

5 Local Authorities Subsystem: Findings from Data Analysis

5.1 Factors Affecting Bristol's Local Authority Subsystem

The local authority opinions presented in this work are those obtained through interviews with the members of Bristol City Council (BCC) and the West of England Combined Authority, supplemented with views expressed by other interviewees.

Drawing on the interview data analysis, we have formulated the causal model of Bristol's Local Authority subsystem in relation to SLE, as shown in Figure 6¹¹, and briefly explained below:

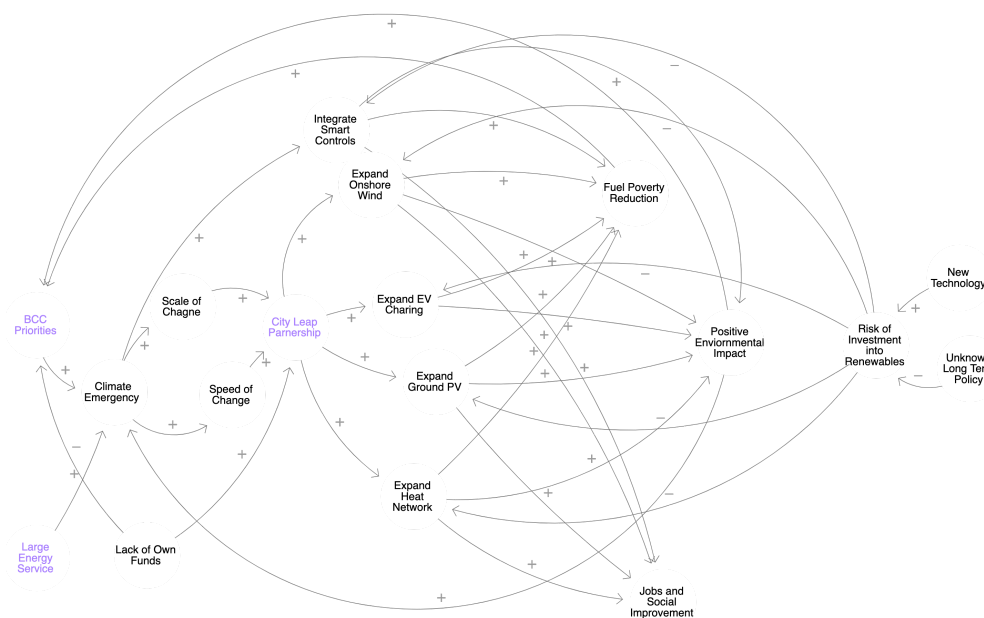


Figure 6: Causal Loop Diagram of Bristol's Local Authority Subsystem (factors local and specific to Bristol are presented in purple).

Bristol is the first city within the UK to have declared a climate emergency. While the city has a number of **priority areas** to address as identified in the One City/City Leap documents [35, 36], the **climate emergency challenge** is the key focus for the city and its council.

As part of its addressing the climate challenge, BCC has set up the City Leap [36] programme of work, one key area of which is the transition to clean energy systems. This work is supported by BCC's large **Energy Team**, which currently consists of approximately 40 employees. This is an unusually privileged position for a UK city council, as most councils have lost their energy teams altogether (due to the austerity-induced budget cuts) or have managed to retain only a small team of energy managers.

The BCC's Energy Team has been supporting a wide set of energy transition projects, such as the development of ground-mounted PV arrays, onshore wind turbines, energy efficiency projects for council-owned housing, micro-district heating development and electrification of vehicles in the city. However, on declaration of the climate emergency, BCC observed that the scale and speed

¹¹This model can be simulated through this url: <https://energysystems.blogs.bristol.ac.uk/2021/01/19/localauthority/>

of energy transition needed to be scaled-up to levels that could not be sustained by the council's currently available human and financial resources, as noted by P6:

...in light of the climate emergency We know it's just not enough, and we know that, with the council's ability to deliver on the scale and at the speed that we need, it's just impossible. So, we've done some calculations on our ambitions for the next 10 years in terms of our energy projects for things like expanding our existing heat network, ...low carbon and affordable heating ...more onshore wind, more ground-mounted PV, more EV charging, all of those bits of infrastructure, we've essentially looked at our ambition and we've looked at the cost of that ambition And it came to around a billion pounds, about £950,000,000, so much more than the council's got And with ever-shrinking public budgets we know we're not going to be able to deliver that over the next 10 years solo.

