Sefton Borough Council

LCR SPV

Mechanisms of Energy Infrastructure Delivery for Liverpool City Region

REP/21657300

Issue | rev 1 | September 2011

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Executive Summary

1 The objective of this assessment is to elevate resilient low carbon energy infrastructure development for economic regeneration up the local authority investment agenda. The Liverpool City Region (LCR) ambitions have evolved into a Low Carbon Economy Action Plan (LCEAP), 2011 from the Liverpool City Region Multi Area Agreement (MAA), 2009 and the mini-Stern report, 2009. The evolved LCEAP ambitions identify the need to develop resilient energy infrastructure for the LCR.

2 This study has identified twelve sizable projects across the LCR amounting to over £200million of capital investment. These low and zero carbon projects have the capacity to generate annually 79,000MWh of electricity and 280,000MWh of heat to the fuel poor and cross sector consumers at competitive tariffs. The business case of this LCR capital programme is estimated to have an attractive internal rate of return of 10%. Annual CO_2 savings of 119,000tonnes have been estimated on LCR present emissions.

3 The LCR aspirations and project opportunities presented provide significant potential for the City Region to create economic growth and address fuel poverty with the development of resilient low carbon energy infrastructure. However, this will demand clear unequivocal City Region leadership and joint working and this approach is also identified in the Coalition Government's Local Growth White Paper (2011) which sets out clear roles for local authorities in supporting economic growth.

4 The core Liverpool City Region (LCR) districts of Halton, Knowsley, Liverpool, Sefton, St.Helens and Wirral are developing a wide framework of work building capacity and knowledge on low carbon energy. This work is supporting better joint working opportunities across public and private partnerships to attract and secure external investment for low carbon economic development. The ultimate aims of such investment are economic regeneration, development of skills, provide cost and carbon savings and tackle fuel poverty across the LCR. The participating core districts of this study have formed a steering group to inform and assist the consultants in examining the Mechanisms for Resilient Energy Infrastructure Delivery for Liverpool City Region.

5 The LCR, and indeed the UK more widely, faces significant challenges to achieving carbon reduction targets. Notwithstanding the importance of developing a broad portfolio of different types of renewable and energy efficiency technologies at a range of scales, it is the exploitation of opportunities for carbon reduction on a large scale that will make the most significant contribution to achieving the LCR's carbon ambitions. In delivering this the LCR has the opportunity to make a step change in Gross Value Added (GVA) of the City Region.

6 The consultants, with the assistance of steering group members, have opted to examine the potential for LCR involvement in bold innovative steps. The study shows that the business case for the known and potential low and zero carbon projects of significant scale can be commercially attractive when developed with strategic and technical diligence. Furthermore, tried and tested delivery mechanisms are presented in the form of Special Purpose Vehicles (SPV) for the LCR local authorities to adopt.

7 The SPV mechanisms examined show how capital investment and the means of contractual delivery can be arranged. SPV mechanisms can blend public and private sector sources of finance and, under a clear governance framework, can be constructed to suit the risk appetite of all parties involved. To meet their multi-facetted ambitions local authorities may choose to develop either individual SPVs or take a collective approach. The latter being an LCR SPV which enable the development of individual public/private project contracts within local authorities.

8 Facing up to the challenge presents the LCR local authorities with the choices to either; be involved in bold innovative steps to develop significant capital projects that respond to the needs of the City Region, or be disengaged leaving it to market forces, to deliver carbon reduction that are driven by investment returns. The former is the preferred choice and requires coordinated local authority resources across the LCR.

9 Successfully attracting investment for the delivery of capital intensive energy/carbon projects will be unfamiliar to the majority of LCR local authorities. However, harbouring any expectation that the private sector will deliver local authority energy/carbon related economic regeneration ambitions while providing all investment and covering all risk, is unrealistic.

10 The boldest step to be taken by LCR local authorities is the need to become the pro-active driving force during development stages of energy/carbon projects. They will need to ensure that energy and economic regeneration interests are cornerstones of the mission statement of any project from the point of formation through to operation.

11 A growing number of domestic energy efficient retrofits have used SPVs to bring together public sector and utility funding. There are well proven and successful schemes in operation across the country employing SPVs. These projects are complex and innovative going a long way towards addressing many local authority economic regeneration ambitions. However, they do not necessarily approach the scale of energy project required to meet the significant ambition of the carbon reduction challenge.

12 The importance of identifying and appointing high level champions within each local authority is critical. Project delivery can only be moved forward within the local authorities by employing expertise across departments driven from the very top. Therefore project champions therefore need to be at least Director level in order to instruct interdepartmental collaboration, communication and cooperation. With this level of championing the LCR will be well placed to successfully deliver resilient energy infrastructure wherever opportunities are identified.

13 In delivering energy infrastructure projects it is essential for LCR local authorities to have a clear understanding of the specific roles and responsibilities of any SPV. Responsibilities undertaken by the local authorities will depend upon the commercial model and arrangements required to deliver a project or group of projects in order for them to be implemented in the most effective and efficient manner possible.

14 An annex to this assessment to produce a Sustainable Energy Action Plan (SEAP) for the LCR has been commissioned by MEAS and is presented in a separate report. The requirements of a SEAP stem from the Covenant of Mayors movement that was launched by the European Commission in 2008. The Covenant of Mayors is a voluntary movement whereby cities join the initiative to

receive technological and financial support. Presently there are 2,693 signatories representing 128,325,192 inhabitants. It is recommended that LCR local authorities collectively become supporters and signatories and produce a SEAP. In so doing the LCR will gain support and financial assistance with resilient low carbon energy infrastructure governance structure development and project delivery.

15 Conclusions and recommendations are drawn from this study and summarised as a series of next steps to be undertaken by the LCR local authorities individually or collectively. Built on the outline business cases developed, these are:

1. Establish local authority project champions at Director level and a Task Group to communicate the mutual actions required by involved participating departments to deliver projects.

2. Agree the SPV business case and communicate this to LCR champions through a clear plan of co-ordinated LCR funding applications for large scale investment programme.

3. Agree chronological order of application for EU and other funding streams and engage with these funding bodies through the Task Group.
   - Seek funding support for LCR champion(s) to attend and instigate events across public and private sectors to present, promote and seek knowledge transfer for the benefit of the LCR project SPV development.

4. Reinforce confidence of local authorities by identifying and using best practice from around the UK and other countries.

5. Progress soft market testing of private sector partners and specialist energy services providers to establish memorandum of understanding.

6. Use remaining CCSF fund and other funding streams to carryout:
   - Initial project feasibility / design to include increased GIS granularity and heat network layout
   - Take the business cases developed in this study to the next stage through detailed technical/economic feasibility study.

7. Include reference of projects in Local Development Frameworks, e.g. in Core Strategy policies and potentially allocation Development Policy Documents (DPDs). Notwithstanding other windfall projects and Stage 2 Renewable Study projects coming to the fore.
   - Local planning authorities to clearly set out how they will determine planning applications for energy infrastructure and have the resources to deliver decisions to time.
   - Optimise available resources for planning authorities by developing clear policies to avoid unnecessary delays.

8. Keep the process 'live' by clarifying other opportunities to build-on/incorporate initiatives into SPV delivery model(s).
9. Prepare a Sustainable Energy Action Plan (SEAP) for LCR • Use the SEAP to draw the opportunities together as part of a wider programme and the CCSF objectives of energy infrastructure delivery.

1 Introduction

Liverpool City Region is ambitious to become energy self-sufficient and a net energy exporter by the year 2030, through a combination of greater energy efficiency and renewable supply. Also, to become the biggest low carbon goods and services city-region economy in the UK.

Liverpool City Region Multi Area Agreement, 2009

The core Liverpool City Region (LCR) Districts of Halton, Knowsley, Liverpool, Sefton, St.Helens and Wirral are developing a wide framework of work building capacity and knowledge on low carbon energy. The work is supporting better joint working opportunities across public and private partnerships to attract and secure external investment for low carbon economic development. The ultimate aims of the investment to LCR are job creation, skills development, cost and carbon savings through low and zero carbon energy generation infrastructure for local authorities (and their residents) and partners (and their customers).

This LCR initiative builds on previous work commissioned by Merseyside Environmental Advisory Service (MEAS) which examined LCR's renewable energy options evidence base and for emerging planning policy. The evidence and advice provided in these commissions supports LCR local authorities in setting out their policy frameworks for low and zero carbon development.

Investment in the LCR is anticipated for the delivery of infrastructure improvements under Project Viridis, solar PV and retrofitting homes is estimated to be worth up to £30m and £5bn to the city's economy respectively. The Renewable Energy and Energy Efficiency in Housing (REECH) programme attracted £7.5m European funding for renewable and energy efficiency home improvements in deprived areas and the 'Smart' partnership with energy supply and distribution companies. More recently, LCR successfully secured £100k investment from the Climate Change Skills Fund (CCSF) to support capacity development in planning for renewables and decentralised energy. The LCR CCSF work package includes multiple interconnected projects such as capacity development for energy delivery in community groups and with local authority

planning teams, within the local authorities of the LCR for the implementation of decentralised energy networks through the Local Development Framework and for mechanisms for a resilient energy infrastructure.

All the LCR CCSF projects are interconnected, approved by the LCR Environment and Waste Board and managed by a LCR Steering Group of environmental, planning and regeneration officers.

To achieve the ambitions of the Liverpool City Region Multi Area Agreement, 2009 to become energy self-sufficient and a net energy exporter by the year 2030 there is a need to take bold steps requiring significant capital projects carrying potentially high levels of risk.

This study provides the Special Purpose Vehicles (SPV) mechanisms by which LCR local authorities can now drive delivery of local energy infrastructure and services effectively.

Successfully attracting investment and delivering capital intensive energy schemes will be unfamiliar to the majority of LCR local authorities. However, because the private sector is unlikely to deliver all of the local authority energy ambitions while providing all investment and covering all risk, local authorities will have to quickly assimilate the conclusions of this study to fill the project delivery gaps.

Local authorities will have to become the primary stakeholders and governing body in developing large scale low carbon energy schemes in the LCR to meet their own ambitions.

The SPV mechanisms examined are intended to describe how sizable capital investment and the means of contractual delivery can be arranged. SPV mechanisms can blend public and private sector sources of finance, under a clear governance framework SPV can be constructed to suit the risk appetite of all parties involved. Many energy sector domestic retrofits have used SPVs to bring together public sector and utility funding and there are well proven and successful schemes in operation across the country.

This project study covers:

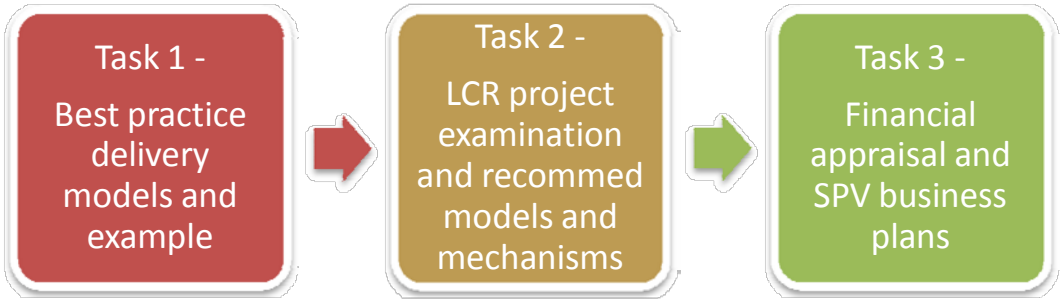


Figure 1: LCR Resilient Sustainable Energy Infrastructure Study Process

- TASK 1 - Examine best practice delivery models and learn by example
- TASK 2 - Review current and proposed energy infrastructure activity within the LCR and shortlist projects for examination. Estimate the energy balance of shortlisted projects. Recommend appropriate models and mechanisms to take forward a co-ordinated response for the LCR

- TASK 3 – Evaluate project economics and business case. Prepare and deliver appropriate information to disseminate to LCR Senior Officers

A range of energy project types could have been covered in this study, a non-exhaustive list is described below:

- Domestic energy efficient refurbishment
- Domestic solar thermal
- Domestic photo-voltaics
- Domestic and commercial heat pumps
- Large-scale wind
- Community heat networks
- Combined heat and power

However, the focus of this study has been placed on large scale urban opportunities that are technology agnostic and provide low and zero carbon heat and power generation, namely combined heat and power (CHP) enabled by community heat network infrastructure. The focus on this type of project opportunity, while presenting what the consultant believe to be the most significant means of delivering carbon reduction at scale, also aligns with the timescales and budgetary constraints of the commission.

2 Task 1 - Special Purpose Vehicle Options

2.1 Summary

This section of the study has examined key requirements for the development of resilient energy infrastructure projects for the LCR's local authorities. The Route to successful energy infrastructure delivery whether individual projects or groupings of projects across the LCR requires that the following high level stages are carried out and communicated to all stakeholders.

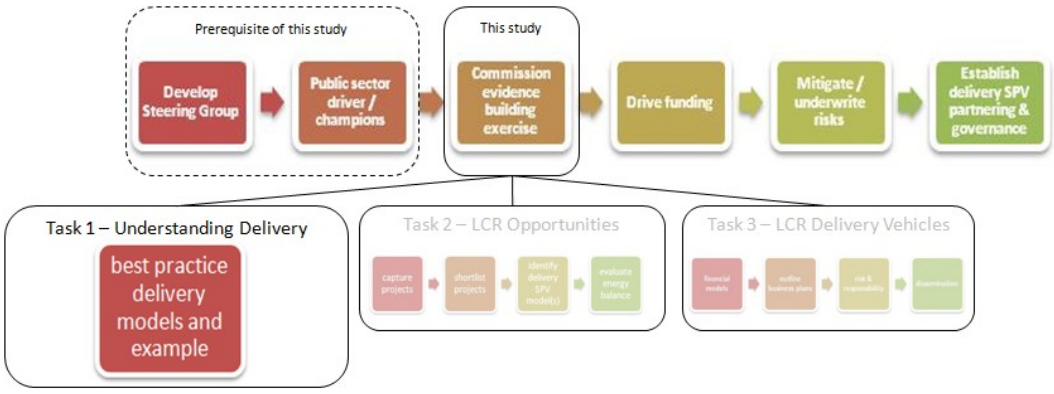


Figure 2: Task 1 Understanding Delivery - Route to a Successful LCR Energy Infrastructure Delivery

As illustrated, prerequisite stages to this study have been established to a large degree for the LCR by previous consultants studies managed by MEAS albeit that individual local authority drivers and champions have yet to be named with the exception of Knowsley MBC.

The importance of identifying high level champions within each local authority has become more evident during this commission. In order to move project delivery forward calling on cross departmental action project champions need to be at Executive Directors level without which local authority wide support in the form of collaborative communication and cooperation is unlikely to happen. With this level of buy-in successful delivery of resilient energy infrastructure across the LCR gets closer to becoming a reality.

Each activity of the 'study' will consist of the following key actions:

Develop Steering Group

- LCR Coordination
- Nomination of Authority Steering Group member

Public Sector Drivers and Champions

- Identify the needs / drivers
- Identify Authority skills gas
- Identify and inform Champion

Evidence Building

- Understand delivery mechanism options
- Project identification and shortlist
- Energy and carbon estimation
- Business case assessment
- De-risking (anchors, funding and finance options etc)
- Partnership models
- Appropriate delivery mechanisms
- Identify Service Level Agreement (SLA) ambitions

Drive Funding

- Evidence for EU funding (Sustainable Energy Action Plan)
- Prudential Borrowing, Bonds....
- Planning levy (CIL, Allowable solutions...)
- Utility partner obligations (CESP/CERT)
- SmartCities

Mitigate / Underwrite Risks

- Construction
- Technical
- Economic/Market
- Political

Establish Delivery SPV model, Partners & Governance

- Develop Legal SLA
- Contract Heads of terms
- Partnership Agreements
- Business setup
- Governance and Board Arrangements

2.2 Introduction

One of the next steps identified in the LCR commissioned Renewable Energy Capacity Study was to develop officer skills, including financing and procurement skills for delivering decentralised energy, including setting up and running Energy Services Companies (ESCos) which is a particular type of SPV. The ESCo would ideally incorporate both housing and commercial development proposals.

A SPV is a legal entity or multi-party structure created with a specific aim or objective. SPVs are a key tool in financial risk management and allow an organisation to undertake specific projects and developments without exposing the whole organisation to the risks involved.

A number of SPV models are currently utilised in a variety of sectors to facilitate the deployment and delivery of energy infrastructure schemes. For example, in the domestic sector, SPV models are being explored for the large scale retrofitting of homes with energy saving or generating measures in line with the UK Government's forthcoming Green Deal.

The advantages of supporting, creating and operating a SPV model would enable LCR private sector partners to be part of a LCR energy infrastructure management arrangement, bring private finance and equity and strengthen applications for European Investment Bank funding. This specific business justification has been included in Birmingham City Council's application for European Investment Bank European Local Energy Assistance (ELENA). The City Council is currently applying for £1.3m ELENA funding to support 90% of the costs of procurement, marketing and supply chain development of their large scale eco-refurbishment Birmingham Energy Savers Phase 3 Pathfinders' programme. The aim of the programme is to take advantage of the Green Deal legislation and retrofit 15k homes at a cost of £100m by 2015 with an 'option to extend to £400m by 2020 via procurement to leverage in additional private sector investment.

This broad appraisal of SPV options (Task 1) provides an overview of models that exist in the market and how they work. Followed by an indication of which models may best suit the needs of Liverpool City Region (LCR). This appraisal has been informed by what the consultants consider to be invaluable lessons learned from existing examples of SPV/ESCo commercial arrangements.

The Energy Saving Trust is currently preparing work for DECC and all nine national Local Carbon Framework pilot areas (Bristol, Nottingham, Newcastle, Liverpool, Birmingham, Leeds, Sheffield, Leeds and Manchester) to suggest datasets and tools for local authorities in planning area wide emissions reduction strategies. In addition the Energy Saving Trust has commissioned a review of available finance models for large scale domestic retrofit programmes and a legal review of the State Aid implications of each of these models.

This work could be instructive in identifying the potential of SPVs financing LCR energy infrastructure schemes. In particular, linking wider opportunities for retrofit and renewal (see figure 6 of section 2.4.1 - multi-stand SPV models) and linking area-wide regeneration and renewal. These studies are expected to be completed during July 2011 will be publicly available.

The Low carbon Framework pilot area work and that of Arup in assisting Manchester City Council and others to identify Organisational Structure and Sources of Finance and can provide useful learning for the LCR.

The findings of this LCR appraisal are used to refine a short list of options for which more detailed evaluation and appraisal is carried out (Task 2). Ultimately, preferred delivery options for which a set of outline business plans are developed are presented in Task 3.

2.3 SPV Fundamentals

Although a range of models and arrangements exist for SPV projects the core requirements of these entities remain the same. The information provided below covers the fundamental characteristics of SPV for delivering energy infrastructure projects covering responsibilities, transactions, funding, benefits and key issues to consider for LCR.

There are also a number of independent references describing means of developing community energy schemes that can prove useful in developing fundamental understanding of the mechanisms presented for Task 1[1, 2].

2.3.1 Understanding Fundamental Responsibilities

In delivering energy infrastructure projects it is essential for the local authorities of the LCR to have a clear understanding of the specific roles and responsibilities of any SPV. Responsibilities undertaken by the local authorities will depend upon the commercial model and arrangements required to deliver a project or group of projects in order for them to be implemented in the most effective and efficient manner possible.

Figure 3 below outlines the key responsibilities to be fully understood for each LCR project for any SPV arrangement:

Figure 3: Typical Key Responsibilities for any SPV Arrangement

[1] Community energy: 'urban planning for a low carbon future', and

[2] Community energy: 'planning, development and delivery', Town and Country Planning Association and CHPA, 2010.

The extent to which these responsibilities are allocated to the SPV and any partners involved will depend upon the project characteristics. However, all will be relevant to a greater or lesser degree depending on the level of appetite for involvement in a project SPV that an LCR Authority has. These responsibilities can to a large extent be attributed to five key business areas;

1. Policy

   The policy business area is responsible for coordinating the positioning of the SPV within the guidance and governance of the local area and authority (or in this case the city region and multiple local authorities). This involves consultation and communication associated with the project as well as stakeholder engagement.

2. Projects

   The project's business area provides the necessary tools for the delivery of the energy infrastructure project(s) from inception to decommissioning. This includes legal and financial services, capital raising and project development and management.

3. Energy

   The energy business area is responsible for the operation of the energy infrastructure project. This includes management of supply, distribution and generation contracts, utility liaison and asset operation and maintenance.

