to upskill a team. Sharing knowledge across departments in another form of learning on the job, e.g.: “we’ve just learnt through experience. And we’ve learnt through creating technical specifications and talking to people” (E14).
- **Working with expert partners**, .e.g., members of the Oxford council team have ‘learnt a lot from Pivot. And a lot from any consultants or other people we’re working with’ (E14).
- **Online / Short courses** are available to address particular skills needs, for example ‘the Coursera courses that I’ve done have been very, very good. Then there’s the government ones which do courses on environmental and sustainability’ (E2). Motivated staff often take the initiative to look for upskilling in their own time, but this could be formalised with recommendations on the best and most relevant opportunities as well as training time allocation to further such initiatives.

9.4 Insights and recommendations for the local government sub-system

In relation to the local government and technologies deployed in ESO, particularly looking at EVs, chargepoints and energy infrastructure, we note the following key skills issues:

9.4.1 Upskilling on new energy technologies and practices

The energy system is changing fast and all parts of the local authority need an understanding of these changes and the implications for their operations. This extends not only to the internal operation of the council but also to policy development. With their declaration of climate emergency,

OCC has a clear high-level commitment to addressing climate change and the changing energy system is an important component. We note in particular the following key areas for upskilling:

- Planning – ensuring supportive policy for clean energy, facilitating clean energy developments, and relating energy to other planning policy drivers.
- Procurement – addressing blockages where rules make it harder to work with the innovative companies that can help deliver new technologies.
- Contracts: supporting the development of new contract forms, for example the chargepoint concession agreements, land agreements etc.
- Legal knowledge relating to contracts, land, energy connections, energy supply, siting of energy infrastructure and other energy related issues are all relatively new to LA legal teams and will only grow in the future so while procuring specialist external support is a good short-term solution, this is costly and internal skills are needed.

9.4.2 Appointing specialist roles

While the local authorities have mainly worked with the principle of employing project managers and outsourcing specialist skills, it is suggested that for many new technology areas there are examples of proven benefits in having **specialists within local authority departments**. For example E2 noted: there is a ‘guy that’s been involved with the procurement for the fleet. And there’s a possibility he may become the fleet guru when it comes to procuring vehicles, telematics, servicing and maintenance. ... I do know that that has been done I think at Coventry and it’s really worked. They’ve ended up having specialist people within their procurement department for particular projects” (E2). As previously noted, specialist skills in, for example data analytics, data management, renewable energy / energy system etc within legal, planning, transport and housing teams would be beneficial.

- **Project managers** appointed for energy projects need a wide range of different skills in order to effectively engage with specialist external partner organisations as well as internal departments. They need to have knowledge of engineering and the energy system as well as the more conventional stakeholder management, resourcing, communication, evaluation and reporting skills.

9.4.3 Growing cross-boundary collaborations

SLES projects cross both geographical, administrative, departmental and subject boundaries as they require system-wide change and adaptation. Thus, the local authorities must develop a new culture of cross-boundary collaborations.

- **Working across geographical areas**, e.g., installing a private wire in ESO required collaboration between 3 neighbouring geographical areas. Energy systems do not align with the geographical and administrative boundaries, so harmonisation on legal, planning, land use and similar issues across the neighbouring authorities as well as clear process of communication and engagement with named representatives across authorities for specific types of projects would facilitate SLES business development.

- It was also noted that **across the departments of a single loc authority** there are too many conflicting priorities (e.g., housing vs decarbonisation), lack of communication and lack of policy alignment (e.g. planning for preservation of historical buildings vs addressing energy poverty).
 1. **Cross-departmental education on SLES** technologies, benefits, management and procurement practices is the first step in aligning perspectives of the local authority employees;
 2. **Coordinated policy and planning processes** are the other essential requirement for faster SLES adoption.
- **Cross-stakeholder engagement** is also a necessity for SLES adoption. Not only do the local authority energy project managers engage externally and internally they also need to engage effectively with local businesses and the public to explain innovative initiatives and their benefits for the local area – engendering innovative partnerships, encouraging uptake, for example of EVs or new domestic heating methods, etc.

10 Skills Summary and Discussions

This report looks at the different aspects of SLES from the perspective of the ESO project. This means that we focus on particular technology areas, namely large-scale battery, transmission-grid connection, private wire deployment, rapid EVCP at scale, EV fleet development, ICT-enabled energy optimisation and ground source heatpumps. Each of these technologies have their own issues and skills needs but we also observe some commonalities and explore how best to develop and deploy the skills needed across a local area.

10.1 Evolving Energy Infrastructure

As National Grid manages the transmission infrastructure and the DNOs the distribution networks, we see in ESO, the role for an addition to the energy supply infrastructure via the transmission-connected privately owned cable that connects to a large battery. Such a battery, currently, in Oxford feeds the Superhub and EV charge points at Redbridge but has the capacity to deliver electricity to other EV locations such as the bus depot, delivery firms and major employers – and potentially more.

This new model of **transmission connection with battery storage** – and with further renewables generation, could change the way energy is provided for local services in the future. In particular, it could help resolve the challenge of limited distribution network capacity, by allowing battery-connected charging service provision or **expanding EVCP networks**.

The necessary **battery optimisation software** is another key part of this infrastructure evolution. If all of this is to be deployed at scale, we will need more of all of the skilled professionals discussed above relating to the energy system, in particular:

- Transmission connection engineers
- Battery designers and installers
- Specialist construction trades including groundworks and structures