This massive scaling-up of the transition activities was planned and set in motion through the City Leap project, whereby BCC has initiated a tender process for a private–public partnership, inviting innovative, clean energy companies to bid for an opportunity to deliver various services to the city of Bristol on 50 - 50 partnership terms. The winners (single companies or consortia) will form joint ventures with BCC to deliver large-scale transition activities.

The joint ventures between BCC and the commercial companies are intended both as a way of scaling-up the investment as well as, on the one hand, reducing the risk of BCC's investment in the new technology and, on the other, reducing the risk of lost investments due to policy changes by the commercial investors. By investing with established technology-providing companies, the council gains a level of certainty that the said technology has been tried and tested in previous projects. Similarly, the commercial investors gain a level of certainty of a return for their investment, even if the national policy on these technologies within the UK is rather unstable.

Along with its fostering transition to a zero-carbon economy by 2030 (a target set by BCC), the City Leap project will support job creation, societal improvement for the citizens of Bristol and the reduction of fuel poverty.

5.2 What skills are needed for Bristol's Local Authority (energy) subsystem currently and in the future?

The skills deemed relevant to each of the areas of Bristol's Local Authority ecosystems by our interviewees are summarised in Figure 7. We note that the City Council has a number of teams that are focused on addressing various issues of the city's administration. However, the key focus of the City Council is to design the projects and relevant policies, and then to commission their delivery through tenders and procurement of skills from commercial partners, rather than just developing in-house skills for tackling all areas of the various projects' delivery.

5.2.1 Engineering Skills for the Local Authority Subsystem

BCC already owns a substantial number of clean energy resources (such as wind and solar generation, rooftop PV on council-owned buildings, electric charging stations and vehicles). These assets will continue to grow (both through the City Leap joint ventures and through the Council's own investment) and will need to be maintained and operated. Furthermore, the City Innovation team engages in technology research and directly employs engineers as well; thus, as per P6:

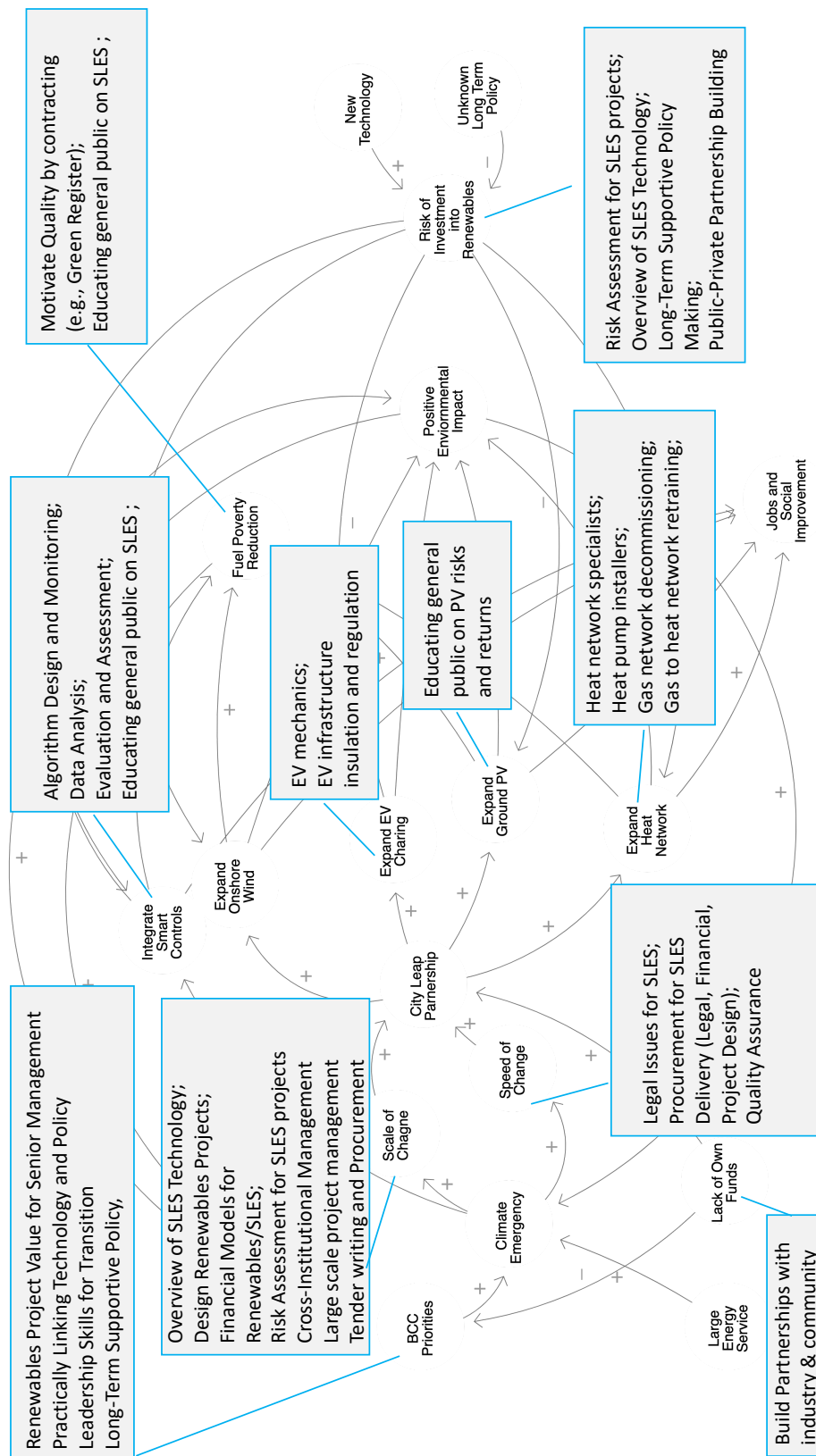


Figure 7: Skills in the Causal model of Bristol's Local Authority Subsystem.

...we're transitioning to a smarter energy system. Things are becoming more automated and more interconnected, which is fantastic. With that, there are undoubtedly going to be some skills challenges ...the clever individuals that come up with the algorithms that allow your in-house heat pump to talk to your central heating and your battery to talk to your PV ...Some of that work is becoming rapidly automated but there still needs to be ...an individual, or a team of individuals, in an operation centre looking at the data flows and screens and saying, okay, something's gone a little bit awry there; we need to tweak the provisions.

- *Data Analysis* to evaluate performance of the BCC SLE SoS and identify ways of optimising it;
- *Algorithm Design and Monitoring*, primarily to operate and maintain the council's resources, optimise their performance, as per input from the data analysis, and undertake innovation and pilot projects.
- *Heat Network Specialists* are needed to support the district heating program roll out, which is a new and growing area of BCC's energy transition.
- *EV Infrastructure Installation and Regulation Compliance Checks* skills are required for BCC's charge point installation projects. Some aspects of this work require innovative solutions, e.g. P18 states that during the installation of charge points they learned that the width of the pavement, can be no less than 1.2 metres wide to ensure that pushchairs can go down it. "So, when you put in a charge point you have to say, 'Hold on, the pavement's not wide enough. ...we had to put the charge point in the road. Wow OK, how do you do that? Well, we need to put bollards. We will need to put a tree next to it to protect it and all this. So, the Highways team, it was totally new to them doing a charge point. And their electrician, who's always a very busy man, spent weeks and weeks trying to get him engaged on the project."