4. Metering and Transactions

   The metering and transactions business area covers both marketing and accounting responsibility for the SPV. Typical actions would include metering, billing and reporting, performance surveys and energy contract management.

5. Stock

   The stock business area provides the management of the assets associated with the SPV.

These business areas and typical operations within an SPV are summarised in the figure below;

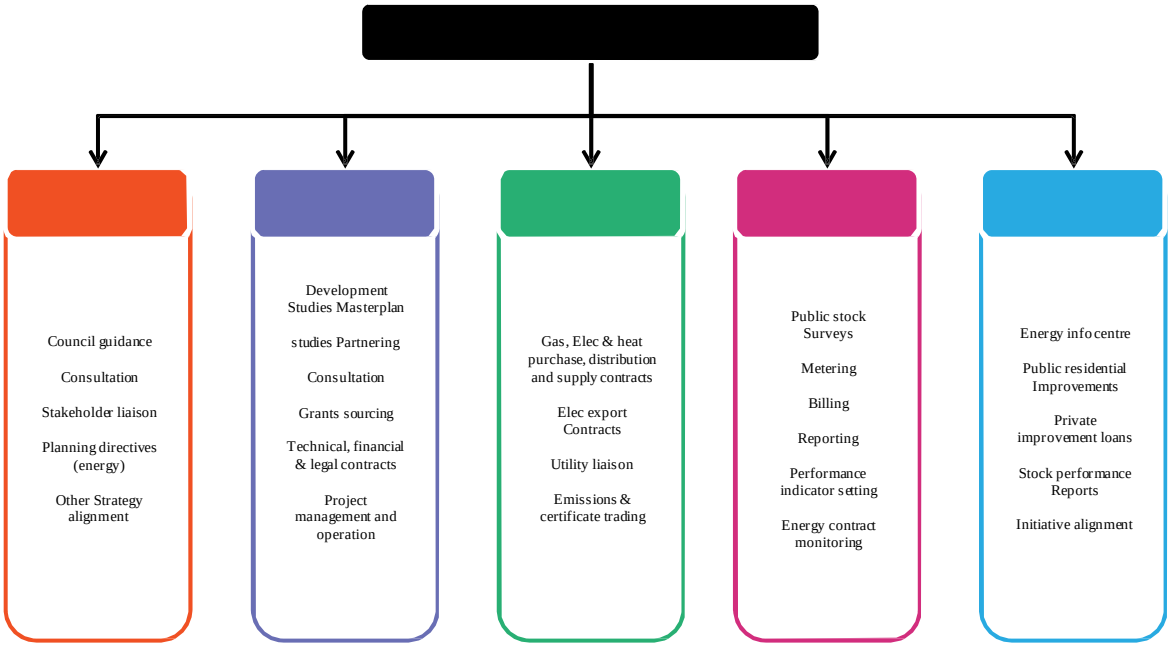


Figure 4: Fundamental SPV Business Area Operations for Authority Involvement

These fundamentals are explored in more detail in task 3 of this study particular to the projects and more refined assessment of the LCR local authority ambitions.

2.3.2 Governance

The responsibilities and operations of an SPV as identified above requires that a clearly defined Governance structure forms part of the business plan. Identifying governance within such a structure ensures that the activities and objectives of are carried out.

The LCR local authorities will need to ensure that energy related public interests are a contractual priority for the project SPV stakeholders. This is the case during the development period and throughout the long term operational performance of the project. The local authority should therefore take a leading role in the governance structure which translates into taking a key role in the contractual enabling of project delivery described in task 3.

2.3.3 Transactions

The figure below summarises the key transactions between an SPV and other parties (general financial flows into and out of the SPV) in the context of energy

infrastructure.

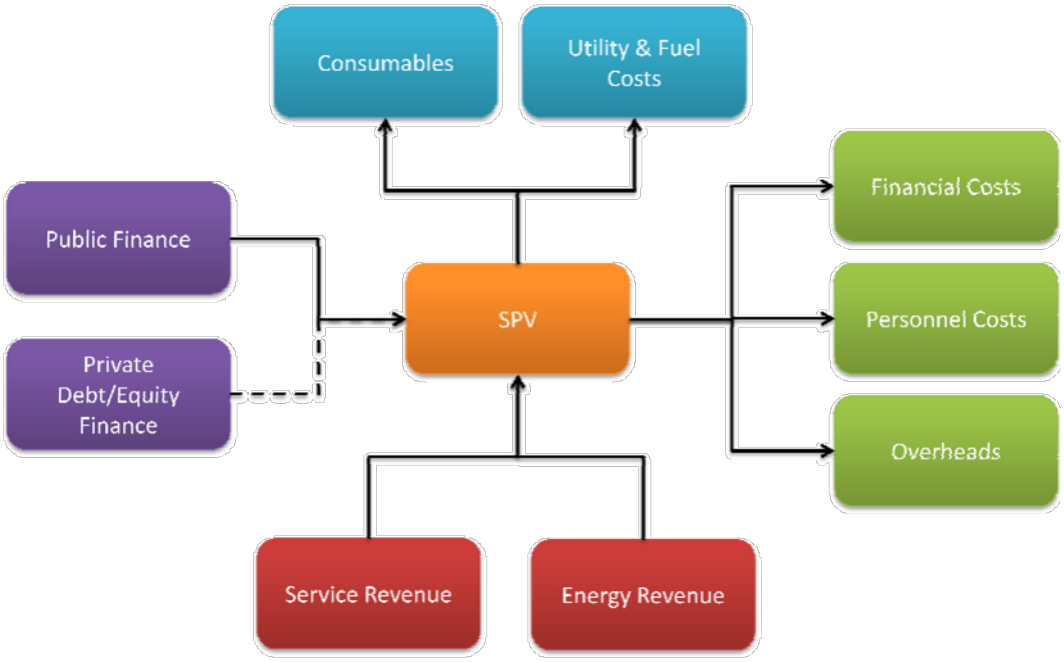


Figure 5: Typical SPV Model Transactions

The key transactions can be considered as a four key groups (shown above by colour) by LCR;

1. Operational Costs (Blue)

   These cover the variable costs associated with the operation of the SPV such as utility costs (electricity, water and gas), fuel costs, operational consumables and maintenance.

2. Business Costs (Green)

   Business costs cover all outgoing transactions associated with the operation of the SPV. These costs include operational and management personnel costs, fixed operating overheads and financial costs.

3. Revenue Streams (Red)

   The SPV may receive income or revenue from a number of business areas. The main contributors will typically be from the sale of energy both locally and remotely and from other services provided.

4. Funding (Purple)

   Transactions falling under the Funding group are the most likely to vary from project to project depending upon the SPV public and/or private structure and arrangements put in place. Typical transactions would include government incentives, loans or grants and related transactions with the commercial and/or public partners.

2.3.4 Funding and Incentives

It is becoming increasingly necessary for energy infrastructure developments to gain financial support from sources other than local authorities themselves as

public sector budgets come under increasing pressure. Other public financing mechanisms and private means will more than likely be required to progress any project. Similarly, maximising a projects qualification for low and zero carbon generation and supply revenue incentives should be a feature of energy infrastructure developments. The use of a purpose designed SPV for delivering an energy infrastructure project provides a significant opportunity for the LCR to capture and include alternative finance for both capital investment and working capital.

Typical sources of capital finance the LCR should consider (excluding demonstrator funds) available for energy infrastructure projects include;

- Commercial partners; e.g.:
    - Energy services companies or utilities
- Public sector; e.g.:
    - Community Infrastructure Levy (CIL)
    - Allowable Solution (Zero Carbon Hub proposal pending)
    - Prudential borrowing
    - EU European Investment Bank (EIB) programmes
    - Planning levies
    - SmartCities
- Grant funding schemes; e.g.:
    - Green Deal (loan)
    - Renewable Heat Premium Payment
- Investment groups; e.g.:
    - Sources of private sector equity

Although the inclusion of alternative financing arrangements increases the level of commercial complexity in many cases this is often the only means of delivering what are often front-loaded long-term development projects.

Of most use for the scale of LCR aspirations, the European Commission has created a tailored technical assistance package called ‘ELENA’. ELENA helps public sector bodies such as local authorities mobilise funds for investments in sustainable energy at a local level. ELENA can cover up to 90% of the costs for technical support necessary to prepare, implement and finance an investment programme such as feasibility and market studies, structuring of programmes, business plans, energy audits, preparation for tendering procedures, in short everything necessary to make a LCR energy infrastructure framework ready for investment. As mentioned earlier Birmingham City Council is one of a number of UK local authorities seeking ELENA funding to support their large scale domestic retrofitting investment programme.

Typical sources of revenue incentives available across the UK for low and zero carbon energy infrastructure projects include;

- Renewable Obligation Certificates (ROC)
- Feed in Tariff (FiT)

- Renewable Heat Incentive (RHI)

2.3.5 Potential Benefits

Large scale energy infrastructure projects require specialist skills in; technical and financial feasibility, business case development, raising finance, design, construction and operation. A SPV with carefully selected partners provides a means of delivering the process in full. The benefits brought by the SPV approach to the LCR local authorities are:

- Independent off balance sheet financing vehicle for local authorities (stakeholders and profit arrangements dependent on commercial model and SPV board structure)
- Reduction in local authority liability by partial transferring to the private sector
- Public sector support in the form of funding contributions and demand guarantees through anchor loads provides encouragement to the private sector funding partner(s) and reduces revenue risk
- Service level agreements and Head of Terms of the SPV partners can provide protection to the local authority in the event of the SPV failure of responsibility in terms of performance, cash expenditure and receipts
- Low and zero carbon infrastructure deliver carbon reduction and economic benefit to the local economy and energy affordability to consumers.
- An SPV can provide a level of corporate and energy tax exemption to the developing partners and energy consumers
- Private partnering opens up the prospect of refinancing the energy infrastructure capital assets should the need arise
- The SPV can be used as a mechanism to create financial surplus or recycling funds for further low carbon investment programmes, e.g. social housing refurbishment, dependent on the SPV's mandate/remit
- An SPV structure provides confidence and attractiveness to funding organisations, e.g. European Investment Bank finance applications

2.3.6 Key Issues to consider

In delivering an energy infrastructure project the LCR local authorities may want to consider the nature and extent of their participation in ownership with reference to current Government regulation. Although current Government regulation does not in any way rule out local authority investment of more than 20%, and indeed 100% publicly owned projects are a perfectly proper and road-tested model, the consequences of greater levels of financial participation needs to be examined carefully particularly in the present economic climate. The LCR local authorities will in all likelihood wish to engage a specialist partner from the private sector, for example an Energy Services Company (ESCo).

'Making ESCo's Work: Guidance and Advice'[3] produced by the London Energy Partnership outlines regulation for local authority companies and ownership governance models.

The decision to commission a private partner given the present economic climate and public spending constraints needs careful consideration with particular regard to the public sector handing over of long term commercial operations and potential revenue earning potential to the private sector.

2.4 Public vs. Private Approach

There are advantages and disadvantages of either a public or private approach to the creation of an energy project delivery SPV, these are described below.

2.4.1 Public sector owned

A council can own and operate a project providing an energy service to its residents and businesses. These are usually run by an Arms Length Management Company (ALMO) run along similar lines to that of a private sector ESCo, i.e. contracting for energy supply and carrying out asset operation and maintenance. Such ventures are often wholly owned by the local authority but can be setup with a wider remit and with partners as a SPV.

The wholly owned setup allows the local authority to maintain focused management for the project and to keep any surpluses separate from other council budgets.

Advantages

- Allows full control by the council which may choose to outsource some or all functions to the private sector
- Retains public sector objectives, e.g. fuel poverty, expansion to areas with less commercial value, appropriate for a social housing project.
- Lower internal rate of return required (eg 3.5% to 7.5%)
- The council may also wish to provide low cost services, such as billing and revenue collection to minimise the need for financing
- Retains financial benefits for use by the council in other projects
- Can develop a local supply chain
- Can relinquish capital share/equity once project is operationally de-risked and thereby treat as an income source

Disadvantages

- Risks largely falls to the council, although it can outsource functions to limit risk

[3]Community Energy Online:http://ceo.decc.gov.uk/en/ceol/cms/process/Stage_3/plan/Governance_Str/Governance_Str.aspx

- High initial capital investment and schemes often grow slowly as there are little or no profits to reinvest
- May not provide best value to the council's residents
- Council may need to develop appropriate skills and capacities
- Potential political risk

Routes for finance

- Community Infrastructure Levy (CIL)
- Allowable Solution (Zero Carbon Hub proposal pending)
- Prudential borrowing (CIPFA Prudential Code)
- EU European Investment Bank (EIB) programmes
- SmartCities
- Grant funding – EU, EIB
- Finance – public and private debt
- Council reserves

The diagram below illustrates a possible multi-fund structure for a local authority. Many local authorities may already have existing revolving loan fund arrangements for their own estate and a number (in particular those with retained housing stock) are exploring rent-a-roof scheme options for example on social housing stock. Separate strands of work may be underway on large scale retrofit finance, currently seeking to leverage energy supplier obligation funding (CERT and CESP)[4]. These funds will be made up of varying proportions of public and private sector debt and equity and rely on different grant and subsidy schemes.

By drawing these different funding streams together or understanding how they inter-relate, appropriate management structures and oversight arrangements can be put in place. It may also be possible to achieve greater scale more readily, allowing re-finance and other options to be explored and making the carbon savings in any one area a more attractive proposition to the private sector.

The Greater London Authority has recently announced the establishment of energy efficiency Urban Development Fund (UDF) as part of an overall £100 million fund[5] linking energy efficiency and waste investments in one overall green fund. Bristol City Council is also bidding for European support for a multi-stranded approach to energy efficiency and decentralised energy.

[4] CERT (Carbon Emissions Reduction Target**),**
http://www.decc.gov.uk/en/content/cms/funding/funding_ops/cert/cert.aspx

CESP (Community Energy Savings Programme),
http://www.decc.gov.uk/en/content/cms/funding/funding_ops/cesp/cesp.aspx

[5] http://www.lda.gov.uk/our-work/european-funds/ERDF/jessica/index.aspx

If this sort of approach is followed, domestic retrofit programmes (such as project Viridis) can sit alongside any CHP/Decentralised Energy SPV but deliver against common carbon reduction and green economy targets.

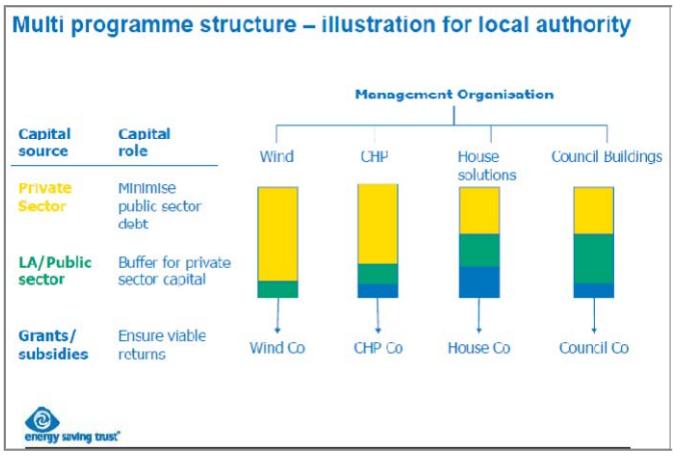


Figure 6: Multi Programme Delivery Structure Illustration

2.4.2 Private sector operated (or owned)

These projects can be set up independently of the council. However, the council may have a role as a matchmaker for projects or as a customer. Also, the council will operate as the planning authority. For projects which utilise council assets, heat and electricity demand, buildings or land, the council may decide to procure a private sector partner to deliver the energy services. Private sector companies offer a variety of setups. The contracts can be set up as:

- Fixed term, where the assets are returned to the council at the end of the contract term.
- Performance based, where the contractor is only paid if an agreed level of savings are made.
- Concession arrangement – a contract that authorises the concessionaire exclusively to operate a business activity within a defined area for a specified period, at the end of which the assets of the business typically revert to the person giving the concession.

Advantages

- Transfer of risk to the private sector
- Council may be able to negotiate a favourable price if they provide asset heat and electricity loads
- May retain some interest through a share of the profits
- Private sector organisations tend to be more efficient
- If a PFI approach is used, this is well understood by the public sector

Disadvantages

- Little or no control for the council
- High internal rate of return required (eg 15%) so small or marginal projects may not be appropriate

- The council may be asked to provide funding for marginal projects with little or no return on investment
- If a PFI approach is used, some councils have not had good experiences with these in other sectors

Routes for finance

- Finance is usually provided wholly by the private sector although for most projects, local authorities are asked to contribute financially or to de-risk the project in other ways, e.g. estate consumption guarantees and landlord consumer default insurance.

2.4.3 Joint venture

The council can choose to develop a contractual partnership with a private sector ESCo and any other partners it chooses, e.g. other public sector organisations. This usually involves setting up a SPV which both organisations invest in. This SPV outlines the contractual obligations of each partner, the financial obligations and the risk involved.

Advantages

- Reduces the council's exposure to risk and the financial burden placed on the council
- Allows the council to reap some of the financial benefits of a successful project, which can be reinvested in other energy projects
- Utilises the strengths of both public and private sector organisations

Disadvantages

- Reduces the amount of control that the council has
- More complex model than the alternatives
- As contracts are agreed at the beginning of a project, they may become inflexible as priorities change exacerbated by lack of partnering terms and public sector governance role
- Subject to commercial lending rates for private sector finance, (e.g. IRR of 15%) and there may be additional set-up costs associated with the SPV and contracts with partners
- Subject to private sector tax regime

Routes to finance

- Debt and/or equity from private sector
- Public finance as described in the 'Public sector owned' column

2.5 Introduction to SPV Models

By way of introduction to SPV models, a range of generic commercial arrangements and SPV models for the delivery of public sector driven energy infrastructure projects can be drawn from industry practice over recent years. The

broad format of these potential models is set out in the table below which highlights the main parties' responsibilities for the provision of energy services under each of the generic models. Later sections of this study provide more specific arrangements appropriate to the projects identified in the LCR.

Model	Energy Centre ✳	Infrastructure	Fuel & Utilities Procurement	Operation & Maintenance	Billing & Transactions
Energy Service Company (ESCo)	SPV	SPV	SPV	SPV	SPV
ESCo +Consumer Facility Management	SPV/Consumer	SPV	Consumer	SPV/Consumer	SPV
Contract Energy Management	SPV/Consumer	SPV/Consumer	SPV/Consumer	SPV/Consumer	SPV/Consumer
Specialised Technology Provider	Consumer	Consumer	SPV/Consumer	SPV/Consumer	Consumer

✳ Heat and/or power generating plant house within a purpose designed building.

An extensive list of examples exist of projects delivered through the use of SPVs is provided in Appendix A.

2.5.1 Energy Services Company

An energy service company (ESCo) can be defined broadly as a company (incorporated or otherwise) specifically setup for the purpose of providing the means to attract investment for delivery and long term operation of an energy project. Typically companies operating in the ESCo space consist of specialist commercial businesses and increasingly a number of public utility companies. Under an ESCo model a single SPV is solely responsible for all aspects of a development and operation. Under this model the SPV accepts all risk of plant failure and energy cost (depending on contractual arrangements) and the SPV becomes the single point of contact for all energy services required by the Authority and connected consumers.

The SPV will generally require a long-term contract or concession agreement under this arrangement in order to deliver commercial returns to the investor while achieving public authority objectives.

2.5.2 ESCo and Consumer Facility Management

Under this model the energy service responsibilities are jointly provided by the SPV and Authority/consumers own facility management operations. Typically the SPV would be responsible for all distribution and generation infrastructure, the majority of operation and maintenance and the billing procedures. The Authority/consumer therefore retains a pre-determined level of responsibility for

the energy centre facility, fuel procurement and building integrated service operation and maintenance.

Under this arrangement risk is split between the Authority/consumer parties and the SPV. As a result the SPV is likely to receive lower income. As with the ESCo model this arrangement is likely to require a long term contract arrangement to incentivise the SPV.

2.5.3 Contract Energy Management

The SPV under this Contract Energy Management (CEM) arrangement takes responsibility for a portion of all of energy services in conjunction with the Authority/consumer; as a result the SPV is not wholly responsible for any single service. This model is likely to be adopted in more specialised scenarios where novel plant or services are provided which the Authority/consumer is not confident or willing to provide.

2.5.4 Specialist Technology Provider

Under a specialist technology provider (STP) the SPV takes responsibility for providing specialist services such as novel fuel procurement and operation of non-standard plant. The Authority/consumer retains responsibility for the provision of all standard services.

