CORNWALL INSIGHT

CREATING CLARITY

Unlocking Clean Energy Greater Manchester

Financing Options Report

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European Union
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About Cornwall Insight

Getting to grips with the intricacies embedded in energy and water markets can be a daunting task. There is a wealth of information online to help you keep up-to-date with the latest developments, but finding what you are looking for and understanding the impact for your business can be tough. That's where Cornwall Insight comes in, providing independent and objective expertise. You can ensure your business stays ahead of the game by taking advantage of our:

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1 Executive Summary

Cornwall Insight ("we", "us", "our") have been commissioned by Energy Systems Catapult ("ESC") to provide support under Workstream 2 of the Unlocking Clean Energy in Greater Manchester (UCEGM) project. The objective of UCEGM is to deliver additional clean energy capacity to supply local authority assets across Greater Manchester, and to demonstrate innovative and scalable energy business models. This report is the latest stage of that support and builds upon deliverables previously provided from late 2021 onwards.

In this report, we consider the two preferred routes identified from Phase I of Workstream 2 through which local authorities (LAs) may raise finance for renewable energy projects – Public Works Loan Board (PWLB) loans, and raising money through crowdfunding activities - and how well each of these aligns with the short-term business models which ESC has proposed.

We have also examined potential upcoming changes to the energy market which could arise from various sources, including fundamental market reform and impacts of the ongoing energy market and wider economic uncertainty.

1.1 Public Works Loan Board (PWLB)

In examining the potential use of the PWLB, we note the following:

- With low costs, high flexibility and easy access to finance, PWLB is and should remain the default option for LAs to finance their renewable energy ambitions
- Securing PWLB money is a comparatively straightforward process, with the most challenging element likely to be obtaining consent from the relevant LA's Section 151 officer and internal approvals. Providing education to this officer on the business model and level of revenue certainty may be crucial in getting their buy-in to the investment
- LAs are increasingly – and are encouraged to – review the investment over its lifetime for net benefits (which might, for example for solar, by 25-30 years), rather than a commercial payback period of 8-12 years
- Some LAs are nearing their capital adequacy limits and will not be able to borrow further funds through PWLB[1], although investments to reduce costs over time should still be viable and other routes to finance exist, for example, through ring-fenced special purpose vehicles
- Though LAs have expressed concerns about PWLB rules on investing for yield and how this applies to renewable energy generation, the guidance from the PWLB states that these projects are not considered investment for yield by Treasury
- The UK Infrastructure Bank is currently issuing money though the PWLB, at a discount of 0.2% to usual rates, and is keen to invest in projects of over £5mn in value

1.2 Crowdfunding

In examining the potential use of crowdfunding, we note the following:

- It is a viable option for investment proposals with a degree of innovation, and is commonly associated with projects that have environmental and social benefits, and which allow for community inclusion and/or low risk for investors

[1] Though note that this means that they also should not be raising capital elsewhere either, according to principles set by the Treasury

- For LAs, the most appropriate focus is recommended as debt-based crowdfunding, particularly where benefits will mostly accrue to the LA rather than the wider community
- Where there are high levels of community or environmental benefit and a compelling narrative can be identified, a donation-based model where funding is not returned could be considered
- There may be options for reward-based crowdfunding, where rewards could be based on providing low-cost EV charging, for example
- The key risks around the crowdfunding route are generating investor interest through campaigns and investment proposal, choosing the right crowdfunding platform and capital realisation
- Suitable project types are either relatively small scale or would need to include funding from other sources - in the latter case, crowdfunding could be seen as chiefly a method to engage the local community and build support, rather than provide significant funding
- Of the various business models, considered from a financial viability and attractiveness perspective, a private wire (offering higher returns to meet the higher costs of money obtained through crowdfunding) or a solar EV carport (offering other benefits and rewards to the community) are most viable

1.3 Municipal Bonds

In examining the potential use of Municipal Bonds, we note the following:

- Very few municipal bonds have been successfully issued, and the current balance of interest rates does not favour issue of further bonds in the near-term as PWLB rates are in line with bond rates
- The minimum size for bonds is less flexible than PWLB raises, at £250mn. Bonds are therefore more likely to be used to re-finance large sections of an LAs debt, rather than targeted specifically to funding renewable generation portfolios
- The process for issuing a bond is 6-8 weeks minimum, or possibly 8-10 weeks or even longer, depending on requirements for credit ratings and engagement with lenders. There are also significant fees involved to set up credit ratings, as well as overheads to engage with investors
- The investment environment is currently changing, with a shift to higher interest rates following increases to the Bank of England base rate. While this affects both PWLB and municipal bond costs equally, it may impact investor confidence (and thus municipal bonds) to a greater extent; further, several LAs are currently experiencing financial difficulties which again may impact on investor confidence