5.2.2 Trades Skills for Local Authority Subsystem

BCC does not directly employ a large number of tradesmen, except where specific work must be carried out by the BCC employees (e.g. installations on the highway must be carried out or overseen by the BCC Highways team). Nevertheless, BCC procures the skills of tradesmen in undertaking all of its projects. The trade skills listed below were noted to be of particularly growing relevance:

- *Charge Point Installation Engineering*, e.g. as per P6: "Maintenance of a charge point if a charge point broke."
- *EV Mechanics Skills* to maintain the growing number of the council's and citizens' EVs;
- *Heat Pump Specification and Installation Skills*, e.g. P18: "size heat pumps correctly to the size of the room ...there's quite a lot of design features with heat pumps.;"
- *Retrofitting Skills for Energy Efficiency*, as per P18: "How to insulate a house properly. ...a heat pump only works if the building is brilliantly insulated."
- *Gas Network Decommissioning*, as per P18 "we want to take every gas boiler out";

5.2.3 Managerial Skills for Local Authority Subsystem

The main focus of BCC's activities is to develop projects, procure their delivery and manage them to completion. As noted by P29:

The skill is for us to be able to unlock the skills where they lie with our partners and out there. Because undoubtedly there will be people who have the technical skills somewhere to do the stuff we want to do.

While the usual array of managerial skills is clearly relevant to BCC as well, here we note the issues noted as specifically relevant to the large and multi-stakeholder project management, due to the nature of the City Leap initiatives:

- *Cross-Institutional Management* is particularly relevant within the City Leap context; as noted by P6, BCC has to see that: "...City Leap as a joint venture will sit outside the council. We need that interface with the council in a sensible way ...";
- *Large-Scale Project Management with Multiple Stakeholders*, as noted by P9: SLE SoS "...requires such an interplay by so many different systems and players, not just the Council but telecoms; all of the utilities will have to play into that."
- *Procurement for SLE SoS Delivery* (Legal, Financial, Project Design) is noted (by P4) as "...becoming a key element for us ..." since the many large projects cannot be designed and delivered solely by the city council's internal staff;
- *Tender Writing* for energy systems. As noted by P4, poor tenders lead to loss of funds and poor project delivery: "...there isn't that knowledge, as one fairly senior local authority person said, we wrote this tender and we wrote it very lightly to allow the market to innovate. And I said, 'What you actually allowed your market to do was to take all your money and not deliver what you wanted.'"
- *Building Partnerships with the Industry and Community* so that BCC can "...make the most of partner organisations' capacity ..." (as per P29).

5.2.4 Energy Skills for Local Authority Subsystem

- *Overview of SLE Technology* An understanding is necessary if local authorities are to embrace these technologies. As noted by P4: "I would hazard a guess that most levels of local authorities ... wouldn't know one end of a heat pump from the next ... A lot of my projects are dealing with our solar PV, solar thermal, heat recovery systems – a heat emitting system whether an air source, ground source or biomass – and then you make all that work together with software, a building management system, how it all integrates and works together, and then how it integrates with the grid. ... Not many people with the specialism to cover all of that ..." (P4).
- *Senior Management's Ability to Value Renewables Projects* is currently very weak, as noted by P18: "...directors and the senior management team haven't really quite bought into it ... A lot of people at senior officer level ... have been in economic development and think in that way. It's all about productivity and GDP ... And now that they're to deliver energy and climate change elements ... It's not necessarily cost efficient to do it, but it's carbon efficient to do it."