As noted the above provides a brief introduction to SPV delivery models, later sections of this study provide greater insight into specific arrangements for LCR project delivery.

2.6 Project Development and SPV Influencing Factors

This report only covers energy SPV issues and opportunities for LCR. There are other utilities (such as water and telecoms) and other area-wide regeneration frameworks (including energy efficiency) that lend themselves to an SPV type approach. In examining the opportunities arising from the set of projects covered in this report, the local authorities involved should not lose sight of the wider opportunities beyond energy, nor the potential to link urban development and regeneration funds to energy infrastructure, which has the potential to offer attractive returns on investment.

A number of factors must be taken into account when considering the most appropriate SPV model and arrangements for efficient and effective delivery of energy infrastructure projects. These influences on the opportunities and constraints for energy project SPV development for LCR are outlined below;

a) Project Risk & Investment Level

The commercial arrangements and SPV model structure utilised to deliver energy infrastructure developments provide a means of managing the risks associated with both investments in and the development of a project.

The levels of investment and development risk associated with a project will also impact upon the available options for delivering a project.

b) Project Development Stage

The development stage of a project will influence the options available for the deployment of energy infrastructure projects within the LCR. This is mainly due to the direct relationship between project development stage and project risk, i.e. the closer a development is to construction completion the lower the risk it presents to the energy project business case.

c) Project Type and Scale

The type and scale of scheme under development will have a direct influence on SPV models and arrangements available in order to aid with project delivery. A larger project with higher capital investment is likely to require a different delivery model than a small off-the-shelf project.

d) Key Project Drivers

The drivers for a project impact upon the options available for delivery in the LCR. A project stimulated on the basis of providing a return on capital is likely to is likely to have a wider range of options available than a project with the sole aim of achieving significant reductions in carbon emissions and provide affordable warmth.

e) Technical, Environmental, Geographic and Consumer Considerations

The location and environment in which the project is being developed, and the standard practices and procedures in place will influence the SPV characteristics. Development of schemes within a particularly industry or location may require the application of a certain type or level of financial consideration due to reasons including legislative requirements and political motivation within the LCR.

The type of consumer associated with a scheme is also likely to impact on the options for project delivery. Public and private sector investors are likely to have differing views and requirements on acceptable delivery methods.

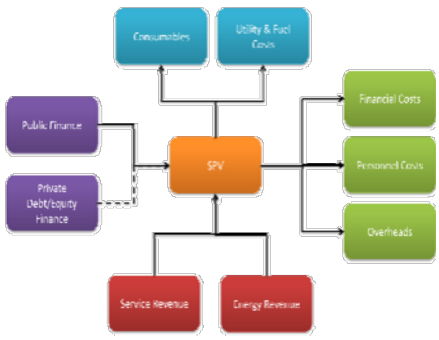
2.7 Financial Modelling

The selection of an appropriate SPV model and associated commercial arrangements for LCR will be dependent upon several factors. One of these main factors will be the economic attractiveness of any project to a third party and as such the importance of financial and cost modelling must be understood.

Modelling of costs and financial implications can be an expensive exercise if not planned, implemented and managed correctly.

This section describes the transactional flow aspects presented earlier in figure 5 of this study.

As such it is important that before allocating resource and time to the assessment and



estimation of capital costs and the production of financial models for a project the level, detail and accuracy required is understood.

2.7.1 Project Development Stage Modelling

The table below sets out a range of examples describing the project development stage and a typical level of financial understanding associated with it.

The projects identified and models examined are described later in this study are, all are clearly either at the early Options Appraisal or Pre-Feasibility stages described below.

Project Development Stage	Description	Financial Assessment
Options Appraisal	• Initial consideration of the options available for the production of energy to supply a development or existing area. • Consideration of several options in order to weigh up potential opportunities and constraints. • Aim to identify the most suitable options for meeting the aims of the scheme.	• Financial considerations likely to be considerations of typical benchmark costs per unit of installed capacity. • Operational costs likely to be consideration of fuel and operational requirements only. Revenues likely to be considered in terms of widely publicised incentive schemes and operating cost savings.
Pre-Feasibility	• Consideration of a select few energy solutions in order to better understand the best option for deployment as part of a development or within a specific area. • Aim to identify the most suitable solution to be taken on and developed into a full solution	• Capital costs can be investigated through consideration of past projects and experience within the area. Detailed consideration of appropriate up-to date benchmarks. • Further research of available incentives and opportunities for the derivation of revenue. Consideration of the wider operational costs associated with a scheme.
Feasibility	• Detailed assessment of the opportunities, constraints, costs and benefits associated with the development of a specific energy solution. • Assessment should take account of a number of elements including technical, economic, political and social considerations. • Aim to confirm the appropriateness of the selected option and provide the certainty required to develop a full solution.	• Financial modelling and cost build-ups considered to a greater level of detail than previously. • Capital cost build-ups based on typical schedules of assets and works required to develop scheme. Benchmarks used for smaller items and budgetary information researched for key items. • Initial cash flow analysis and projections produced to better understand the economic implications associated with the scheme. • Finer financial details such as tax, inflation etc, are not typically considered.
Detailed Design	• Full design and development of scheme taking account of all implications and factors impacting upon the deployment	• Capital cost build-ups produced from actual quotations and/or budgetary figures where required.

Project Development Stage	Description	Financial Assessment
	and operation of the energy scheme. • Full asset and works schedules produced.	• Full financial model produced detailing all transactions and financial considerations over the life of the scheme or investment period.

2.7.2 Capital Cost Assessments

Capital cost considerations form a key component in financial modelling. Capital costs should be a key consideration in any LCR decision making process and will have a direct influence on the development of potential schemes. A scheme exhibiting significant potential returns on investment or extensive emission reductions may be left undeveloped or be rejected by funders on the basis of too high a level of investment or risk.

As such the accuracy to which capital costs may be developed, estimated and assessed is of the utmost importance when assessing the possibilities of developing energy infrastructure projects.

The flow chart below represents a typical methodology applied in order to develop a capital cost build up for a project.

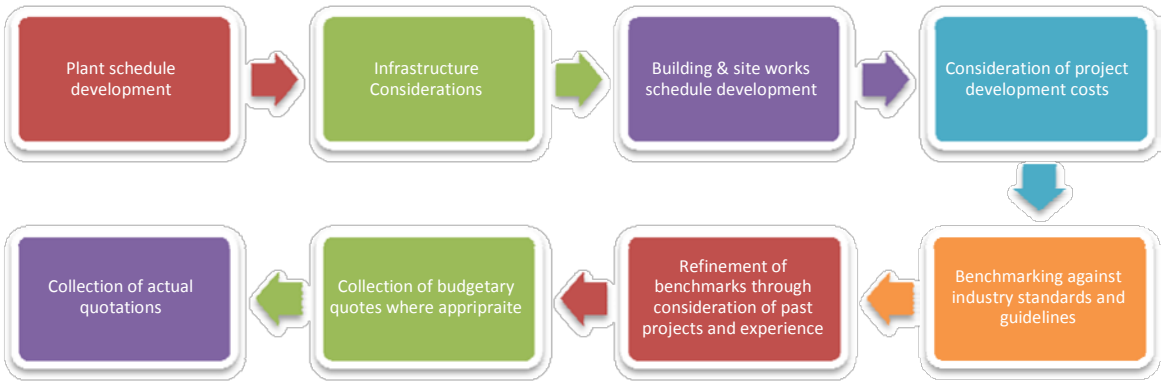


Figure 7: Typical Capital Cost Build-up Process

In the build-up of capital cost estimates for energy infrastructure projects a structured approach can generally be applied to ensure that all costs are taken account of where appropriate. This table below presents an example of costs which may be taken into account during the development of capital cost estimates for an energy infrastructure project.

Item	Description
Generation Plant Items	The costs associated with the purchase and installation of generation plant and associated items form a key element within the build-up of capital costs associated with energy infrastructure projects. Items may include; Primary System Back-up and supplementary generation Pumping systems

Item	Description
	Heat Rejection Flue and Water Treatment Electrical and Mechanical Connections and Interfaces
Energy Centre Costs	Energy centre costs cover the capital expenditure associated with the development, construction and fit-out of the energy centre housing the generation plant. Energy centre costs may include; Building construction costs Provision of services Architecture costs
Distribution Infrastructure	Distribution infrastructure forms a key element of the cost build-ups associated with energy infrastructure projects. Infrastructure costs need to take account of the infrastructure required for the distribution of energy generated as well as any infrastructure costs which may be incurred in order to allow for a scheme to operate as effectively as possible. Items taken into account could include; District heating network District heating interface connections Private wire electrical distribution network Electrical export facilities Fuel supply infrastructure
Project Development Costs	As well as considering the costs associated with the purchase of assets and the works required in order to develop a scheme it is important to take account of the costs associated with development of a project. Typical costs taken into account include; Project Management Project Design & Development Legal Costs Commercial Costs Contingency Funds
Other Costs	The costs taken into account will depend upon the project and will need to be considered on a project by project basis. Some other costs which may need to be taken into account include; Building Costs Land and Site Costs Refurbishment Costs Grid connection Planning costs Regulatory/licensing costs.

2.7.3 Operational Costs and Revenues Assessment

Decentralised energy schemes give a local authority the opportunity to directly influence the physical energy use and supply arrangements within its jurisdiction. These projects will help the local authority tackle various issues within the community, including:

- CO2 reductions – the management of energy use, particularly in buildings, can be one of the most accessible means of reducing carbon emissions. Decentralised energy schemes can be a means of delivering material, measurable carbon reductions.
- Fuel poverty – by delivering energy more cheaply and efficiently, decentralised energy schemes can lessen the impact and prevalence of fuel poverty, providing wider benefits to health and social exclusion.
- Economic development – the delivery and operation of decentralised energy schemes creates both employment and investment in the local area. Cost savings from cheap reliable energy can also benefit businesses connected to the scheme.
- Security of supply – conventional energy customers are exposed to a number of risks and reliability of supply concerns, including power cuts and fluctuations in energy prices. Generating energy locally can potentially reduce these risks, in particular when provided as part of a package of measures to reduce energy consumption.

The LCR local authorities also need to understand the capital costs associated with the development of a project but perhaps more importantly the operational costs, savings and revenues which may be realised through the operation of the developed system.

Understanding the operational costs and revenues associated with a scheme allows for an economic assessment to be undertaken as well as a full financial model to be developed without which delivery cannot be moved forward.

The table below presents the typical considerations taken into account in the build-up of operational cost and revenue projections for an energy infrastructure project.

Item	Description
Fuel & Resource Costs	Fuel, power and consumables typically account for the largest operating costs. Items typically accounted for include; • Fuel Costs • Electricity Costs • Consumables
Operational Costs	Operational costs relate to the costs associated with the operation of a scheme and consist of labour costs for both operation and maintenance. These costs will likely vary with scheme capacity, run hours and output but are unlikely to be directly related as with fuel and resource costs. Items typically accounted for include; • Consumable variable costs

Item	Description
	• Maintenance labour costs
Operational Overheads	Operational overheads relate to the annual fixed costs associated with the operation of a scheme. These costs are likely to include salaried staff and scheme management. Items typically accounted for include; • Management • Insurance • Revenue Collection
External Costs	External costs relate to costs imposed by external bodies such as tax. These costs are likely to vary significantly from scheme to scheme. Items typically accounted for include • Tax • Licensing etc.
Distributed Energy Sales	Sale of the generated energy by the SPV generator to consumers (i.e. on site or off site to a local distribution network) will represent a significant portion of the revenues of a scheme. Where the energy generated is used by locally connected consumers savings associated with marginal tariff improvements are taken into account. Items typically accounted for include • Heat Sales/Saving • Electricity via Private Wire Sales/Saving • Cooling Sales/Saving
Exported Energy Sales	Where generated energy (mostly electricity) is exported back to the national grid revenue may potentially be derived. • Exported Electricity
Incentives	As a result of the growing desire to reduce the impact of climate change many organisations and governments have available incentives, borrowing mechanisms and Planning Act capital concessions for the development of low and zero carbon energy solutions. These incentives may take many forms from tax breaks to cash and can significantly improve the financial outlook of a scheme. Items typically accounted for include: • Cash Incentives and Borrowing • Feed in Tariff (FiT), Renewable Heat Incentive (RHI), Renewables Obligation Certificates (ROC) • Planning levy's • Tax Breaks

2.7.4 Economic Assessment

2.7.4.1 Cash Flow Analysis

Cash flow assessments are the most common method of appraising energy infrastructure schemes. This method involves considering the income and outgoings associated with a project over a defined period. This allows for a long

term view of the requirements of the running and the performance of a project. A discounted cash flow model may also be utilised, particularly over longer term investment periods and where dissimilar projects are to be compared.

As with all financial modelling this method can be completed to various degrees of detail and accuracy depending upon what is required by the project.

Assessment periods will depend upon the asset life and the requirement for replacement. A typical assessment period would be in the order of 25 years.

2.7.4.2 Assessment Techniques

A number of methods and procedures exist for assessing a project based on the associated cashflow. The table below describes a number of these techniques typically used.

Technique	Description
Internal Rate of Return (IRR)	Also referred to as the annualised effective compound return rate, it provides an indication of the profitability of a project as an investment. The calculation does not take into consideration environmental factors such as interest rates or inflation and should therefore only be used to compare similar projects.
Payback	Payback provides a basic indication of the time a project will take to break-even and begin to provide a net positive return, i.e. the capital cost of a project divided by the average net revenue. Payback does not typically take into account the cost of financing a project through borrowing capital nor does it consider inflation. Payback may be presented both in terms of simple payback and discount payback.
Net Present Value (NPV)	Net present value (NPV) gives an indication of the 'value' added by a project to an investment based on the cash flows associated with the project. NPV takes into account the estimated future cash flows and discounts them to give an estimation of present value of the cash flow. The value by which the cash flow is discounted is based on the relative risk of the cash flow compared to typical investment returns such as banking investments and relates to the required return on investment for a project.
Other	Other methods of assessing the financial and economic viability of projects include the use accounting ratios and whole life cost assessments.

2.8 SPV Procurement Process

There are a number of fundamental steps in setting up and procuring an ESCo. This can be found on the Energy Saving Trust local authority web pages. This report broadly follows this guidance and goes further by providing bespoke models for each project characteristics.[6]

There are three main procurement route characteristics that the LCR will need to consider:

1. design, build, finance and operate (DBFO) or design, build and operate (DBO);
2. Competitive procurement of energy services against the offer of a long-term contract, and
3. Procurement of separate design and build (D&B) and operating contracts.

It is presumed that where projects are led by local authorities and other public bodies within the LCR there will be the legal obligation to follow an OJEU procurement process unless pre-existing frameworks can be utilised to develop SPV's[7]. It is not within the scope of interest of this assessment to describe the OJEU process, detailed timescales for compliance with OJEU can be found on the official OJEU website.

The fundamental procedure for the procurement of an SPV can be summarised into a number of tasks outlined below. These are not a radical departure from other forms of procurement that the LCR will be familiar with;

1. Preparation of Tender Documents - Expression of Interest Invitation to Tender, Technical Output Specification, Outline Contractual Heads of Terms, Legal Contract Documents, Tender Response Documentation
2. Issue of Expression of Interest Documents - Issued to a preferred list of energy service providers
3. Issue of Tender Documents - Subsequent to review of expressions of interest
4. Mid-tender review meetings - A series of one to one consultations to clarify the technical, economic and contractual requirements of the energy service contract; discuss tender additions proposals; discuss commercial risks and opportunities; discuss project partner proposals; scrutinise proven experience
5. Review of Tender Submissions - Multi-discipline process focussing on

[6] http://www.energysavingtrust.org.uk/business/Business/Local-Authorities/Energy-Services/Project-delivery/

[7] Official Journal of the European Union is a tendering process required by EC Directives for public sector procurement where the value exceeds an annually updated threshold. The process starts with a notice in the OJEU website (http://www.ojeu.eu/WhatIsTheOJEU.aspx)

Technical & commercial proposals, proven expertise, legal terms, capital contribution and timescales
6. Post Tender Negotiations - To enable refinement and potential re-alignment of bid documentation.
7. Notification to preferred bidders
8. Further negotiations - Predominantly focussing upon commercial and legal contractual terms
9. Contract Award

It is of paramount importance to note that in order to commence through the above procurement process LCR members or any other body wishing to procure a SPV delivery arrangement will first need to have developed concept project opportunities and understand the energy economics and commercial delivery appropriateness.

3 Task 2 - Identifying LCR Opportunities

3.1 Summary

Task 2 presents the particular part of the overall delivery mechanism development process described in figure 2 of section 2 (Task 1).

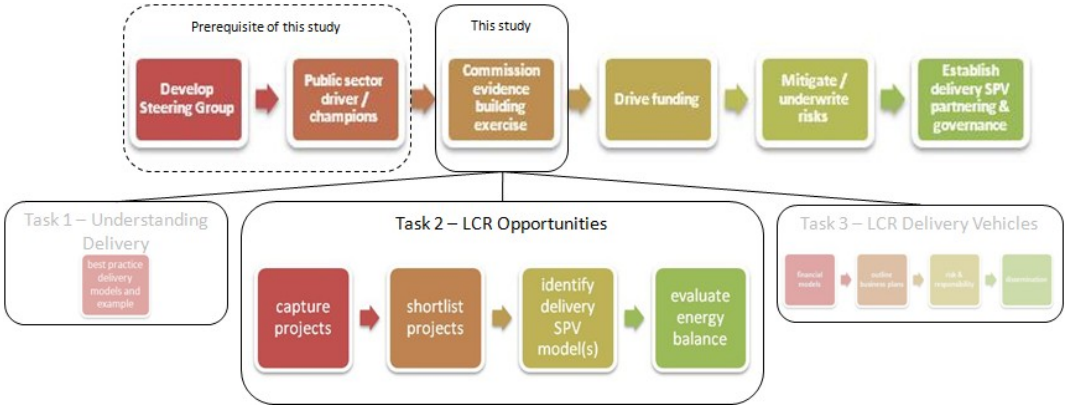


Figure 8: Task 2 LCR Opportunities - Route to a Successful LCR Energy Infrastructure Delivery

There are two prerequisite stages to this study undertaken by LCR as previously described and illustrated. This and the following section of the study describe the process stage of 'commission evidence building exercise' which comprises task 2 and task 3 of the commission.

Task 2 of this study has determined through knowledge sharing between steering group members and the consultant that there are 12 suitable project candidates offering an appropriate level of data for the study stage. These projects are spread across all local authorities of the LCR. Examination of low and zero carbon energy infrastructure opportunities is presented in this task 2 section.

The sum total of the technical and financial analysis of these projects has estimated that low and zero carbon energy demand amounting to over 280million MWh of heat and 79million MWh of electricity could be served. This estimate is based on the concept of resilient heat and power generation by low and zero carbon energy centres utilising a combination of renewable and conventional fuels. Electricity generation would connect to the local distribution network (non-technically termed the Grid), heat would be distributed by around 25km of transmission and primary distribution heat networks.

The steering group and consultants took a view of SPV model suitability to LCR projects. This view took initial account of each local authority delivery capability and aspirations in terms of; possessing the skills, resource levels, and the appetite for project delivery leadership, partnering and investment. The result of this simple initial view is that projects would be delivered by the private sector with support 'in-kind' offered by individual local authorities. Not an entirely surprising result given the economic climate and public sector constraints.

3.2 Introduction

The fundamental process of delivering energy infrastructure projects of significant scale for the local authorities of the LCR has been examined in task 1.

It is the subject of task 2 to; capture projects within this study and previous studies, produce a shortlist of the most appropriate projects, identify the most appropriate SPV model for the shortlisted projects and produce a basic energy evaluation for each.

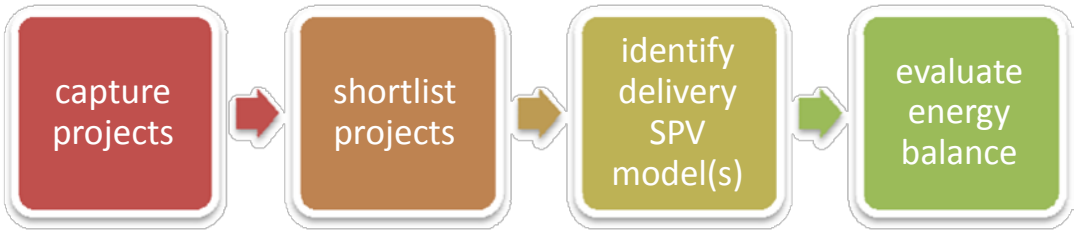


Figure 9: Task 2 Identifying Opportunities Study Process

3.3 Shortlist of LCR projects

The shortlist of projects is presented in appendix D developed from projects identified in previous LCR work stage studies and by the steering group during the project capture exercise of this study. Project capture consists of consideration of previously identified study 'priority zones'[8] and a collective of steering group intelligence (Appendix B and C).