- *Designing Renewables Projects*: given that carbon reduction is a key consideration in all BCC projects, there must be a plan for the use of clean energy. However, it is noted (by P18) that “the council doesn’t really have the skills to look at the planning reports. So all the planning officers in my mind should be going on energy awareness courses. I mean really that solar design, what is possible on a roof to do solar panels?”

5.2.5 Finance Skills for Local Authority Subsystem

- Development of *Finance Models for Renewables / SLE* is a critically missing skill (as per P18), finance people at BCC currently have: “this little formula built in a spreadsheet that if the payback is more than five years, it comes up with an error.” Given that most energy projects have a much longer payback time, financial services are often the bottleneck in transition projects.

5.2.6 Legal Skills for Local Authority Subsystem

- *Contract Writing for SLE projects* is complicated by the fact that the legal teams are not very well familiarised with the SLE technologies: “...So legal people don’t really understand solar panels. They’re certainly not going to understand batteries. If we tried to put a battery in someone else’s building, we’d be there for months, with the lawyers having arguments about it.” (P18)
- *Risk Assessment* skills for SLES projects are lacking as the clean energy equipment is new and unfamiliar to many. As stated by P18, they worry: “...what is this box on the wall? I don’t know what it does. Do I need to maintain it? What happens if it goes wrong?”. They need to become accustomed to treating these as they would any other equipment which “...just comes with a manual and a warranty.” (P18).

5.2.7 Policy Skills for Local Authority Subsystem

- *Practically Linking Technology and Policy*: “It’s about understanding the application of it [energy technology]. Understanding the integration of that panel into a number of different building types. But However, also, how to translate that into local policy.” (P18).
- *Long-Term Supportive Policy Making* is necessary both at central and local government levels. As noted by P4: “...some local authorities ...got an idea of a project ...[that] would take ...three to four years. ...And you could see them just getting a bit jittery, because they know they’ve got local elections between that time etc. etc. etc. ...then, commitment falls away.”
- *Motivate Quality by Contracting Qualified Delivery Partners* (e.g. Green Register), as suggested by P4: “I think there needs to be some form of certification at the highest level of accreditation for companies ...especially if they use public money.”
- *Quality Assurance* of renewable projects suffers as “The operation and maintenance isn’t covered within contractual elements at the beginning, so nobody will come back and fix it.” (P4). Local authorities need to develop quality assurance skills and integrate these into local policies and contracts.

- *Evaluation and Assessment for Continuous Improvement* is centred on integrating the current learning into planning for the future. In other words, accounting for “...that measurement piece, that evaluation, that kind of continuous improvement” (P6). While local authorities do not always need to carry out measurement and evaluation by themselves (e.g. this can be carried out by academics or other sub-contractors), they need to be able to plan for this and integrate the learned results into future projects.
- The BCC teams need to be ready to do their review quickly on *Infrastructure Regulations* as the transition poses previously unforeseen situations. For instance, installing an EV charge point “...has to satisfy all these regulations about, for example say, the width of the pavement...” (which must be 1.2 metres or wider) (P18).

5.2.8 Soft Skills for Local Authority Subsystem

- *Leadership for Transition* is to be assumed by BCC as it is one of the better resourced and innovative local authorities in the South West of the UK: “there are a lot of eyes on Bristol in terms of us in a leadership role and the ability to share knowledge, best practice, share mistakes with our local authority counterparts.” (P6)
- BCC has engaged in the City Leap, which is essentially a project to *Build Partnerships*, “...establishing a long-term, very flexible, very innovative partnership to bring in that investment, to bring in a billion pounds over the next ten years through public and private partnership.” (P6). Thus, partnership building skills are essential to all teams across BCC, as well as to all other local authorities who wish to replicate a similar transition approach.
- Skills for *Educating the General Public* on various topics of SLE (e.g. SLE overview and risks and benefits of PV/other technology installations) are also necessary within the local authority, as the general public must engage with the local authority plans to have these delivered successfully.