3.3.1 Shortlist rationale

As described earlier, priority zones have been identified by LCR steering group members in previous capacity study exercises. Both within and additional to these zones the projects have been shortlisted based on broad but non-scientifically exhaustive merits appropriate to the stage of the exercise. The short listing rationale includes the following key characteristics considered to be fundamental to successful project opportunity identification:

1. Local authority political agenda and policy alignment
2. Proximity to zones / areas of public regeneration
3. Suitable energy related development characteristics (scale, density etc)
4. Inclusion of key public sector anchor properties / energy demands
5. Inclusion of key private sector anchor properties / energy demands
6. Inception by or inclusion of key private sector partners
7. Existing momentum of development progress / planning

[8] Arup - LCR Renewable Energy Capacity Study

8. Adjacent developments offer expansion and linkage for mutual benefit

A Proforma data gathering exercise to substantiate and gain clearer detail of the captured projects identified in this study (appendix C) has been undertaken by having one to one discussions with steering group members where Proforma data was not forthcoming. As a key developer with significant interests in the City Region, Peel Land & Property (Ports) Ltd were consulted directly and were found to be very supportive of the LCR energy infrastructure delivery ambitions.

3.3.2 Selected Projects

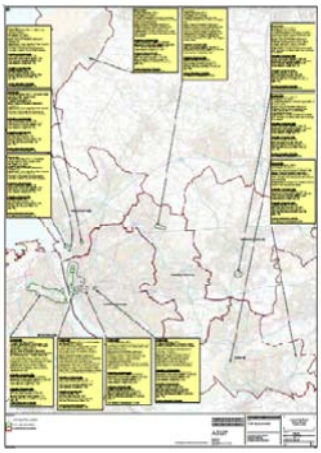
There are 12 shortlisted projects presented below, a project reference nomenclature has been adopted that resets and is different from the capture exercise presented in appendices. New project references are sequential and are used from here-on in the study. Cross reference to previous study project references can be found in appendix tables.

Sub Region Project Reference	Location Description	Space-types Potential customers/partners	Adjacencies & Expansion Opportunities
Liverpool – DES 1	A non-specific project covering a typically attractive energy dense urban area of existing properties City centre area to West of Lime Street station and East of Prince's Dock	Commercial buildings Retail (shopping centres) Hotels Town Hall Law Courts and prisons Leisure facilities Residential buildings (flats)	Concept includes anchor loads with extension into wider mixed use and Eldonian community (non specific)
Liverpool – DES 2	Existing properties Royal Liverpool Hospital Trust & PFI contractor redevelopment & University of Liverpool	Hospital Liverpool University campus Liverpool John Moores Univeristy campus Liverpool Vision Liverpool City Council	Potential links between organisations and/or with adjacent redevelopment of existing hospital site as private high tech commercial enterprises
Knowsley – DES 3	Existing Knowsley Business Park & South of Knowsley Industrial Park with space for expansion / new development including housing	Existing: Commercial buildings Light Industry Emerging/expansion: Employment land build- out EfW / energy centre plant	EfW gasification and other CHP concept for KiP Knowsley Industrial Park opportunity identified from Stage 1 and Stage 2 Priority Zones - District heating
Sefton – DES 4	Emerging properties Development areas around Southport & Formby District General Hospital	Existing Hospital Emerging New College Residential Light Industry Hotel	Concept includes anchor loads with extension into wider mixed use community (non specific)

Sub Region Project Reference	Location Description	Space-types Potential customers/partners	Adjacencies & Expansion Opportunities
St Helens – DES 5	Emerging properties Area around Sutton Leisure Centre and Lea Green distribution centre	Existing Leisure Centre Sports College Distribution Centre Emerging New employment land build-out	Concept includes anchor loads with extension into wider mixed use community (non specific)
Halton – DES 6	Emerging properties Green-field area in Daresbury to West of A56	Existing Business Park Science Park Emerging New employment land build-out New residential	Expansion from Daresbury anchor loads to new development areas
Wirral – DES 7	Wirral Waters Regeneration Enterprise Zone (Peel Holdings) THE largest regeneration project in the UK.	UK government approved application and Enterprise Zone 1.7Msqm mixed use: Commercial/Office space Retail & Leisure Residential (13,000) Hotels Energy and waste strategy Willingness to be innovative	Good proximity to adjacent Birkenhead and Wallesey areas of existing residential and SME
Halton – DES 8	Potential regeneration Runcorn Docks	Planned Large Residential area Likely requirement for complimentary non-residential spaces	Concept includes anchor loads with extension into wider mixed use community (non specific)
Sefton – DES 9	EMR Gasification - large scale opportunity, Bootle Docks/	Energy plant with allied energy requirements and commercial case energy export needs	Tie-in potential to Peel Liverpool Waters development (DES 12) Proximity to Renewable Energy Systems Proximity to Sefton Council Public buildings
Liverpool – DES 10	Liverpool Waters development (Peel Holdings)	Planned Large Residential and Commercial area	Tie-in potential to Sefton EMR (DES 11) energy centre supplies of energy forming links with wider Sefton community
Liverpool – DES 11	Eldonians Low Carbon CHP	Various planned developments	Combined with DES1
Knowsley – DES 12	Jaguar Cars Ltd	TMP exploring information on supply opportunities led by Jaguar Midlands. CHP possible in 2 years time. PV will happen earlier	

Sub Region Project Reference	Location Description	Space-types Potential customers/partners	Adjacencies & Expansion Opportunities
		Great potential for business park development	

The above table presents the shortlisted projects and identifies those where there are clear opportunities to explore expansion or the linking up of projects to serve a wider community. However, the latter two opportunities, DES 11 and 12, have been identified but to not have clarity of data or aspirations at the time of writing, they are listed in this study but are not evaluated further.



It is worth noting that the Wirral project DES 7, Peel Land & Property (Ports) Ltd - Wirral Waters, is estimated on more known data being made available. A conservative assumption has been made in this study that approximately 33% of the fully developed out project serving the entire Wirral Waters development would be brought forward initially.

The project opportunities identified above are GIS mapped in Appendix E and include a summary description of each. An A1 hard copy and pdf version is provided with this study.

Included on the map are; estimates of energy consumption, financial return and carbon reduction potential made in tasks 2 and 3 of this study. Increased granularity of the mapping exercise for each project opportunity as part of initial heat network design should be developed at the next stage.

The following presents suggestions of SPV mechanisms judged to be appropriate for the delivery of each project opportunity and estimates of energy balance.

It should be noted that judgement of SPV appropriateness is based on cursory examination and discussions with steering group members. It is recognised that skills, resource levels, and appetite for project delivery leadership, partnering and investment of each Authority will need to be determined in detail at the next stage of project development/delivery.

Energy balance modelling using an approach commonly employed by local authorities across the UK at a similar stage to LCR members has been carried out. The model is sufficiently flexible to enable the assessment of projects where little actual data exists but where assumptions can be made based on broad project characteristics.

3.4 Project SPV Models for LCR

The following models are presented from the knowledge base of Arup and the Energy Saving Trust as typical SPV encountered in the UK and the EU.

Type 1. Council owned undertaking
A Company limited by guarantee established by a Council to invest in and deliver its objectives. Precedent: EnviroEnergy, Nottingham City Council
Type 2. Arm's-length joint venture undertaking with Council stake
An arm's-length company limited by guarantee, supported by the involvement and investment of key stakeholders. Precedent: Thameswey, Woking Council
Type 3. Social enterprise undertaking underwritten by Council support
A not-for-profit company established to deliver Council and stakeholder social and environmental objectives. Precedent: Aberdeen Heat and Power
Type 4. Private undertaking governed by partnership arrangement
A private Distributed Energy SPV instigated by the Council to invest in and develop a network. Precedent: Southampton Geothermal Heating Company, Utilicom
Type 5. Mutual undertaking underwritten by Council/stakeholders support
A mutual company or society established to deliver benefits to its heating consumers and/or wider social and environmental objectives. Precedent: Danish Distributed Energy co-operatives (e.g. Assens, Hoje Taarstrup, CTR)

Another type of organisation, the Private Finance Initiative Contract (PFI), exists but is not discussed further, as the procurement route tends to be expensive and too inflexible for the needs of community focused projects. The Barkantine scheme in London is the best-known examples of PFI-financed municipal Distributed Energy projects. However, some other form of Public Private Partnership may be appropriate, variants of Type 2.

3.4.1 LCR Project Delivery SPV Summary

The LCR steering group in conjunction with the consultants broadly examined each project in terms of their suitability to SPV type taking due account of each local authority's skills, resource levels, and the appetite for project delivery leadership, partnering and investment.

The following table presents each project against the SPV judged to be most suitable.

Sub Region Project Reference	Location & Description	Suggested SPV Type
Liverpool – DES 1	Existing properties City centre area to West of Lime Street station and East of Prince's	**Type 2 – Driven by Town Hall** (Arm's-length joint venture undertaking with Council stake

Sub Region Project Reference	Location & Description	Suggested SPV Type
	Dock	An arm's-length company limited by guarantee, supported by the involvement and investment of key stakeholders)
Liverpool – DES 2	Existing properties Royal Liverpool Hospital Trust & PFI contractor redevelopment & University of Liverpool	**Type 4 – Driven by Hospital Trust** (Private undertaking governed by partnership arrangement A private Distributed Energy SPV encouraged by the Council to invest in and develop a network)
Knowsley – DES 3	Existing and emerging new developments at Knowsley Business Park & South of Industrial Park	**Type 2 – Driven by Council ownership of business parks** (Arm's-length joint venture undertaking with Council stake - An arm's-length company limited by guarantee, supported by the involvement and investment of key stakeholders)
Sefton – DES 4	Emerging properties Development areas around Southport & Formby District General Hospital	**Type 1 or 2 - Driven by Council and Trust** (Council owned undertaking - A Company limited by guarantee established by a Council to invest in and deliver its objectives)
St Helens – DES 5	Emerging properties Area around Sutton Leisure Centre and Lea Green distribution centre	**Type 2 – Driven by Leisure Centre** (Arm's-length joint venture undertaking with Council stake - An arm's-length company limited by guarantee, supported by the involvement and investment of key stakeholders)
Halton – DES 6	Emerging properties Green-field area in Daresbury to West of A56	**Type 2 – Driven by Science Park & Residential** (Arm's-length joint venture undertaking with Council stake - An arm's-length company limited by guarantee, supported by the involvement and investment of key stakeholders)
Wirral – DES 7	Wirral Waters Regeneration Enterprise Zone (Peel Holdings) the largest regeneration project in the UK.	**Type 4 – Driven by Peel instigated/supported by Council** (Private undertaking governed by partnership arrangement - A private Distributed Energy SPV encouraged by the Council to invest in and develop a network)
Halton – DES 8	Potential regeneration Runcorn Docks	**Type 3 or 4 – Driven by Council social objectives** (Social enterprise undertaking underwritten by Council support - A not-for-profit company established to deliver Council and stakeholder social and environmental objectives)
Sefton – DES 9	EMR Gasification - large scale opportunity, Bootle Docks/	**Type 4 – Driven by EMR heat off-take instigated/supported by Council** (Private undertaking governed by partnership arrangement - A private Distributed Energy SPV encouraged by the Council to invest in and develop a network)
Liverpool – DES 10	Liverpool Waters development (Peel Holdings)	**Type 4 – Driven by Peel instigated/supported by Council / TMP** (Private undertaking governed by partnership arrangement - A private Distributed Energy SPV encouraged by the Council to invest in and develop a network)
Liverpool – DES 11	Eldonians Low Carbon CHP	**Type 5 – Mutual undertaking underwritten by Eldonians/Council/stakeholders support** (A mutual company or society established to deliver benefits to its heating consumers and/or wider social and environmental objectives.)

Sub Region Project Reference	Location & Description	Suggested SPV Type
Knowsley – DES 12	Jaguar Cars Ltd	**Type 4 – Driven by Jaguar instigated/supported by Council / TMP** (Private undertaking governed by partnership arrangement - A private Distributed Energy SPV encouraged by the Council / TMP to invest in and develop a network)

Of the 12 projects identified in the task 2 refinement exercise the following table presents their grouping according to the possible project SPV type:

Suitable SPV Delivery	LCR Project Nominal Quantity✳
Type 1. Council owned undertaking	1
Type 2. Arm's-length joint venture undertaking with Council stake	3
Type 3. Social enterprise undertaking underwritten by Council support	3
Type 4. Private undertaking governed by partnership arrangement	5
Type 5. Mutual undertaking underwritten by Council/stakeholders support	1

✳Nominal Quantity : A number of projects are identified as being potentially delivered by one of two SPV types, to be expected at this stage of assessment.

It can be said that given the present economic climate it is not surprising that only one project could be considered to fall into the type 1 'Council owned undertaking' category.

The vast majority of projects captured by the steering group and consultant in collaboration are those projects being brought forward by a private sector partner. However, as already highlighted in task 1 of this study it is of paramount importance for Local Authorities to take a lead role in encouraging the projects, shaping the delivery requirements, assisting the funding process and taking a role in the delivery and operating arrangements of the SPV.

3.5 Refined options appraisal

It is a premise of this study and is indeed best practice when undertaking such an exercise that in order to determine whether an envisaged project delivery mechanism the financial and commercial characteristics must be understood.

The first step in developing project financial and commercial characteristics is to estimate the energy balance of a development where data is available. However, the energy balance along with the technology options appraisal should not be underestimated, it can be a significant undertaking dependent on the stage of the planned development; the earlier the stage the greater the number of desired options there may be, the later the stage that more precision is likely to be needed.

For the identified shortlisted projects the following table presents the estimated energy balance of each. This simple but effective refinement estimate is judged to

provide sufficient robustness considering the context of the study and stage of development of the projects in question.

The operational energy data has been derived by relating previously identified CHP plant capacities to rules of thumb of scheme data characteristics. Appendix F presents the model and its assumptions. Independent of fuel type assumptions which are discussed in task 3, this approach calculates the relative annual operational energy balance depending on development type and mix for a given CHP capacity. A key element of the operational data is the derivation of the scheme annual heat generation provided by both CHP plant and standby and supplementary boiler.

Results are presented in task 3 section 4 of this study, taking the estimate of scheme heat generation and by making a simple visual estimate of the length of heat distribution network using mapped areas, rules of thumb are then used to determine the heat carrying capacity for different pipework diameters of heat network.

From this estimate of heat network along with CHP plant characteristics, electricity consumption assumptions and financial assumptions the outline commercial case can be developed to substantiate whether the SPV of choice is a pragmatic one.

Sub Region Project Ref	Project Ref	CHP thermal capacity (MWth)*	Heat consumption (MWh)	Electricity Consumption (MWh)	Heat network length (m)
Liverpool – DES 1	City centre West	3.3	30,783	9,281	3,000
Liverpool – DES 2	RLHT & UoL	3.85	38,194	10,828	3,500
Knowsley – DES 3	KIP & South	9.9	108,035	27,843	9,000
Sefton – DES 4	Southport & Formby DGH	1.65	15,391	4,640	1,500
St Helens – DES 5	Sutton Leisure & Lea Green	0.55	5,456	1,546	500
Halton – DES 6	Daresbury	0.66	6,156	1,856	600
Wirral – DES 7	Wirral Waters	7.7	71,828	21,656	7,000
Halton – DES 8	Runcorn Docks	0.55	8,593	1,546	500
Sefton – DES 9	Bootle Docks	WiP	WiP	WiP	WiP
Liverpool – DES 10	Liverpool Waters	WiP	WiP	WiP	WiP
Liverpool – DES 11	Eldonians	WiP	WiP	WiP	WiP
Knowsley – DES 12	Jaguar	WiP	WiP	WiP	WiP
		28.16	284,436	79,196	25,600

* MWth refers to Megawatt hours of thermal output capacity. Heat output rather than electrical capacity is used for the reason that projects are predicated on heat network development. Electrical consumption is estimated from assumed thermal efficiency of power generation technology, reference Appendix F.

The sum total of the technical analysis of these projects estimates that low and zero carbon energy consumption amounting to over 280,000MWh of heat and 79,000MWh of electricity could be served, excluding adjacent expansion opportunities. This estimate is based on the concept of resilient heat and power generation by low and zero carbon energy centres utilising a combination of renewable and conventional fuels. Electricity generation would connect to the local distribution network; heat would be distributed by around 25km of transmission and primary distribution heat network.

It is to be expected for projects of scale such as those identified to be developed over a phasing programme of many years. Anything from 5 to 20 years can be expected from the point of breaking ground. There will be financial implications of extended phasing programmes to be described in the following task 3 section.

4 Task 3 - LCR Delivery Vehicle Assessment

4.1 Summary

It has been stated that for successful energy project delivery mechanisms on the terms desired by LCR local authorities it is advisable for project prospects to be fully understood before progressing towards delivery of the projects.

Experience of the consultants and the market in general brings with it the lessons learnt that projects can succeed or fail for a range of reasons. Primarily technical and commercial reality often falls short of local authority aspirations.

Understanding the potential for technical and commercial delivery is of paramount importance when considering partnering or private enterprise concessions to finance and deliver projects.

On this basis Authority understanding is developed by establishing project financial magnitude, risk and responsibility levels that influence the commercial opportunity and help to arrive at a preferred delivery vehicle or SPV mechanism.

Figure 10 : Task 3 LCR Delivery Vehicles - Route to a Successful LCR Energy Infrastructure Delivery

This study has focused attention on 12 of the low and zero carbon energy infrastructure project opportunities across the LCR, which are spread across all local authorities of the LCR.

As presented in task 2 section 3 of this study, the sum total low and zero carbon energy could potentially amount to over 280million MWh of heat and 79million MWh of electricity.

This section of the study (task 3) presents the financial estimate of the identified projects, excluding adjacent expansion opportunities. The capital cost of these projects is estimated to exceed £200million, the internal rate of return on this investment from modelled net cash flow analysis at a discount factor of 7.5% is anticipated to be between 7% and 10%.

It is the consultants view that the levels of investment return identified present commercial attractiveness to the private sector investor/SPV partner. Considering the early stage of project analysis the conservative model assumptions are viewed to present an appropriately robust forecast of return, i.e. tariffs are not overly optimistic and risks have not been ignored.

Clearly the modelled technical and commercial project outcomes are sensitive to a range of variables; this is to be expected given the resolution of available data and the stage of the study. However, it is the experience of the consultant that the results are comparable to those commonly encountered for urban heat network focused distributed energy infrastructure at similar stages of development.

More detailed feasibility assessments is essential and should focus efforts on; acquiring better project data sets, generating project data sets where necessary, and examining project sensitivities related to optimising return on investment, energy efficiency and CO_2 reduction.

It should be noted that assumptions have been made in this study, informed by intelligence and knowledge of project delivery, which go some way towards optimising for return on investment sensitivities to technology and CO_2 reduction.

However, by far the greatest sensitivity at this stage relates to the accuracy of available project building characteristics and energy data. Attempting to optimise at this stage for technology selection is considered to be premature.

The output of task 3 presents; SPV business plan options, identified risks and suggested Authority responsibilities.

4.2 Introduction

For the projects identified and shortlisted in task 2 it is the objective of task 3 to; examine the shortlisted projects to a first pass level of financial detail.

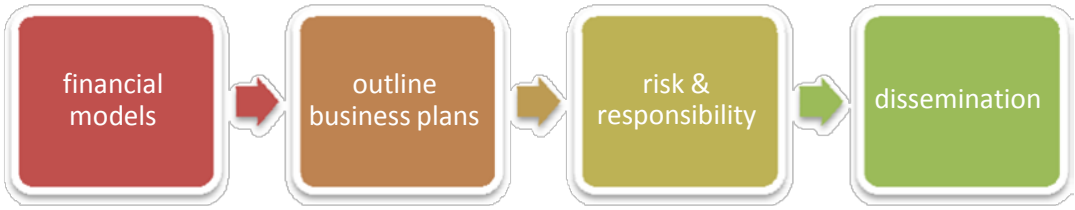


Figure 11: Task 3 Delivery Vehicle Assessment Study Process

This is done for each project by taking the modelled energy balance estimates and developing the financial model using fundamental parameters of cost and return. Each project is presented as a discrete model, and where appropriate are grouped where geographical synergies are apparent whether within the area of a single local authority or across boundaries.

Outline business plan(s) are derived to illustrate the commercial opportunities. Business plans are presented graphically and discussed in terms of the transactions determined in the financial analysis of this section.

For each project business plan risks and responsibilities are summarised. To assist in the understanding of delivery mechanism development, Service level Agreement (SLA) priorities are discussed along with typical contract Heads of Terms to illustrate the contractual relationship needs between delivery partners.

The findings of the study presented to a selected LCR audience and other interested parties at a presentation and workshop event. Included in this event was a soft market test of the identified projects with invited ESCo and Utility

companies offering specialist energy development investment and operational services.

4.3 Financial analysis

The modelling exercise for each project is presented in Appendix F. The following table provides a summary of the financial elements for discussions.

Sub Region Project Ref	Project Ref	Capital cost (£)	SPV Net Cash flow (£/year)	SPB (years)	NPV (7.5% discount rate)	IRR	CO_2 Saved (Tonnes / year)
Liverpool – DES 1	City centre West	£26,000,000	£2,200,000	12.2	£1,200,000	8%	14,000
Liverpool – DES 2	RLHT & UoL	£25,000,000	£2,600,000	9.5	£8,000,000	11%	16,000
Knowsley – DES 3	KIP & South	£68,000,000	£6,700,000	10.1	£16,800,000	10%	42,000
Sefton – DES 4	Southport & Formby DGH	£11,000,000	£1,100,000	10.5	£2,300,000	10%	7,000
St Helens – DES 5	Sutton Leisure & Lea Green	£3,000,000	£400,000	9.2	£1,200,000	12%	2,000
Halton – DES 6	Daresbury	£5,000,000	£400,000	10.7	£800,000	10%	3,000
Wirral – DES 7	Wirral Waters	£57,000,000	£5,100,000	11.3	£7,300,000	9%	33,000
Halton – DES 8	Runcorn Docks	£6,000,000	£500,000	11.7	£500,000	9%	2,000
Sefton – DES 9	Bootle Docks	WiP	WiP	WiP	WiP	WiP	WiP
Liverpool – DES 10	Liverpool Waters	WiP	WiP	WiP	WiP	WiP	WiP
Liverpool – DES 11	Eldonians	WiP	WiP	WiP	WiP	WiP	WiP
Knowsley – DES 12	Jaguar	WiP	WiP	WiP	WiP	WiP	WiP
		£201,000,000				**Avg 10%**	**119,000**

The table shows the financial estimate of the identified projects, excluding adjacent expansion opportunities.

The capital cost estimates of the projects range from £3million to £68million, across the LCR in total the project capital is estimated to exceed £200million, the internal rate of return on this investment from modelled net cash flow analysis at a discount factor of 7.5% is anticipated to be between 8% and 12% with an average of 10%.

It is important to note that end of life replacement costs are not included in this assessment.

Key to these estimates are a set of model assumptions presented in appendix F pertaining to the achievement of a balance between commercial viability and CO_2 reduction performance. Presently the assumption is that CO_2 reduction is the driving force behind the LCR local authority aspiration to deliver energy infrastructure projects.

On this basis the largest CO_2 reduction potential is achieved by off-setting otherwise carbon rich conventional electricity. The 'prime mover' technology selected is therefore a generic form of biomass CHP. Mindful however of the need for commercially deliverable projects supplementary boiler plant is assumed to be natural gas fired.

While the incentive mechanisms of Renewable Obligation (RO) and Renewable Heat Incentive (RHI) are included in the model, including the value of CO_2 on the UK Carbon market is not felt to be an appropriate level of inclusion at this stage.

Successful project delivery sensitivities to a range of parameters are discussed below and an example of sensitivity to fuel/technology is presented for comparison.

4.3.1 Model Sensitivities

Commercial viability of long term performance based energy infrastructure projects is sensitive to a wide range of technical, financial and market force variables. Without an understanding of these variables either by consideration or analysis there will be investment uncertainty and risk. It is apparent from the list below that some sensitivity will remain during the lifetime of a project. These ongoing variables form key components of service level agreements discussed later in this study.

Project Sensitivity
Typology and mix proportions – preferable mix of regeneration/existing consumer across residential, commercial and public buildings
Heat density – selection of concentrated areas of energy demand through mapping and identification of large anchor loads.
Heat distribution network design – planning of optimal routes from energy centre to connected consumers taking account of future expansion prospects while optimising network diameters and pressure drop for capital and running cost.
Energy centre and network roll-out programme – influenced by building refurbishment / construction programme and relative proximity of phased development.
Project renewable/carbon planning – Local Development Framework (LDF) aspirations, planning conditions and evolving energy performance regulations.
Quality of energy data – Reliable actual data of heat and power consumption, new development demand profiling, projection forecasts.
Technology and fuel selection – Pragmatic, robust, efficient and proven technology, sustainable and high quality fuel supplies and storage facilities where appropriate. Design configuration for CO_2 v commercial viability optimisation, interaction and compatibility of technologies; e.g. gas and biomass, CHP and boilers, solar thermal and heat pumps, photovoltaics.

Fuel and power tariffs - Existing and projected tariffs, influence of evolving incentives, e.g. ROC, FiTs and RHI.

A simple illustration of the sensitivity of CO_2 and investment return is provided in the table below. The model has been re-run for gas fired CHP with 90% of supplementary heat supplied by biomass boilers.

Sub Region Project Ref	Project Ref	Presented case (biomass CHP with gas boilers)		Sensitivity example (gas CHP with biomass boilers)	
		IRR	CO_2 (Tonnes / year)	IRR	CO_2 (Tonnes / year)
Liverpool – DES 1	City centre West	8%	14,000	10%	7,000
Liverpool – DES 2	RLHT & UoL	11%	16,000	16%	9,000
Knowsley – DES 3	KIP & South	10%	42,000	15%	24,000
Sefton – DES 4	Southport & Formby DGH	10%	7,000	12%	4,000
St Helens – DES 5	Sutton Leisure & Lea Green	12%	2,000	12%	1,000
Halton – DES 6	Daresbury	10%	3,000	10%	1,000
Wirral – DES 7	Wirral Waters	9%	33,000	12%	17,000
Halton – DES 8	Runcorn Docks	9%	2,000	8%	2,000
Sefton – DES 9	Bootle Docks	WiP	WiP	WiP	WiP
Liverpool – DES 10	Liverpool Waters	WiP	WiP	WiP	WiP
Liverpool – DES 11	Eldonians	WiP	WiP	WiP	WiP
Knowsley – DES 12	Jaguar	WiP	WiP	WiP	WiP

The table generally illustrates that sacrificing CO_2 reduction potential in favour of lower capital technology (gas CHP with 90% of supplementary heat provided by biomass boilers) provides a greater returns on investment.

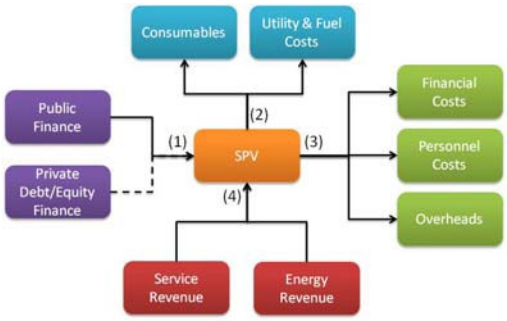
However, the exception to the rule can be seen for projects DES 5 and DES 6 which show little difference in economic viability for the fuel and technology cases. This can be ascribed to the fact or assumption that in comparison with the other projects they are small in capacity and have small heat networks, it demonstrates the need to optimise projects for high heat density to minimise network cost. Thus, aiming for a high ratio of heat consumption to heat network length is a good development benchmark.

Assumptions used in the modelling exercise are presented in Appendix F, they illustrate key components of sensitivity assessment. The modelling exercise carried out at this stage is relatively coarse; e.g. 50% of electricity generated is assumed to be consumed by the local authority/connected consumers with 50% assumed to be exported, all heat is assumed to be useful and sold at a competitive average market rate with conventional fuels after efficiency losses.

At this outline assessment of opportunities it is appropriate to illustrate project sensitivity and its effects on technical and financial viability. However, it is more appropriate to carry out sensitivity analysis during the detailed feasibility stage of projects.

4.4 Indicative business plans

The following table presents the key transactions modelled in this assessment. Relating each key financial transaction to each project is helped by considering the transaction diagram reproduced from figure 5 in section 2 of this study.



The diagram transactions demoted (1) to (4) are itemised in the table.

Sub Region Project Reference	Location & Description	Suggested SPV Type	Estimated SPV main annual transactions
Liverpool – DES 1	City centre West	Type 2 – Driven by Town Hall - **Arm's-length joint venture undertaking with Council stake**	(1). £26,000,000 Capital cost (2). £2,845,000 Fuel cost (3). £315,000 Operation and maintenance cost (4). £4,330,000 Revenue
Liverpool – DES 2	RLHT & UoL	Type 4 – Driven by Hospital Trust - **Private undertaking governed by partnership arrangement**	(1). £25,000,000 Capital cost (2). £3,400,000 Fuel Cost (3). £371,000 Operation and maintenance cost (4). £5,000,000 Revenue
Knowsley – DES 3	KIP & South	Type 2 – Driven by Council ownership of business parks **-Arm's-length joint venture undertaking with Council stake**	(1). £68,000,000 Capital cost (2). £9,561,000 Fuel cost (3). £952,000 Operation & maintenance cost (4). £12,890,000 Revenue
Sefton – DES 4	Southport & Formby DGH	Type 1 or 2 - Driven by Council and Trust - **Council owned undertaking**	(1). £11,000,000 Capital cost (2). £1,422,000 Fuel cost (3). £156,000 Operation & maintenance cost (4). £2,000,000 Revenue
St Helens – DES 5	Sutton Leisure & Lea Green	Type 2 – Driven by Leisure Centre - **Arm's-length joint venture undertaking with Council stake**	(1). £3,000,000 Capital cost (2). £484,000 Fuel cost (3). £53,000 Operation & maintenance cost (4). £700,000 Revenue
Halton – DES 6	Daresbury	Type 2 – Driven by Science Park & Residential - **Arm's-length joint venture undertaking with Council stake**	(1). £5,000,000 Capital cost (2). £570,000 Fuel cost (3). £63,000 Operation & maintenance cost (4). £840,000 Revenue

Sub Region Project Reference	Location & Description	Suggested SPV Type	Estimated SPV main annual transactions
Wirral – DES 7	Wirral Waters	**Type 4 – Driven by Peel supported by Council - Pivate undertaking governed by partnership arrangement**	(1). £57,000,000 Capital cost (2). £6,640,000 Fuel cost (3). £730,000 Operation & maintenance cost (4). £9,800,000 Revenue
Halton – DES 8	Runcorn Docks	**Type 3 or 4 – Driven by Council social objectives - Social enterprise undertaking underwritten by Council support**	(1). £6,000,000 Capital cost (2). £590,000 Fuel cost (3). £62,000 Operation & maintenance cost (4). £800,000 Revenue
Sefton – DES 9	Bootle Docks	**Type 4 – Driven by EMR heat off-take supported by Council - Private undertaking governed by partnership arrangement**	Work in Progress
Liverpool – DES 10	Liverpool Waters	**Type 4 – Driven by Peel supported by Council / MEAS / TMP - Private undertaking governed by partnership arrangement**	Work in Progress
Liverpool – DES 11	Eldonians	**Type 5 – Mutual undertaking underwritten by Eldonians/Council/stakeholders support - A mutual company or society established to deliver benefits to consumers**	Work in Progress
Knowsley – DES 12	**Jaguar**	**Type 4 – Driven by Jaguar supported by Council / MEAS / TMP - Private undertaking governed by partnership arrangement**	Work in Progress

The financial analysis carried out provides an early stage assessment of the business case of each LCR project opportunity. Appendix F presents modelled assumptions for the significant number of variables included in this early stage appraisal. It should be noted however that at the more detailed stage of assessment the refinement of these variables and consideration of further variables need to be taken into account. Not least of these are; fixed and variable elements of tariffs and operating costs, administration costs and debt finance payment, etc, all relate to the transaction groupings (1) to (4) of the flow diagram presented.

There are clear benefit to both LCR Local authorities in terms of achieving CO_2 reduction and consumers of the energy generation of the projects in terms of energy supply resilience and cost competitiveness.

The analysis shows there to be robust business case propositions for investment in all of the LCR projects. It is the consultant's experience of infrastructure performance based investments and a view appropriate to the LCR projects that

investment will be required from both the private sector, whether specialist delivery partners or debt financiers, and from public sector finance mechanisms.

It is a characteristic of energy performance based infrastructure development that a mix of funding mechanisms be employed. The following describes some of these mechanisms.

4.5 Development and capital funding

Local Authority entry into the Covenant of Mayors and the formation of a Sustainable Energy Action Plan (SEAP) is recognised as being a key part of the diligence process required to have been undertaken in order to attract public finance. The LCR recognises this and has taken a pro-active step by commissioning a framework for a SEAP to take forward the SPV business cases presented by the study.

There will be considerable development costs in delivering the desired energy infrastructure projects. These costs are presently not included in the financial cases of this study. However, European Investment Bank (EIB) grant funding of development costs is available through the ELENA technical assistance facility **(European Local ENergy Assistance)**[9]**.**

There will be development cost economies of scale should LCR local authorities act multilaterally in carrying forward the selected projects simultaneously.

Notwithstanding the benefits presented in this business case, it is important to reflect that this assessment is at the options appraisal pre-feasibility stage. There are modelling refinements to be carried out and significant technical analyses to be undertaken. Employing assistance funding streams such as ELENA should be used to take forward the delivery programme including carrying out detailed feasibility studies.

Capital funding of energy infrastructure is also available to meet programme defined objectives. The following provides some insight into the streams offered by the EIB and others, the LCR are strongly urged to make use of these programmes at the appropriate time:

European Energy Efficiency Facility (EEE-F)

Overview

- Spend = €205million – available since May 2011
- Support = new finance instrument for providing technical assistance and investment in energy efficiency and renewable energy projects.

[9] ELENA support covers a share of the cost for technical support that is necessary to prepare, implement and finance the investment programme, such as feasibility and market studies, structuring of programmes, business plans, energy audits, preparation for tendering procedures - in short, everything necessary to make cities' and regions' sustainable energy projects ready for EIB funding.
http://www.eib.org/products/technical_assistance/elena/index.htm

- Mechanism = investment vehicle
- Fund manager = Deutsche Bank

Criteria

- minimum of 20% primary energy saving (higher for building sector)
- Technologies = must use proven technologies
- Payback = 2-5 years

General

- Difference to ELENA - EEE-F investment vehicle whereas ELENA project preparation
- EEE-F could be used alongside ELENA.
- Fund should be used to enhance the role of ESCos providing guaranteed energy savings
- Aims to encourage biomass technologies

ICLEI (European Commission) Smartcities

Overview

- Spend = €75million
- Support = cities deliver pioneering measures for 40% GHG emissions reduction via sustainable energy use & production by 2020.
- Public consultation closed = 13 May 2011
- Launch conference = 21 June 2011

Criteria

- Duration = Project should last around 3 years
- Definition of 'cities' as yet unclear, expected to include urban realm, Cities and Towns
- Other cities = At least 3 cities participating in joint application.
- Level = EU-co financing between 75-100%.
- Focus of energy projects = buildings, networks, energy supply technologies and the integrative management of energy flows favoured.

General

- EC seeks close link with ELENA and the European Energy Efficiency Facility (EEE–F)

4.6 Development Agreements

The energy services industry is a maturing market, Good practice guidance 'GPG377 – Guide to procurement of energy services for community heat and power', provides an excellent reference with examples of project Development Agreements. Arup have significant experience of modifying this general form to suit the project, business plan and client commercial involvement ambitions.

The LCR projects will require draft agreements to be prepared along with output specifications at the outline design stage of a project in order to capture local authority ambitions and ensure projects are progressed legally. It is understood that the LCR local authorities would seek to transfer the vast majority of risk to the private sector where possible while maintaining a high degree of governance for the long term benefit of the community. This is ideally done via a SPV employing an ESCo partner.

The Development Agreement for the LCR projects will be the main legal instrument around which the parties of the SPV are engaged to develop the projects. It will contain all the provisions relating to the development, design, construction and operation of the project.

The LCR agreements would legislate for the division of responsibility at each stage of the project, describe how the risks are divided and details the payments to be made by the project consumers to the SPV in return for energy services and potentially capital provided by the SPV ESCo partner.

The Development Agreement will have as appendices an Output Specification and other relevant drawings and schedules of work, details of insurances, performance requirements, equipment or prices as will be necessary. The LCR energy projects are likely to be developed by two primary parties, the ESCo through the SPV and to a varying degree by the local authorities offering the project concessions.

However, there are examples of schemes having several contracting authorities, acting as a purchasing consortium, the ODA and Stratford City are an example, although generally speaking, a single project Development Agreement can still be used and will simplify the procurement process significantly.

A draft Project Agreement or Heads of Terms will generally be included with an Invitation to Negotiate, allowing the ESCo to understand particular issues such as the level of risk, which they are required to accept, and any requirements which are unusual or specific to the particular project. Much of a Development Agreement will be similar in form to a PPP contract or conventional Facilities Management service contract.

4.6.1 Heads of terms

Draft Heads of Terms should be developed at the earliest opportunity and ESCo partner views sort at the Invitation to Negotiate stage, they are not legally binding.

The LCR projects are required to be developed to an outline feasibility stage typically at which point Heads of Terms may be formed more specifically.

The following headings are typical of Heads of Terms for an energy services contract; a concise description of the project particulars would follow each heading:

1. Definitions and interpretations
2. Status of the Heads of Terms (principal commercial intent of the HoTs)
3. Roles and responsibilities (see section 4.6.2)
4. Physical assets (energy centres, distribution networks, consumer connections, etc)
5. Specific obligations of the ESCo Partner (site operating procedures, system performance, service level agreement)
6. Specific obligations of other development partners (property developers, utilities etc)
7. Funding and revenue (capital investments, loans, grants, energy sale revenues, operating revenues, revenue recycling etc)
8. SPV incorporation
9. Project documents
10. Timeline programme
11. Additional services

4.6.2 Delivery risk and responsibilities

The management of risk is essential in all projects. It is necessary to minimise exposure to risk all the way through the project development process to ensure the desired outcome. A risk matrix assists in identifying, understanding and assigning responsibility of risks to enable them to be managed during the project development and in operation. The following provides an example[10] illustration of such a risk and responsibility matrix:

Risks	SPV service partner	Shared	Local Authority
Engineering design	✓		
Capital cost over-run	✓		
Time to completion	✓		
Failure to meet output specification	✓		
Failure of plant	✓		
Long term plant replacement	✓		

[10] GPG377 – Guide to procurement of energy services for community heat and power.

Insurances	✓		
Non payment by domestic consumers			✓
Non payment by non-domestic consumers	✓		
Damage to property		✓	
Force majeure event		✓	
Operating costs	✓		
Plant efficiency/performance	✓		
Variations in national fuel prices			✓
Changes of law		✓	
Health and safety	✓		
Reduction in occupancy		✓	
Project development change of priority		✓	
Market economic shift		✓	

It is usual to include a structure diagram within the roles and responsibility section of the Heads of Terms similar to the transaction diagram provided in section 2 to illustrate the roles of the SPV partners.

4.7 LCR SPV Models

Developed from consideration of the projects and expressed LCR local authority appetite the following outline SPV models are recommended as being appropriate.

4.7.1 Local Authority Project SPV

For projects whereby the local authority is the primary instigator and delivery party and financer, at least initially, i.e. until refinancing after a period of project de-risking, the following SPV model is presented.

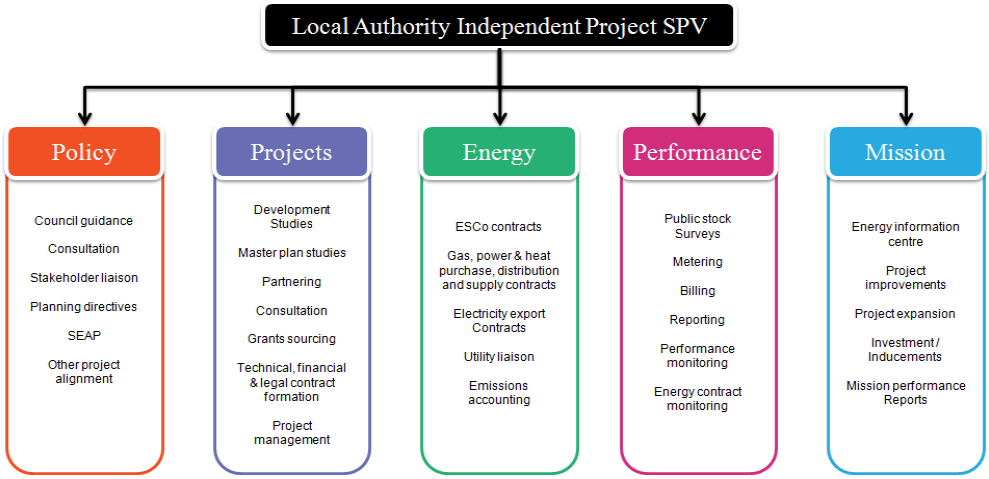


Figure 12: Local Authority Independent Project SPV

In this model the only private sector contractual arrangements would potentially include debt finance and operating ESCo businesses. All other responsibilities would be down to the local authority SPV.