5.3 Training Needs for Local Authority Subsystem

5.3.1 Areas of Training Needs within BCC

The key areas in the Local Authority in Bristol where training is considered particularly relevant are:

- A basic *Overview of SLE SoS and Renewable/Energy Efficiency Technologies* is necessary to enable BCC employees to handle SLE SoS concerns in all areas of the council’s activities (e.g. integrating energy efficiency measures by the planning department, installation of charge points by the Highways department).
- *Evidence-Based Policy Making* skills are critical in practically linking the policy to the renewable technology and commercial delivery opportunities (e.g. given the evidence of EV and the performance of bio-gas fuelled buses, a policy of electrification of Bristol’s transport can be put in place).

- *Managing a Large Set of Stakeholders on a Project* is likely to become the daily practice in BCC, as within the SLE SoS environment, the interconnected subsystem stakeholders become relevant for other subsystem projects (e.g. time of vehicle charging within the Transport and Mobility Subsystem becomes relevant to heating within the Energy Subsystem).
- *Engineering Skills for Management of SLE Projects* are essential, as the technically knowledgeable manager is able to make decisions based on facts, rather than on a third party's interpretations and opinions (e.g. which generation technology will best fit the local environment? Is the given platform suited for the data analysis task at hand?).
- *Building Partnerships* is another critically pertinent skill for BCC, as, given the scale of investment and speed of change necessary for the SLE SoS transition, BCC must work with both private and public organisations, as well as with the citizens directly.

5.3.2 Modes of Training

- *Learning by Doing* is particularly relevant for acquiring the relevant background technical skills (e.g. heat pump installation, etc.) that are then drawn upon for policy/project decision making: "...you really gain that by delivering and installing. ...knowing whether or not that company's good at installing heat pumps ...and how they manage the project is a little difficult to discern from a classroom-based training exercise" (P4). Thus, a short-term secondment of the BCC Energy and Policy team within SLE companies could be very beneficial.
- *Peer Learning* is both valued and a well-practised mode in BCC: "the Head of Highways [at BCC] is actually willing to send his electrician to London and spend time with the electrician in London 'cause it's about peer-to-peer learning. They wouldn't trust getting this from a manual and they definitely don't trust the manufacturers" (P18). This mode is also supported through groups and bodies set up specifically for this purpose, such as the UK's Core Cities Group [37] and the Association for Public Service Excellence [38], where peer groups for experience exchange and mutual support are regularly convened. In addition, external peers, such as consultants, are often invited to help with learning specific skills, e.g. "...if you need to know other tools then maybe you need to go and get a consultant" (P18).
- *Conferences and Workshops* are often used to learn about technology and practice: "...the most useful thing I found was going and engaging at conferences ...hearing people talk through live use cases from different companies or research institutes, that was far more useful to me than reading things online because you could go and have a conversation with those people afterwards" (P29).
- *Demonstrators* are particularly relevant in reducing uncertainty for the planning of novel projects, risk, and the decision making as "...you could go and see this working" (P18).
- *Online Courses* are also used by BCC staff, where they feel they need to fill some knowledge gaps. These tend to be done voluntarily, in their own time, e.g. "So, for my own benefit I did an IOT course, just to try and get fundamentals and understanding of what that was because it was completely new to me. ...just six-to-eight week courses ..." (P31). To support this further, BCC could select and recommend specific providers to interested staff, as well as account for the necessary learning time within the workload allocation.

- *Internships* at BCC are used to support specific scoped project needs (e.g. community engagement; peripheral software development). These provide a valuable opportunity for collaboration between the Council and the City's universities and colleges, as interns are often (yet not exclusively) taken in from these institutions.

5.4 Insights and Recommendations on Bristol's Local Authority Subsystem

Having decided that carbon-neutrality by 2030 is a key target for the city, the local authority now has to ***ensure that the right ecosystem is in place*** to enable realisation of this target.