This sort of model would be suitable for relatively modest capital projects and those consisting of mainly public sector consumers with limited roll-out complexity.

This approach to relatively low risk projects would enable local authorities to capitalise on secure long term revenue stream. The SPV setup could take the form of a straightforward limited company, could be a not-for-profit organisation or a cooperative arrangements with public tenants and other community groups.

4.7.2 LCR Umbrella SPV

For project where investments are relatively large, have long time frame roll out and where private sector development is a key feature, more complex arrangements will prevail. For such project there is likely to be a low appetite for risk and expectation of revenue earning opportunities, at least during the outset of a projects development.

In this situation ensuring local authority involvement in the governance of a project to meet economic regeneration, carbon saving and spin off social ambitions should be the priority.

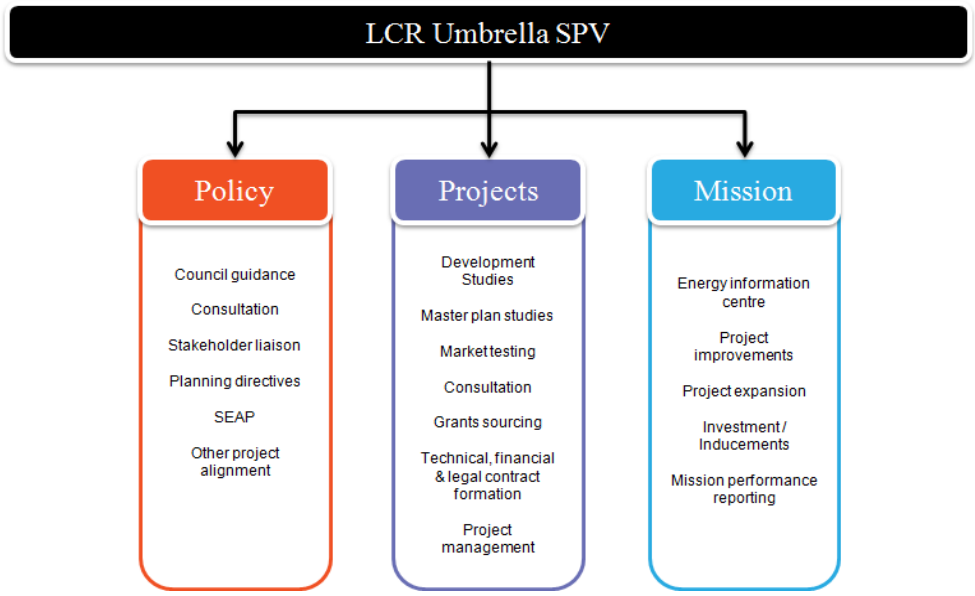


Figure 13: LCR Umbrella SPV

In this model the key feature is that the LCR local authorities take the leadership role on instigating the delivery concept. This role would be designed to enable numerous projects to flourish across the LCR. This serve to provide the governance structure and project evidence required to make the most of public sector development and capital funding mechanisms such as ELENA, CIL, Allowable Solutions, etc.

The figure below illustrates how subsequent projects can be delivered as individual contracts tailored to the particulars of each development. There is nothing preventing this arrangement being adopted by each local authority.

However, if undertaken as an LCR initiative serving all local authorities across the city region will provide economies of scale. In particularly such an approach forms a key outcome of the SEAP initiative and provides the basic terms of administration and governance. The SEAP relationship and LCR collective approach will have particular administrative economies of scale when it comes to applying for EU and EIB funding.

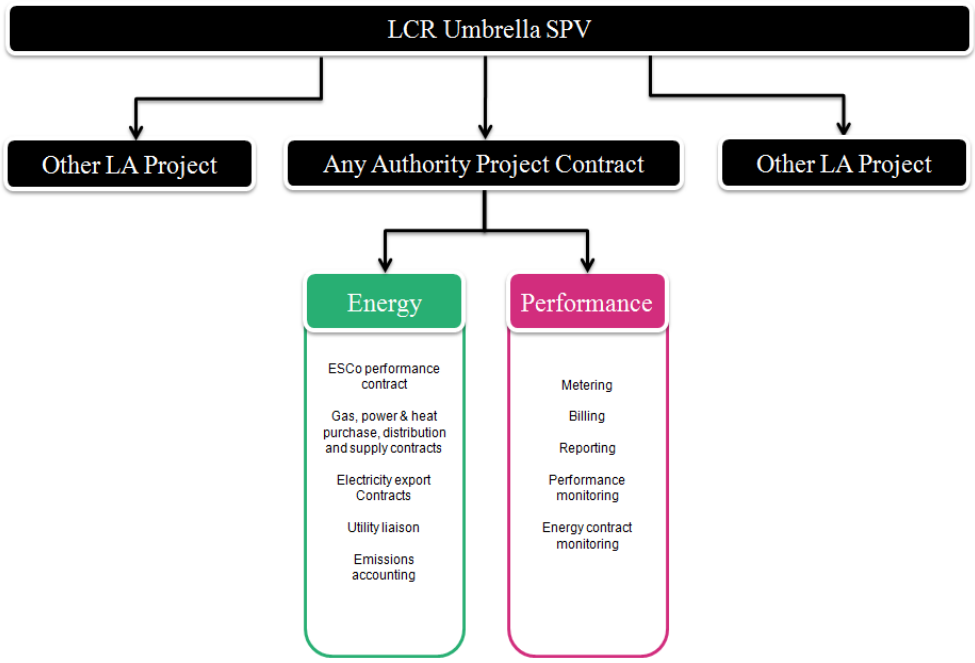


Figure 14: Expanded Umbrella SPV illustrating multiple project delivery

This sort of model would be suitable for relatively large capital projects, those consisting of a mixture of private and public sector consumers and projects with relatively long roll-out complexity. In particular it provides a structure to cater for projects with inter-relationships across local authority boundaries.

This approach to relatively high risk projects enables local authorities to set the agenda for what can be long term lucrative concessions to private sector partners. The project contracts could take the form of simple operating contracts, socially driven not-for-profit or even cooperative arrangements to more involved limited company joint venture SPVs.

5 Conclusions and Recommendations

The conclusions and recommendations of this study can be summarised as a series of next steps to be undertaken by the LCR local authorities individually or collectively built on the outline business case developed, these are:

1. Establish local authority project champions at Director level and a Task Group to communicate the mutual actions required by involved participating departments to deliver projects.

2. Agree the SPV business case and preferred model and communicate this to LCR champions through a clear plan of co-ordinated LCR funding applications for large scale investment programme.

3. Agree chronological order of application for EU and other funding streams and engage with these funding bodies through the Task Group.
   - Seek funding support for LCR champion(s) to attend and instigate events across public and private sectors to present, promote and seek knowledge transfer for the benefit of the LCR project SPV development.

4. Reinforce confidence of local authorities by identifying and using best practice from around the UK and other countries.

5. Progress soft market testing of private sector partners and specialist energy services providers to establish memorandum of understanding.

6. Use remaining CCSF fund and other funding streams to carryout:
   - Initial project feasibility / design to include increased GIS granularity and heat network layout
   - Take the business cases developed in this study to the next stage through detailed technical/economic feasibility study.

7. Include reference of projects in Local Development Frameworks, e.g. in Core Strategy policies and potentially allocation Development Policy Documents (DPDs). Notwithstanding other windfall projects and Stage 2 Renewable Study projects coming to the fore.
   - Local planning authorities to clearly set out how they will determine planning applications for energy infrastructure and have the resources to deliver decisions to time.
   - Optimise available resources for planning authorities by developing clear policies to avoid unnecessary delays.

8. Keep the process ‘live’ by clarifying other opportunities to build-on/incorporate initiatives into SPV delivery model(s).

9. Prepare a Sustainable Energy Action Plan (SEAP) for LCR • Use the SEAP to draw the opportunities together as part of a wider programme and the CCSF objectives of energy infrastructure delivery.

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Glossary

ALMO – Arms Length Management Company

CCSF – Climate Change Skills Fund

CERT – Carbon Emissions Reduction Target

CEM – Contract Energy Management

CESP – Communtiy Energy Savings Programme

CIL – Community Infrastructure Levy

CIPFA – Chartered Institute of Public Finance and Accountancy

CHP – Combined Heat and Power

CRC – Carbon reduction Commitment

D&B – Design and Build

DBFO – Design, Build, Finance and Operate

DECC – Department of Energy and Climate Change

DETR – Department of Enterprise and Transport in the Regions

DH – District Heating

DNO – Distribution Network Operator

DPDs – Development Planning Documents

ERDF – European Reconstruction and Development Fund

EEE-F – European Investment Bank, European Energy Efficiency Facility fund

EfW – Energy from Waste

EIA – Environmental Impact Assessment

EIB – European Investment Bank

ELENA - European Investment Bank, European Local ENergy Assistance fund

ESCo – Energy Service Company

FiT – Feed in Tariff

GIS – Geographical Information System

ICLEI (European Commission) Smartcities

IRR – Internal Rate of Return

km – Kilometres

kW – Kilowatts

LA – Local Authority

LDF – Local Development Framework

LEP – London Energy partnership

MBT – Micro-Biological Treatment

MEAS – Merseyside Environmental Advisory Service

MW – Megawatts

MWDA – Merseyside Waste Disposal Authority

MWe – Megawatts (electrical capacity)

MWh – Megawatt-hours

MWth – Megawatts (thermal output capacity)

NPV – Net Present Value

ODA – Olympic Delivery Authority

OJEU – Official Journal of the European Union

PFI – Private Finance Initiative

PPP – Public Private Partnership

PV - Photovoltaics

REECH - Renewable Energy and Energy Efficiency in Housing

RHI – Renewable Heat Incentive

RO –Renewables Obligation

ROC – Renewable Obligation Certificate

RSL – Registered Social Landlord

SCDL – Stratford City Development Limited

SEAP – Sustainable Energy Action Plan

SGHC – Southampton Geothermal Heating Company

SLA – Service Level Agreement

SPB – Simple Payback

SPV – Special purpose vehicle

SRF – Solid Recoverable Fuel

SSE – Scottish and Southern Energy

STP – Specialist Technology Provider

UDF – Urban Development Fund

Appendix A

Special Purpose Vehicle Project Examples

A1 Scheme Operators

The table below outlines a number of projects within the UK previously developed as part of which a range of SPV models have been adopted.

Scheme - Operator	Date Founded (approx.)	Residential Customers
Olympic Park & Stratford City – ODA & SCDL (Cofely)	2008	10,000+
Nottingham – EnviroEenergy Ltd	1970	4,600
Leicester -Leicester City Council	1960	3,500
Slough Estate - Slough Heat and Power Ltd (SSE)	1980	3,000
Pimlico – Pimlico District Heating Undertaking	1950	3,000
Sheffield - Veolia Environmental Services Ltd	1988	2,800
Barbican - Citigen (London) Ltd (E.on)	1993	2,000
Byker - Newcastle City Council, Your Homes Newcastle	1979	1,800
Aberdeen – Aberdeen Heat & Power Co Ltd	2003	1,000
Lerwick - Shetland Heat and Power Ltd	1998	840
Wick - Caithness Heat and Power Ltd	2006	600
Falkirk – Falkirk District Council	2005	500
Southampton - SGHC Ltd (Cofely)	1987	500
Woking - Thameswey Energy and Xergi	1992	400
Tower Hamlets – Barkantine Heat & Power Company (EDF)	2001	350
Cranberry – Newham Borough Council	2005	330
Milton Keynes – Thameswey Energy	2006	300
Barnsley - Barnsley District Council	2005	200
Glenshellach, Oban - Argyll Council	2006	40
Birmingham - B'ham District Energy Co Ltd (Cofely)	2007	20

A2 Additional Notes

The notes below provide additional details on a range of the projects outlined in the table above.

It should be noted that the information provided has been collected from a range of sources and as such Arup provides no responsibility for the reliability or accuracy of the information presented.

Aberdeen: Aberdeen Heat and Power Ltd currently supplies heat and power to three estates. This includes, Stockethill: 288 homes, Hazlehead: 200 homes including a local academy and swimming pool, Seaton: 500 homes. Capital funding has come from a number of sources including Aberdeen Council, Scottish Government and the Energy Savings Trust community heating scheme.

Barnsley: Owned and operated by Barnsley District Council. There is currently one 320kW and one 150kW woodchip boiler producing heat for 166 flats. Funding totals £1.7m, and has been provided by South Yorkshire Forest Partnership, Yorkshire Forward, Energy Savings Trust and the DTI's Bio-Energy Grant Scheme.

Birmingham: owned and operated by Utilicom (Cofely), the first phase of this scheme is only 1.5MW and serves a hotel and conference centre. Unusual in that it relied only on a long term supply contract, with no subsidy.

Byker: this scheme was founded in 1979 and is currently owned and operated by Newcastle City Council and Your Homes Newcastle. Byker heat station utilises a natural gas-fired CHP engine equal to 1.16MWth. The scheme currently supplies heat to 1,840 dwellings.

Central Milton Keynes: Utilises a natural gas CHP engine with an electrical output of 3.2MW and 3.0MW of heat. The scheme currently connects 307 apartments, offices and hotels and is operated by Thameswey.

Citigen (London) Ltd: two natural gas CHP engines producing 28 MWth provide heat and cooling for the Barbican estate and offices. Sponsored by the City of London Corporation and now wholly owned by E.on.

Cranberry, Newham: The Cranberry estate was constructed in the mid 1980s and consists of a mixture of social housing and private dwellings. The social housing is all electrically heated while the private housing has a mixture of electric and gas heating. A Community Energy system sized at 530kWe of gas fired CHP to provide 100% of the heat load within the estate serving 330 dwellings and that of the two schools.

Falkirk: This scheme is owned and operated in partnership between Falkirk Council and Housing & Social Work Services. The scheme provides heat and power to 504 high rise flats at Callender Park.

Glenshellach: The Glenshellach housing scheme in Oban is supported by a 650kW biomass engine. The scheme was funded by Highland and Islands Enterprise Communities Scotland. Heat is currently provided to 44 homes. The total project cost £500k.

Leicester: The district heating scheme has CHP units at four council sites, serving 17 council buildings and 3,500 residential premises.

Lerwick: Is owned and operated Shetland Heat Energy and Power Ltd. The scheme was financed by the Shetland Islands Council Charitable Trust. Operations commenced in 1998, using a 7MW waste to energy plant run by Shetland Islands Council. Properties connected include a swimming pool, three schools, a fish factory, a dairy, residential care centres, library, the main hospital, retail, commercial. Total properties supplied the scheme are 840.

Nottingham: the district heating scheme has been providing heat to residential areas since the 1970s, having early supplied Boots' factories and offices. It is now run by Enviroenergy Ltd, a company owned by the City Council, which takes heat from an incinerator and provides heat and power to 4,600 homes, civic buildings, schools and Nottingham Trent University. The current installation takes steam from an incinerator and utilises a 15MW gas CHP engine.

Olympic Park & Stratford City: Joint scheme for two mixed used development: Base case 10,000+ dwellings; 1m sq.m of commercial; 12 Olympic venues. Both district heating and cooling for commercial consumers served by 18,000kWe of gas CHP, 3,000kW biomass boilers, 30,000kW gas boilers, 37,000kW of chilling.

Sheffield: The district heating scheme is operated by Veolia. It supplies 140 buildings in the city centre with heat and 3,500 homes, the scheme was set up in 1988.

Slough: originally established in the 1920s to ensure that Slough Trading Estate properties were supplied with heat and electricity. The Slough scheme, now owned by SSE, utilises a 35MW pass-out steam turbine biomass CHP. Slough Heat and Power has 3,000 industrial, commercial and domestic customers.

Southampton: as part of a joint venture between the council and Utilico SGHC Ltd was established in 1987. Heat and power is supplied to the Civic Building in the City Centre, and to the Holyrood Estate. The current CHP plant utilises a 5.7MWe CHP engine, it supplies 464 Houses and 20 major commercial and public buildings.

Tower Hamlets: the London Borough of Tower Hamlets procured the renewal of heating provision on the Barkantine estate through a PFI scheme with funding support of £6m from DETR. The scheme is owned by EdF with Dalkia as the operator of the energy centre. Electricity is sold wholesale to EdF which claims a 25% retail market share among heat consumers.

Wick District Heating: the scheme is operated by Caithness Heat and Power, a joint venture between Inverhouse Distillers, Pulteneytown Peoples Project and the Highland Council. The system supplies 600 council houses, Wick Assembly Rooms and Caithness General Hospital. Funding of £1.54m was secured from the community energy programme, further funding from the Highland Council includes £3.5m and 200k fro the European Regional Development Fund. The plant was installed in 2006 and produces 3MW of heat and 1.5MW of electricity.

Woking: the well-known scheme in Woking is operated by Thameswey, which is a joint venture between the Council and Xergi, a Danish energy services company. Thameswey operates a number of small CHP plants serving council offices, community buildings and blocks of flats, and provides energy management services to the Council.

Appendix B

LCR Stage 1 & Stage 2 Study Priority Zones

B1 LCR Priority Zones

Sub Region LA	Status	Location Description	Space-types Potential customers/partners	Approx Viable Capacity	Potential Constraints	Comments
Liverpool	Existing	City centre area to West of Lime Street station and East of Prince's Dock	Commercial buildings Retail (shopping centres) Hotels Town Hall Law Courts and prisons Leisure facilities Residential buildings (flats)	≈ 3 MWe	Likely costs of pipework installation in dense urban area Mix of land ownership Built heritage Air quality	Any CHP capacity will depend heavily on take-up within identified area SHLAA plans feature new build-out areas in close proximity to priority zone Need to identify potential energy centre sites
Warrington	Existing	Area including and adjacent to the South and South-East of Warrington Hospital	Hospital Commercial units Retail Park School Residential area	≈ 4.5 MWe	Linking to Retail Park would entail crossing an A-road	Warrington Hospital represents key anchor load

Sub Region LA	Status	Location Description	Space-types Potential customers/partners	Approx Viable Capacity	Potential Constraints	Comments
Liverpool	Existing	Royal Liverpool Hospital & University of Liverpool	Hospital University Campus	≈ 3.5 MWe	Requirement to cross Lime St rail cutting to link to South of University Campus	Royal Liverpool Hospital represents key anchor load
West Lancashire	Existing	Ormskirk Town Centre	Commercial Park Supermarket Retail Park College Swimming pool	≈ 1 MWe	Separation between main load centres	Swimming pool represents a key anchor load
Knowsley	Emerging	Knowsley Business Park & South of Industrial Park	Existing Commercial buildings Light Industry Emerging New employment land build-out Energos energy-from-	9.0 MWe (proposed by Energos)	Potential requirement to cross East Lancashire road to access emerging Industrial Park load centres	Significant benefit offered by the commitment of Energos to install generation plant Heat availability not necessarily limited by emergence of related demands

Sub Region LA	Status	Location Description	Space-types Potential customers/partners	Approx Viable Capacity	Potential Constraints	Comments
			waste plant			
Sefton	Emerging	Development areas around Southport & Formby District General Hospital	Existing Hospital Emerging New College Residential Light Industry Hotel	≈ 1.5 MWe	Planned Kew Southport residential development is awaiting cleanup of contaminated land Build-out dates for new King George V College not known	Southport & Formby District General Hospital represents key anchor load Good mix of space-types planned within close proximity to Hospital

Sub Region LA	Status	Location Description	Space-types Potential customers/partners	Approx Viable Capacity	Potential Constraints	Comments
St Helens	Emerging	Area around Sutton Leisure Centre and Lea Green distribution centre	Existing Leisure Centre Sports College Distribution Centre Emerging New employment land build-out	≈ 0.5 MWe	Viability will depend on build-out phasing on employment land	Leisure Centre represents potential anchor load
Halton	Emerging	Green-field area in Daresbury to West of A56	Existing Business Park Science Park Emerging New employment land build-out New residential	≈ 0.6 MWe	Planned build-out area is relatively large at approx 2KM in length	Existing load centres are at either end of planned development area, with feasibility of connection dependent upon new-build elements and precise types New-build scheme providing opportunity to introduce DH from the start

Sub Region LA	Status	Location Description	Space-types Potential customers/partners	Approx Viable Capacity	Potential Constraints	Comments
Wirral	Potential	Wirral Waters (Peel)	Planned Commercial/Office space Retail & Leisure Residential Hotels	≈ 3.5 MWe	Extent to which heat network could serve entirety of site could depend on timing & phasing of scheme Any anchor load(s) would ideally emerge early within scheme build-out	Potential to size plant against sizeable and mixed heat loads New-build scheme providing opportunity to introduce DH from the start
Halton	Potential	Runcorn Docks	Planned Large Residential area Likely requirement for complimentary non-residential spaces	≈ 0.2 - 0.7 MWe (based solely on residential build-out of between 1,200 – 4,000 homes)	Pure residential would not provide suitable mix to maximise plant size	Scheme at this scale is likely to require provision of associated additional Community, Commercial and Retail spaces New-build scheme providing opportunity to introduce DH from the start
Sefton		Adjacent to River Alt, South of Great Altcar	Approx. average wind speed at 45m AGL = 6.5-7.0m/s	15kW ≈ 10.6MWh/year 2.5kW ≈ 1,100MWh/year	Site is closer to residences within and around Great Altcar than adjacent PZ 1 Other environmental considerations	Area is adjacent to A565, just South of Little Altcar

Appendix C

Steering Group Project Capture Exercise

C1 Project Capture Exercise

The following is a non-exhaustive list of known organizations with potential projects development interests. This activity along with other stage 1 activities is an essential first step in identifying and capturing the private sector energy prospects across the region.