5.4.1 Creating the Local Regulatory Landscape

The key role of a local authority, such as BCC, is to create the right regulatory landscape within their locality, aiming to deliver against local goals. Given Bristol's decarbonisation agenda, the local authority needs to both address its own skill shortages for the energy transition, and also to create regulations designed to prevent shortages in all other SLE SoS subsystems. This implies that sector-specific regulations need to be delivered for all noted SLE SoS areas (see Fig. 1), and include:

1. Review of all local training provisions for modern SLE content (e.g. brick-free building, financing renewable energy projects)
2. Per Subsystem regulatory review, e.g. for Building and Retrofit Subsystem:
 - Clean energy sources to be integrated in all new build (aiming for fully self-sufficient sourcing, instead of the current 20% rule);
 - Clean energy generation and energy efficiency pre-conditions for planning approval of all renovations of the existing housing stock;
 - Incentives for energy efficiency retrofit, beyond the current UK-wide funding (e.g. through novel financing and cost sharing models);
 - Certification of all involved in building and retrofit activities to ensure the quality of workmanship (e.g. through required upskilling via Futureproof [28] and Green Register [27]);
 - Activation of professional position uptake in a variety of roles such as a certified retrofit specialist or a heat pump installer (as these professions are expected to be in high demand in the short-to-medium term) with clear professional progression for the longer term.

5.4.2 Assessing Quality of City Leap Delivery

BCC has started the transition to SLE SoS in a strong position, with a competent Energy Service team of approximately 40 in number and an impressive record of innovative energy project delivery and decarbonisation. However, given the estimated need of over "...£1 billion of investment towards Bristol becoming a zero-carbon, smart energy city by 2030" [39], BCC has identified the need for external investment and has initiated the City Leap program of setting up a joint venture to leverage the said investment on a 50%-50% private-public contribution basis.

A procurement exercise for a Strategic Partner for City Leap was initiated in September 2020. The Strategic Partner (i.e. an organisation or consortium that will work with the council to deliver the investment for energy transition) appointment will be concluded in 2021. The current shortlist for the potential partners (following the review of applicants) consists of [40]:

- Ameresco Limited, with Vattenfall Heat UK Limited as an Essential Sub-Contractor.
- ENGIE Services Holding UK Ltd and Sumitomo Corporation (acting as a consortium), with Abundance Investment Ltd as an Essential Sub-Contractor.
- E.ON UK PLC and Marubeni Corporation (acting as a consortium).

While the joint venture and scaling-up of the investment into SLE SoS transition is an inspiring initiative, BCC needs to ensure that *well qualified staff and partners are in place to monitor, access and support the delivery of the City Leap project*. As noted above, a practical technical background is strongly desirable for objective assessment of such activities (e.g. assessment of the quality of heat pump installations or retrofit for energy efficiency). Thus, we recommend that **a City Leap Quality Assessment team** is set up (made up of trained BCC members, as well as independent assessors, such as academic and industry representatives skilled in data analysis and power systems, heat networks, and renewable energy etc.) in order to help the project succeed.

5.4.3 SLE SoS Training Across All BCC Departments

With the declaration of the climate emergency in 2018, BCC has effectively committed to *full energy transition to SLE SoS by 2030*. Within this energy transition project, BCC must also tackle fuel poverty, refurbish the housing stock within the city, reduce transport emissions, bolster the workforce in energy efficiency and engineering areas for the said transition while also maintaining and promoting equitable conditions for the citizens.

The transition requires upskilling the traditional “non-energy” departments at BCC to get them involved with the SLE SoS agenda. Thus, there is a substantial **shift in the knowledge and skills underway in most of BCC’s departments**. Therefore, there is a need for additional cross-departmental **local authority-wide training on SLE technologies, as well as on area-specific issues**. (Examples of specific issues are: how to calculate return on investment for finance team members and how to support upgrades for energy efficiency in protected areas for the city planning teams.)