The table is for population by the project team (Arup, MEAS and Steering Group). The first step is to identify organisations, the second to populate with key characteristics. It is desired by the team project managers that where Steering Group members have existing relationships with organisations they make contact and capture details as appropriate.

To aide in making contact with organisations a Project Narrative will be made available to the team.

It is recognised that some of the organisations will be in the business of developing energy infrastructure while others will have interest purely for their own local energy infrastructure needs and possible tie-in with their surrounding community.

This template is work in progress, columns will be added as appropriate, it is intended for it to be entered into a MSExcel spreadsheet format,

but for now please begin to enter details here.

Ref	Organisation	Contact Details (Name, phone, email)	Project Description	Sensitivity (Y/N)	Development Interest		Priority
					Own	Business	
EF	**Amarc Site (former), Campbeltown Road, Tranmere**	Chainbid Ltd, Corn Exchange, Liverpool	Wind Turbine Operational		✓	✓	Red
EF/FK	**Bioessence**	Biossence Ltd 222 Regent Street	Site granted planning permission for Hooton Park, Eastham.	N	✓	✓	Amber

		London W1B 5TR	400,000 tonnes per annum of either pre-treated waste or solid recoverable fuel (SRF) through gasification and will provide a more suitable and efficient solution to waste management. Potential Heat and Power. Has planning consent and currently raising finance and negotiating contracts no build started as yet.				
PM	**British Gas**	To be confirmed	CESP domestic energy efficiency and renewables programme. Villages Housing RSL Stockbridge Village, more detail needed.	N		✓	
	Cammell Lairds		More detail needed.				

PM	**CEW**	Merton Street, St Helens	Waste management company who have installed an EfW plant. Not sure if active yet but certainly built.	N	✓	✓	Amber
PM	**Clarke Energy**	Knowsley	CHP engineers suppliers			✓	
	Covanta (Ince Marshes)	Peel Estates, Peel energy.	Commercially sensitive, more information needed.			✓	
PM	**Cowley College, St Helens**	BSF	Bio mass boiler (small) 30kWh operational		✓		Red
JY	Daresbury Science Park & surroundings	Steve Dobson – 01925 603655	More information needed		✓		Green

	DB Schenker		Arup to follow up?			✓	
	Eldonians Low Carbon CHP		Arup to follow up?		✓		
PM	**Energos**	Energos Limited 11b Olympic Park Woolston Grange Avenue Birchwood Warrington WA2 0YL	Gasification plant Looking at waste management contracts -	Y		✓	Amber
	E.ON		Funding				
	EMR	Director of Technical Services and SHE European Metal Recycling Limited Sirius House Delta Crescent	Gasification - large scale opportunity, Bootle				Amber

		Westbrook Warrington WA5 7NS					
JY	**Ienos Chlor**		Energy from Waste Arup to follow up. Being built –possibly no export.	Y	✓	✓	Amber
	Industrial Securities					✓	
MK	**Jaguar Cars Ltd**		TMP exploring information on supply opportunities led by Jaguar Midlands. CHP possible in 2 years time. PV will happen earlier Great potential for business park development	Y	✓		Amber
	MWDA		Methane landfill site – 2 at St Helens. Lord Street Lime Pits Haydock/ Newton				
	Jardine Lloyd Thompson		Possible partner		✓	✓	

PM	**Knowsley Chamber of Commerce**		Environmental business club with a focus on green energy clusters	N		✓	
	St Helens chamber of Commerce	St Helens Chamber of Commerce	Director who has kick started energy work.				
PM	**Liverpool University**		Royal Liverpool Re- development		✓		Amber
PM	**Merseyside Pension Fund**		Ethical investment with LCR public sector funds Partner	Y		✓	
EF	**Lovell**		Wirral HMRI Housing Schemes	Y	✓		
EF	**Merseyside Waste Disposal Authority**		Bidston Methane Recovery Plant Gas into grid but dwindling resource				Red

	MWDA		Food waste anerobic digestion possibility at Gilmoss Looking at introducing food waste collections across LCR by 2020				
	National Grid		Transmission network operator			✓	
	Network Rail		Customer		✓	✓	
JY	**New Earth**		Waste resource park includes composting and refuse derived fuel Consented on Wirral waterfront. Process energy demand				Red
PM	**New Horizons Global**		Biotechnology firm with interest in EfW using algae Research	Y		✓	
CD	**Novartis**	Speke	Possible longer term possibility due to interlinks with other industry nearby				Red
PM	**Orchid**	HQ in Lancashire but with facility in	MBT with RDF	Y	✓	✓	Red

		Knowsley near Huyton Waste Transfer Station					
EF	**Peel Holdings**	Peel Energy	Mersey Tidal Energy project Peel reviewing options on barrage design Next stage will be EIA (WITHDRAW BY PEEL)	Y	✓	✓	Amber
	Peel Ports		Wirral waters has a power proposal Need to see to see how dealing with energy infrastructure Could link into Sefton and heat networks. CHP plant already exists and biomass plant is to be built Issue of sequencing Peel biomass park Helios energy and peel Ince Marshes		✓	✓	Amber
	Peel Land and property		See above		✓	✓	
	Peel Energy		See above		✓	✓	
EF/Arup	**Port Sunlight Village**		Biomass Boiler	Y			Red

			Small				
	Pilkington	St Helens	Small CHP plant PV on buildings onsite			✓	Red
PM/Ar up	**QVC**	To be confirmed	More information needed	Y	✓		
	ReFuel					✓	
CD	**RES**		biomass proposals Alexandra docks				
	Royal Liverpool Hospital		See above		✓		
	RSLs Viridis		Setting up SPV of their own for RSLs Tender for PV has gone out and shortlisting		✓		Amber

	Scottish Power		Preparing their own master plan for LCR			✓	
PM/Arup	**Sonae UK Ltd**	To be confirmed	Operational	Y	✓	✓	Amber
PM	**Speke Docks, Garstang**	Jack Allen Holdings	Planning permission given for EfW plant	N		✓	
JY	**Stobart biomass**		New JV company with A W Jenkinson (Stobart Biomass Products) Developing biomass business as well as developing generation capacity			✓	
EF	**Tesco**	Climate Change at Tescos	Heswall CHP scheme Small (for shop needs) Energy from Waste Tescos are looking to develop opportunities. More details from Sefton MBC Tescos stores aiming for : Zero Crabon Low Carbon Normal				Red Red

	Tesco link to Granox site	Prosper de Mulder Ltd West Bank Dock Estate De Soto Road Widnes Cheshire WA8 0PB	Tesco link to Granox site – food waste Granox Site Widnes – warehouse development				Amber
	Veolia		Solvent recovery plant. Garston MEAS have contacts.		✓	✓	
	West Wallasey Garages Ltd		Wind turbines		✓	✓	Red

C2 EST Steering Group Appetite Capture

Knowsley

Business Park

- LA considering a role as a junior partner
- Interested in new income streams for the LA but appetite for investment is low
- Doesn't seem like there are any obvious private sector companies that could take on the project
- Economic development is their key driver
- Seems like the private sector should have a strong role in this so would recommend procurement of a private sector ESCO by the council
- Questions to be answered:
    - LA has identified anchor loads. Are there suppliers of heat to match these or would they need a new CHP system?
    - LA needs to further identify what they want to get out of the project to determine whether they need a more active role in the contract
        - Are local jobs a key criterion for any contract?
        - Would the LA be interested in some involvement – such as billing/admin or marketing? This may become necessary if the finances do not stack up but it wouldn't necessarily involve a financial commitment to the project.

Energos

- Private sector led and currently has planning permission
- Not a popular project
- Could be rolled into Business Park project
- Recommendation: the council engages Energos further as part of the Business Park project and identifies what obstacles there are for joining the larger project

British Gas

- Fuel poverty is the main focus
- Funded through CESP, ERDF, LA and RSL investment – but small amount of funding compared to major retrofit schemes proposed elsewhere
- There is no obvious link between this project and the others so I would recommend that they're kept separate

- This project seems to be the most useful starting point for Knowsley to consider an SPV with an initial focus on retrofit projects. Questions to answer:
    - Is there an appetite within Knowsley to run more of these schemes?
    - Is there an appetite to take on debt to run them?
    - How has the programme run so far? Are there changes to the partnership that would improve it?
    - Consider these questions in the light that Knowsley would have to go through a new procurement process for a delivery agent.

Sefton

Southport

- Very much driven by economic drivers – security of supply, cheaper energy, development of a low carbon economy, and CRC, which is ultimately a cost for public and private sector organisations
- The council is not interested in borrowing and it seems that other partners will provide the finance
- The council also doesn't have an interest in controlling the project
- The council has a lot of relevant skills but there doesn't seem to be a call for them on this project, other than its experience as 'Accountable Body for multi-faceted, large-scale projects'
- There are several partners and stakeholders already identified
- Questions to ask:
    - Is the finance as readily available as it appears?
    - Similarly, are the partners on board to deliver this project?
    - Does the council have a role in procuring a delivery partner?
- Recommendation: the council probably has a significant role in bringing this project together from behind the scenes but it should be delivered by the private sector. Depending on the response to the last question, the council may have a further role in procurement of the delivery partner.

Bootle

- Fuel poverty is the first priority for this project and the council has acknowledged that it will need significant involvement with the project to make it palatable to the community. The council is seen as having 'responsibility'.
- No funding is readily available from the council and lending would require changes to public debt ratios.
- The council has experience in financial management, project management, technical & development experience within the Finance and Built Environment Departments.
- There appears to be an appetite to set up an SPV for this project.
- This sounds like it may be a very marginal project that the private sector may not want to invest in.
- Questions to ask:
    - Despite concerns, would there be a mechanism for the council or other public sector organisations to provide lower cost finance to make the project more attractive to private finance?

  - What is the appetite within the council to set up and run an SPV with private sector finance?
- Recommendation: the council should market test the project with potential ESCo partners and CERT/CESP funders. Contracts with ESCos can include clauses which benchmark the price against local fuel prices and supplier tariffs and require that the ESCo deliver at a percentage below that benchmark, e.g. 5 – 10%. Market testing should determine whether the project is viable for the private sector on its own or needs some support from the council. If the latter is the case, then the council should consider setting up an SPV and contracting out those services which it can't or does not want to deliver in-house.

Wirral

Wirral Waters

- Private sector development from Peel Holdings
- No significant involvement from the council beyond regulatory planning functions
- Recommendation: make sure that planning permission fits in with the council's overall strategy for low carbon development; could the plans link into other potential district heating schemes in the area?

Biossence

- Private sector development from Peel Holdings
- No significant involvement from the council
- Recommendation: make sure that planning permission fits in with the council's overall strategy for low carbon development; could the plans link into other potential district heating schemes in the area?

Port Sunlight Village Trust

- A small scale biomass project for a garden centre
- No involvement from the council
- Recommendation: unlikely to have potential to work with other schemes but worth monitoring as part of the council's overall strategy for low carbon development

Tesco Superstore, Heswall

- Private sector development from Tesco to supply energy from CHP for its own store in the town centre
- No significant involvement from the council
- Question to ask:
  - Are there opportunities to connect up other town centre buildings to this CHP system?
  - Have any planning constraints been put on the development to ensure that it is future-proofed and that it could connect up with other developments?
- Recommendation: investigate opportunities to build a town centre network which incorporates this project. This would likely have to be driven by the council as the current application only applies to Tesco.

Halton

Tesco link to Granox

- Question: what role do they foresee for Halton in the project?

Daresbury

- Questions: how would the Daresbury JV have an involvement?
- Does the Daresbury JV have responsibility for energy services in the developments it already looks after? How is this set up?
- Would this JV be suitable to take on other energy services projects?
- What are the governance arrangements?
- What is the role of the public sector organisations?

Runcorn

- Questions: what role does the council want in this?
- Based on initial assessment, as a residential development, it may be a struggle to get private sector interest and to guarantee sufficient heat
  levels. If there isn't interest from the private sector, would the council look at taking it on?

Liverpool

City centre area to West of Lime Street station and East of Prince's Dock

- Driven by RSLs with support from LAs
- LA wants to drive and track carbon emissions and jobs and skills
- Questions: how does the LA intend to support the project? Anchor loads?
- **Attached briefing note? Strategy?**

Royal Liverpool Hospital & University of Liverpool

- Driven by universities, hospital and working with Scottish Power DNO
- LA does not foresee any financial involvement
- LA will probably have to co-ordinate planning response
- Question: how will this project interact with the City Centre one? Planning requirements that they be prepared to join up?

Appendix D

Task 2 Project Shortlist Exercise

D1 LCR Stage 1 & Stage 2 Selected Task 2 Projects

Sub Region LA	Ref	Status	Location Description	Space-types Potential customers/partners	Approx Viable Capacity	Potential Constraints	Comments	DE SPV Type
Liverpool	DES 1	Existing	City centre area to West of Lime Street station and East of Prince's Dock	Commercial buildings Retail (shopping centres) Hotels Town Hall Law Courts and prisons Leisure facilities Residential buildings (flats)	≈ 3 MWe	Likely costs of pipework installation in dense urban area Mix of land ownership Built heritage Air quality	Any CHP capacity will depend heavily on take-up within identified area SHLAA plans feature new build-out areas in close proximity to priority zone Need to identify potential energy centre sites	**Type 2 – Driven by Town Hall** (Arm's-length joint venture undertaking with Council stake An arm's-length company limited by guarantee, supported by the involvement and investment of key stakeholders)
Liverpool	DES 2	Existing	Royal Liverpool Hospital & University of Liverpool	Hospital University Campus	≈ 3.5 MWe	Requirement to cross Lime St rail cutting to link to South of University Campus	Royal Liverpool Hospital represents key anchor load	**Type 4 – Driven by Hospital Trust** (Private undertaking governed by partnership arrangement A private DE SPV procured by the Council to invest in and develop a network)

Sub Region LA	Ref	Status	Location Description	Space-types Potential customers/partners	Approx Viable Capacity	Potential Constraints	Comments	DE SPV Type
Knowsley	DES 3	Emerging	Knowsley Business Park & South of Industrial Park	Existing Commercial buildings Light Industry Emerging New employment land build-out Energos energy-from-waste plant	9.0 MWe (proposed by Energos)	Potential requirement to cross East Lancashire road to access emerging Industrial Park load centres	Significant benefit offered by the commitment of Energos to install generation plant Heat availability not necessarily limited by emergence of related demands	**Type 2 – Driven by Council ownership of business parks** (Type 2 - Arm's-length joint venture undertaking with Council stake An arm's-length company limited by guarantee, supported by the involvement and investment of key stakeholders)
Sefton	DES 4	Emerging	Development areas around Southport & Formby District General Hospital	Existing Hospital Emerging New College Residential Light Industry Hotel	≈ 1.5 MWe	Planned Kew Southport residential development is awaiting cleanup of contaminated land Build-out dates for new King George V College not known	Southport & Formby District General Hospital represents key anchor load Good mix of space-types planned within close proximity to Hospital	**Type 1 or Type 2** (Type 1 - Council owned undertaking A Company limited by guarantee established by a Council to invest in and deliver its objectives)
St Helens	DES 5	Emerging	Area around Sutton Leisure Centre and Lea Green distribution centre	Existing Leisure Centre Sports College Distribution Centre Emerging New employment	≈ 0.5 MWe	Viability will depend on build-out phasing on employment land	Leisure Centre represents potential anchor load	**Type 2 – Driven by Leisure Centre** (Type 2 - Arm's-length joint venture undertaking with Council stake An arm's-length company

Sub Region LA	Ref	Status	Location Description	Space-types Potential customers/partners	Approx Viable Capacity	Potential Constraints	Comments	DE SPV Type
				land build-out				limited by guarantee, supported by the involvement and investment of key stakeholders)
Halton	DES 6	Emerging	Green-field area in Daresbury to West of A56	Existing Business Park Science Park Emerging New employment land build-out New residential	≈ 0.6 MWe	Planned build-out area is relatively large at approx 2KM in length	Existing load centres are at either end of planned development area, with feasibility of connection dependent upon new-build elements and precise types New-build scheme providing opportunity to introduce DH from the start	**Type 2 – Driven by Science Park & Residential** (Type 2 - Arm's-length joint venture undertaking with Council stake An arm's-length company limited by guarantee, supported by the involvement and investment of key stakeholders)
Wirral	DES 7	Potential	Wirral Waters (Peel)	Planned Commercial/Office space Retail & Leisure Residential Hotels	≈ 3.5 MWe	Extent to which heat network could serve entirety of site could depend on timing & phasing of scheme Any anchor load(s) would ideally emerge early within scheme build-out	Potential to size plant against sizeable and mixed heat loads New-build scheme providing opportunity to introduce DH from the start	**Type 4 – Driven by Peel supported by Council** (Type 4 - Private undertaking governed by partnership arrangement A private DE SPV procured by Peel to invest in and develop a network)

Sub Region LA	Ref	Status	Location Description	Space-types Potential customers/partners	Approx Viable Capacity	Potential Constraints	Comments	DE SPV Type
Halton	DES 8	Potential	Runcorn Docks	*Planned* Large Residential area Likely requirement for complimentary non-residential spaces	≈ 0.2 - 0.7 MWe (based solely on residential build-out of between 1,200 – 4,000 homes)	Pure residential would not provide suitable mix to maximise plant size	Scheme at this scale is likely to require provision of associated additional Community, Commercial and Retail spaces New-build scheme providing opportunity to introduce DH from the start	**Type 3 – Driven by Council social objectives** (Social enterprise undertaking underwritten by Council support A not-for-profit company blished to deliver Council stakeholder social and ronmental objectives)
Sefton	**DES 9**		Bootle Docks	Energy plant with allied energy requirements and commercial case energy export needs	Work in Progress	Work in Progress	Tie-in potential to Peel Liverpool Waters development (DES 12) Proximity to Renewable Energy Systems Proximity to Sefton Council Public buildings	Work in Progress
Liverpool	**DES 10**		Liverpool Waters	Planned Large Residential and Commercial area	Work in Progress	Work in Progress	Tie-in potential to Sefton EMR (DES 11) energy centre supplies of energy forming links with wider Sefton community	Work in Progress

Liverpool	**DES 11**		Eldonians	Various planned developments	Work in Progress	Work in Progress	Combined with DES1	Work in Progress
Knowsley	**DES 12**		**Jaguar**	TMP exploring information on supply opportunities led by Jaguar Midlands. CHP possible in 2 years time. PV will happen earlier Great potential for business park development	Work in Progress	Work in Progress		Work in Progress

D2 Steering Group Selected Task 2 Projects

Organisation	Ref	Contact Details (Name, phone, email)	Project Description	Sensitivity (Y/N)	Development Interest		Priority	DE SPV Type
Bioessence	EF/FK	Biossence Ltd 222 Regent Street London W1B 5TR	Site granted planning permission for Hooton Park, Eastham. 400,000 tonnes per annum of either pre-treated waste or solid recoverable fuel (SRF) through gasification to provide a more suitable and efficient solution to waste management. Potential Heat and Power. Has planning consent and currently raising finance and negotiating contracts. No build started as yet.	N	✓	✓	Amber	**Type 5 – Driven by Bioessence** (Mutual undertaking underwritten by stakeholders support A mutual company or society established to deliver benefits to its heating consumers and/or wider social and environmental objectives)
British Gas	PM	To be confirmed	CESP domestic energy efficiency and renewables programme. Villages Housing RSL Stockbridge Village, more detail needed.	N		✓		**Type 5 – Driven by CESP** (Mutual undertaking underwritten by Council/stakeholders support A mutual company or society established to deliver benefits to its heating consumers and/or wider social and environmental objectives)
Daresbury Science Park & surroundings	JY		More information needed		✓		Green	See previous Stage 1 & Stage 2 Priority Zone table – MORE INFO NEEDED
Eldonians Low Carbon CHP					✓			**Type 3 – Driven by RSL social objectives** (Social enterprise undertaking

Organisation	Ref	Contact Details (Name, phone, email)	Project Description	Sensitivity (Y/N)	Development Interest		Priority	DE SPV Type
								underwritten by Council support A not-for-profit company established to deliver Council and stakeholder social and environmental objectives)
Energos	PM	Energos Limited 11b Olympic Park Woolston Grange Avenue Birchwood Warrington WA2 0YL	Gasification plant Looking at waste management contracts – Knowsley Industrial Park apportunity identified from Stage 1 and Stage 2 Priority Zones	Y		✓	Amber	See previous Stage 1 & Stage 2 Priority Zone table – MORE INFO NEEDED
EMR		European Metal Recycling Limited Sirius House Delta Crescent Westbrook Warrington WA5 7NS	Gasification - large scale opportunity, Bootle				Amber	**Type 4 – Driven by EMR instigated/supported by Council** (Type 4 - Private undertaking governed by partnership arrangement A private DE SPV procured by the Council to invest in and develop scheme)
Jaguar Cars Ltd	MK		TMP exploring information on supply opportunities led by Jaguar Midlands. CHP possible in 2 years time. PV will	Y	✓		Amber	**Type 3 or Type 4 – Driven by Council ownership of business parks**

Organisation	Ref	Contact Details (Name, phone, email)	Project Description	Sensitivity (Y/N)	Development Interest		Priority	DE SPV Type
			happen earlier Great potential for business park development					(Social enterprise undertaking underwritten by Council support A not-for-profit company established to deliver Council and stakeholder social and environmental objectives)
Peel Ports			Wirral waters has a power proposal Need to see to see how dealing with energy infrastructure Could link into Sefton and heat networks. CHP plant already exists and biomass plant is to be built Issue of sequencing Peel biomass park Helios energy and peel Ince Marshes		✓	✓	Amber	**Type 3 or Type 4 – Driven by Council ownership of potential network** (Social enterprise undertaking underwritten by Council support A not-for-profit company established to deliver Council and stakeholder social and environmental objectives)
Port Sunlight Village	EF/Arup		Biomass Boiler Small	Y			Red	**Type 5 – Driven by Charity, supported by Council** (Mutual undertaking underwritten by stakeholders support A mutual company or society established to deliver benefits to its heating consumers and/or wider social and environmental objectives)
Tesco	EF	Climate Change at Tescos	Planning permission granted.				Red	**Type 4 – Driven by TESCO**

Organisation	Ref	Contact Details (Name, phone, email)	Project Description	Sensitivity (Y/N)	Development Interest		Priority	DE SPV Type
			Heswall CHP scheme Small (for shop needs) Energy from Waste Tescos are looking to develop opportunities. Tescos stores aiming for : Zero Crabon Low Carbon Normal					**supported by Council** (Type 4 - Private undertaking governed by partnership arrangement A private DE SPV to invest in carbon savings at existing store)
Tesco link to Granox site		Prosper de Mulder Ltd West Bank Dock Estate De Soto Road Widnes Cheshire WA8 0PB	Tesco link to Granox site – food waste Granox Site Widnes – warehouse development				Amber	

Appendix E

Project Mapping

E1 LCR Project Mapping

A1

Project Data
Project Reference: DES 9, Sefton Local Authority buildings
Sub Region LA: Sefton
Location Description: NA
Space Types & Potential Customers / Partners: NA
Adjacencies: Tie-in potential to Peel Liverpool Waters development (DES 12)
Proximity to Renewable Energy Systems
Proximity to Sefton Council Public buildings

Indicative Technical Data
Heat Consumption (MWh): TBA
Electricity Consumption (MWh): TBA
CHP Thermal Capacity (MWth): TBA
Heat Network Length (m): TBA

Indicative Financial Data
Capital Cost (£): TBA
SPV Net Cash Flow (£): TBA
Simple Payback Period (years): TBA
NPV @ 7.5% Discount Rate: TBA
IRR: TBA

Carbon Reduction Potential
CO2 Saving (Tonnes/year): TBA

Project Data
Project Reference: DES 9, European Metals Recycling (EMR), Bootle Docks
Sub Region LA: Sefton
Location Description: NA
Space Types & Potential Customers / Partners: NA
Adjacencies: Tie-in potential to Peel Liverpool Waters development (DES 12)
Proximity to Renewable Energy Systems
Proximity to Sefton Council Public buildings

Indicative Technical Data
Heat Consumption (MWh): TBA
Electricity Consumption (MWh): TBA
CHP Thermal Capacity (MWth): TBA
Heat Network Length (m): TBA

Indicative Financial Data
Capital Cost (£): TBA
SPV Net Cash Flow (£): TBA
Simple Payback Period (years): TBA
NPV @ 7.5% Discount Rate: TBA
IRR: TBA

Carbon Reduction Potential
CO2 Saving (Tonnes/year): TBA

Project Data
Project Reference: DES 9, Renewable Energy Systems (RES), Bootle Docks
Sub Region LA: Sefton
Location Description: NA
Space Types & Potential Customers / Partners: NA
Adjacencies: Tie-in potential to Peel Liverpool Waters development (DES 12)
Proximity to Renewable Energy Systems
Proximity to Sefton Council Public buildings

Indicative Technical Data
Heat Consumption (MWh): TBA
Electricity Consumption (MWh): TBA
CHP Thermal Capacity (MWth): TBA
Heat Network Length (m): TBA

Indicative Financial Data
Capital Cost (£): TBA
SPV Net Cash Flow (£): TBA
Simple Payback Period (years): TBA
NPV @ 7.5% Discount Rate: TBA
IRR: TBA

Carbon Reduction Potential
CO2 Saving (Tonnes/year): TBA

Project Data
Project Reference: DES 4
Sub Region LA: Sefton
Location Description: Emerging properties, Development areas around Southport & Formby District General Hospital
Space Types & Potential Customers / Partners: Existing hospital, emerging new college, residential, light industry, hotel
Adjacencies: Concept includes anchor loads with extension into wider mixed use community. Non-specific

Indicative Technical Data
Heat Consumption (MWh): 15,391,791
Electricity Consumption (MWh): 4,640,625
CHP Thermal Capacity (MWth): 1.65
Heat Network Length (m): 1,500

Indicative Financial Data
Capital Cost (£): £11,000,000
SPV Net Cash Flow (£): £1,100,000
Simple Payback Period (years): 10.5
NPV @ 7.5% Discount Rate: £2,300,000
IRR: 10%

Carbon Reduction Potential
CO2 Saving (Tonnes/year): 7,000

Project Data
Project Reference: DES 3
Sub Region LA: Knowsley
Location Description: Emerging new Knowsley Business Park & South of Industrial Park
Space Types & Potential Customers / Partners: Existing commercial buildings, light industry, emerging new employment land build-out, energy-from-waste plant
Adjacencies: Energos EfW gasification CHP concept. Knowsley Industrial Park opportunity identified from Stage 1 and Stage 2
Priority Zones, energy centres and district heating

Indicative Technical Data
Heat Consumption (MWh): 108,035,714
Electricity Consumption (MWh): 27,843,750
CHP Thermal Capacity (MWth): 9.9
Heat Network Length (m): 9,000

Indicative Financial Data
Capital Cost (£): £68,000,000
SPV Net Cash Flow (£): £6,700,000
Simple Payback Period (years): 10.1
NPV @ 7.5% Discount Rate: £16,800,000
IRR: 10%

Carbon Reduction Potential
CO2 Saving (Tonnes/year): 42,000

Project Data
Project Reference: DES 5
Sub Region LA: St Helens
Location Description: Emerging properties Area around Sutton Leisure Centre and Lea Green distribution centre
Space Types & Potential Customers / Partners: Existing Leisure Centre, Sports College, Distribution Centre, Emerging New employment land build-out
Adjacencies: Concept includes anchor loads with extension into wider mixed use community. Non-specific.

Indicative Technical Data
Heat Consumption (MWh): 5,456,349
Electricity Consumption (MWh): 1,546,875
CHP Thermal Capacity (MWth): 0.55
Heat Network Length (m): 500

Indicative Financial Data
Capital Cost (£): £3,000,000
SPV Net Cash Flow (£): £400,000
Simple Payback Period (years): 9.2
NPV @ 7.5% Discount Rate: £1,200,000
IRR: 12%

Carbon Reduction Potential
CO2 Saving (Tonnes/year): 2,000

Project Data
Project Reference: DES 8
Sub Region LA: Halton
Location Description: Potential regeneration of Runcorn Docks
Space Types & Potential Customers / Partners: Planned large residential area.
Likely requirement for complimentary non-residential spaces
Adjacencies: Concept includes anchor loads with extension into wider mixed use community. Non-specific.

Indicative Technical Data
Heat Consumption (MWh): 8,593,750
Electricity Consumption (MWh): 1,546,875
CHP Thermal Capacity (MWth): 0.55
Heat Network Length (m): 500

Indicative Financial Data
Capital Cost (£): £6,000,000
SPV Net Cash Flow (£): £500,000
Simple Payback Period (years): 11.7
NPV @ 7.5% Discount Rate: £500,000
IRR: 9%

Carbon Reduction Potential
CO2 Saving (Tonnes/year):2,000

Project Data
Project Reference: DES 6
Sub Region LA: Halton
Location Description: Emerging properties Green-field area in Daresbury to West of A56
Space Types & Potential Customers / Partners: Existing Business Park, Science Park, emerging new employment land build-out, new residential
Adjacencies: Expansion from Darebury anchor loads to new development areas

Indicative Technical Data
Heat Consumption (MWh): 6,156,716
Electricity Consumption (MWh): 1,856,250
CHP Thermal Capacity (MWth): 0.66
Heat Network Length (m): 600

Indicative Financial Data
Capital Cost (£): £5,000,000
SPV Net Cash Flow (£): £400,000
Simple Payback Period (years): 10.7
NPV @ 7.5% Discount Rate: £800,000
IRR: 10%

Carbon Reduction Potential
CO2 Saving (Tonnes/year): 3,000

Sefton District (B)

St. Helens District (B)

Knowsley District (B)

Liverpool District (B)

Wirral District (B)

Halton (B)

Project Data
Project Reference: DES 7
Sub Region LA: Wirral
Location Description: Regeneration zone, Wirral Waters (Peel Holdings), the largest regeneration project in the UK.
Space Types & Potential Customers / Partners: UK government approved application and Enterprise Zone. 1.7Msqm mixed use: Commercial/Office space, Retail & Leisure, Residential (13,000), Hotels. Energy and waste strategy, willingness to be innovative.
Adjacencies: Good proximity to adjacent Birkenhead and Wallesey areas of existing residential and SME .

Indicative Technical Data
Heat Consumption (MWh): 71,828,358
Electricity Consumption (MWh): 21,656,250
CHP Thermal Capacity (MWth): 7.7
Heat Network Length (m): 7,000

Indicative Financial Data
Capital Cost (£): £57,000,000
SPV Net Cash Flow (£): £5,100,000
Simple Payback Period (years): 11.3
NPV @ 7.5% Discount Rate: £7,300,000
IRR: 9%

Carbon Reduction Potential
CO2 Saving (Tonnes/year): 33,000

Project Data
Project Reference: DES 10, Liverpool Waters (Peel Holdings)
Sub Region LA: Liverpool
Location Description: Regeneration of a 60 hectare historic dockland site to create a high-quality, mixed use waterfront quarter in central Liverpool
Space Types & Potential Customers / Partners: Mixed use development of residential, visitor attractions and supporting uses, office/commercial and local shops and services.
Adjacencies: City centre, north Liverpool and the wider sub-region. Tie-in potential to Sefton EMR (DES 11) energy centre supplies of energy forming links with wider Sefton community.

Indicative Technical Data
Heat Consumption (MWh): TBA
Electricity Consumption (MWh): TBA
CHP Thermal Capacity (MWth): TBA
Heat Network Length (m): TBA

Indicative Financial Data
Capital Cost (£): TBA
SPV Net Cash Flow (£): TBA
Simple Payback Period (years): TBA
NPV @ 7.5% Discount Rate: TBA
IRR: TBA

Carbon Reduction Potential
CO2 Saving (Tonnes/year): TBA

Project Data
Project Reference: DES 1
Sub Region LA: Liverpool
Location Description: Existing properties, city centre area to West of Lime Street station and East of Prince's Dock,
Space Types & Potential Customers / Partners: Commercial buildings, Retail (shopping centres), Hotels, Town Hall, Law Courts and prisons, Leisure facilities, Residential buildings (flats)
Adjacencies: Concept includes anchor loads with extension into wider mixed use community. Non-specific.

Indicative Technical Data
Heat Consumption (MWh): 30,783,582
Electricity Consumption (MWh): 9,281,250
CHP Thermal Capacity (MWth): 3.3
Heat Network Length (m): 3,000

Indicative Financial Data
Capital Cost (£): £26,000,000
SPV Net Cash Flow (£): £2,200,000
Simple Payback Period (years): 12.2
NPV @ 7.5% Discount Rate: £1,200,000
IRR: 8%

Carbon Reduction Potential
CO_2 Saving (Tonnes/year): 14,000

Project Data
Project Reference: DES 2
Sub Region LA: Liverpool
Location Description: Knowledge Quarter. Existing properties: Royal Liverpool Hospital Trust & PFI contractor redevelopment & University of Liverpool
Space Types & Potential Customers / Partners: Hospital University Campus **Adjacencies:** Potential links between organisations and/or with adjacent redevelopment of existing hospital site as private high tech commercial enterprises

Indicative Technical Data
Heat Consumption (MWh): 38,194,444
Electricity Consumption (MWh): 10,828,125
CHP Thermal Capacity (MWth): 3.85
Heat Network Length (m): 3,500

Indicative Financial Data
Capital Cost (£): £25,000,000
SPV Net Cash Flow (£): £2,600,000
Simple Payback Period (years): 9.5
NPV @ 7.5% Discount Rate: £8,000,000
IRR: 11%

Carbon Reduction Potential
CO2 Saving (Tonnes/year): 16,000

Legend
- LCR Project Point Locations
- LCR Project Boundaries
- Local Authority Boundaries

Issue	Date	By	Chkd	Appd
P1	23-06-11	RC	RC	MA

ARUP
New Oxford House
30 Barkers Pool
Sheffield S1 2HB
United Kingdom
Tel +44 114 272 8247 Fax +44 114 275 9553
www.arup.com

Metres
0 850 1,700 3,400

Client
CCSF / Merseyside EAS

Job Title
Liverpol City Region Resilient Energy Infrastructure Delivery

Liverpol City Region Energy Project Opportunities

Scale at A1
1:60,000

Job No **216573-00**
Drawing Status **Draft**
Drawing No **001**
Issue **P1**

Template A1 Version 2

Appendix F

Energy and Financial Modelling

F1 Model Assumptions

Assumptions for considering broad commercial analysis (NPV and IRR)

Enert:v Centre costs							
	Assumption	Unit					
Cost of biomass CHP plant	£4,000	kWe					
Cost of gas CHP plant	£800	kwe					
Cost of gas boilers	£30	kW					
Cost of biomass boilers (inc handlin.)	£300	kW					
Cost of energy centre building and fit out	£1000	per m•					
Pro'ect cost	5%						
Contingency	5%						
Transmission, distribution and connection costs							
Transmissions pipework lle gth	1000 m/kWe CHP capacity						
Transmission							
Heat capacity (Mwth				10	30		
Pipe site Green	150	250	350	450			
field Brown fi	£870	£1,328	£1,663	£2,023		(£/m F+R)	
eld Hard Sub	£920	£1378	£1,719	£2,093		(f/mf+R)	
urban Hard	£1,383	£1,841	£2.257	£2,.741		(£/mf+R)	
Urban	£1,862	£2,320	£2.,820	£3,411		(£/m F+R	
Di str bution							
Green field	£726					(£/mF+R)	
Brown fi eld	£776					(£/m F+R)	
Hard Suburban	£1,302					(£/m F+R)	
Hard Urban	£1,860					(£/mf+R	
Connecti on							
Resi (£/unit)	£1,000						
Non-rQs (£/connQction)	£3,000						
Non-resi (£/m')	£10						
Operatin?; co b							
Gas cost	25 p/kWh						
Bi mass cost	3.0 p/kWh						
Elec cost	10 p/kWh						
Biomass CHP O&M	1.5 /kWh						
Gas CHP O&M	1 p/kWh						
Biomass boiler O&M	O.S p/kWh						
Gas boiler O&M	0.25 p/kWh						
Revenues							
Heat sale	4 /kWh						
Power sale Be	8 p/kWh						
c export	3.5 p/kWh						
ROC	S /kWh(e 1.5 ROCs for biomass CHP						
Generala s umpti ons							
CHP availability							
Hours at full load	5000						
Peak heat load	4 x thermal capacity of CHP						
Heat to power ratio Biomass	1 .1						
CHP elec effici ency Biomass	22%						
CHP thermal efficiency Gas CHP	25%						
elec efficiency	IIII						
Gas CHP thermal efficiency							
Biomass boiler efficiency	80%						
New gas boiler effici ency	85%						
Existin1 as boiler efficiency	75%						
CHP output equivalent to	6250 hours full load @ 100% availability						
Heat losses	10%						
Total heat consumption	work out from above						
Total elec consumption	work out from above						
Cash discount rate	7.50%						
Development mix with thermal store (100% CHP availability)							
Non-resi dominated	63%						
Even resi / non-resi	67%						
Resi dominated	57%						
Residential only	40%						
Proportion of CHP elec exported							
Energy centre size (m)	O.0642 x heat capacity (kW) + 176						
C02 emissbns factors (SAP 2009)							
Gas (kgC02/kWh	0 198						
Biomass (wood chips (k C02/kWh	0.003						
Grid electricity (C02/kWh)	0.517						
Displaced electricity (kgCO2/kWh)	0 529						

F2 Model Summary

Sub Region LA	Ref	Approx Viable Capacity (MWe)	Development mix	CHP Technology type	Boiler Technology type (% heat output)	Capital cost (£)	Net Cash flow (£/year)	Simple payback (years)	NPV (@ 7.5% discount rate)	IRR	CO_2 saved (Tonnes/year)
Liverpool	DES 1	3.0	Even resi / non-resi	Biomass	100% gas / 0% biomass	£26,000,000	£2,200,000	12.2	£1,200,000	8%	14,000
Liverpool	DES 2	3.5	Non-resi dominated	Biomass	100% gas / 0% biomass	£25,000,000	£2,600,000	9.5	£8,000,000	11%	16,000
Knowsley	DES 3	9.0	Non-resi dominated	Biomass	100% gas / 0% biomass	£68,000,000	£6,700,000	10.1	£16,800,000	10%	42,000
Sefton	DES 4	1.5	Even resi / non-resi	Biomass	100% gas / 0% biomass	£11,000,000	£1,100,000	10.5	£2,300,000	10%	7,000
St Helens	DES 5	0.5	Non-resi dominated	Biomass	100% gas / 0% biomass	£3,000,000	£400,000	9.2	£1,200,000	12%	2,000
Halton	DES 6	0.6	Even resi / non-resi	Biomass	100% gas / 0% biomass	£5,000,000	£400,000	10.7	£800,000	10%	3,000
Wirral	DES 7	7.0	Even resi / non-resi	Biomass	100% gas / 0% biomass	£57,000,000	£5,100,000	11.3	£7,300,000	9%	33,000
Halton	DES 8	0.5	Residential only	Biomass	100% gas / 0% biomass	£6,000,000	£500,000	11.7	£500,000	9%	2,000