1.4 Regulatory change

Many potential or planned changes may affect future finance available and LA (and indeed wider investment) plans for decarbonisation. We have identified several key issues for discussion:

- Policy levy re-allocation –levies to support investment in low carbon generation historically made up 25%-30% of delivered electricity costs. There has been *increasing discussion*, *including* from potential incoming Prime Ministers, in recent months regarding the potential for some or all of these costs to be removed from electricity bills and moved to gas bills and/or general taxation, either temporarily or permanently. Should this occur, it will negatively affect behind-the-meter business models, with these being in part predicated on the avoidance of such levies
- Network charging reviews – with elements of the Access Review *recently completed*, with impacts reducing network connection costs from April 2023. Further reviews of transmission and distribution charges are ongoing, though impacts are not yet clear

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- Contracts for Difference (CfD) – current UCEGM projects are under the 5MW threshold for the CfD. However, the recent allocation round (AR4) saw *contracts awarded* to solar arrays as small as 6MW and therefore this may represent a suitable future business model against which investment can be raised
    - We note that, to date, two LAs have secured a CfD – Cambridgeshire County Council secured £79.23/MWh in Allocation Round 1 (AR1) for its 12MW *Triangle Farm Solar Park*, and Orkney Islands Council secured £46.39/MWh *for each of its* two 28.8MW community wind projects in AR4, all in real 2012-13 terms
- Network decarbonisation – LA policy aims for decarbonising electricity supply could be achieved by waiting until 2035, when the public grid is targeted to be fully decarbonised. Early decarbonisation and cost stabilisation may therefore be more important targets to avoid defaulting to this "do nothing" option
- Locational Marginal Pricing (LMP) – BEIS's *Review of Electricity Market Arrangements* (REMA) workstream launched in July 2022, and it is anticipated that this may lead to fundamental reforms to existing wholesale market structures, in this case to implement multiple regional wholesale power prices in place of the single national wholesale price which is the current paradigm. However, the direction of reform is currently not clear
- PWLB rate changes – rates have been increased previously for political reasons, and this could be re-implemented at any time. Monitoring other sources of finance, in order to switch to these at need, may be a useful back-up for this funding stream

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2 Public Works Loan Board

2.1 Overview

The *Public Works Loan Board* (PWLB) is a lending facility operated by the Government to provide loans to LAs and other public bodies to fund capital projects. Terms and arrangements are set by HM Treasury, with interest rates published by the Debt Management Office (DMO) on Treasury's behalf. LAs including metropolitan, borough, county, city and combined authorities can access funding, with the applicants themselves responsible for decision making on whether they can service the debts through revenues. They are required by law to have regard to the *Prudential Code*, but have discretion to decide how to fulfil this requirement.

The PWLB is a "non-discretionary lender" and does not ask the purpose of loans issued. Effectively, this leaves LAs free to borrow as long as the application for the funding meets internal clearance, e.g. the LA finance director is satisfied that they can afford to repay the loan.

Interest rates are either fixed or variable – fixed rates are based on gilt yields at time of issue +1%, while variable rates are updated every one, three or six months over the term of the loan. Current rates (*as of August 2022*) range between 2.68% and 3.53%, depending on the type and duration of the loan. These rates have increased over the past six months, as the Bank of England rate increased.

There are also discounts available to these rates: 0.2% for the Certainty Rate, which requires information on plans for long-term borrowing and capital spending over the next three years[2]; and the Local Infrastructure Rate, a rate of gilts +0.6% for nominated projects which are "high value for money", with this funding issued in a number of discrete rounds (unlike usual PWLB funding).

2.2 Enabling delivery

The application process for PWLB finance is a relatively simple electronic template, which is sent to the DMO. Funds are then released within five days. However, before this stage is reached, the LA must internally satisfy itself regarding the loan. The steps towards this loan application are shown in Figure 1.

Figure 1: Steps towards PWLB funding

Source: Cornwall Insight

[2] This has become the default rate, as since 26 November 2020, LAs are required to submit this information to access PWLB funding

These are detailed as follows:

- The Section 151 officer, who administers the financial affairs of the LA and is also known as the Responsible Finance Officer, confirms the 3-year capital spending programme under the Certainty Rate return and updates this as needed on an ongoing basis, and confirms that none of the capital is being invested in primarily for yield. Given that decarbonisation is now a central role for LAs, investment in renewable energy generation to support this would not be considered as "for yield"; section 2.4.1 discusses this is more depth
    - Part of this return includes specifying large projects, providing a short description, and categorising them. These categories are set out below
        - Service delivery: Education, highways and transport, social care, public health, culture and related, environmental and regulatory, police, fire and rescue, central
        - Housing: Delivering new homes, managing or improving existing homes, or purchasing existing homes to meet requirements for housing services
        - Regeneration: To address economic or market failure, where making a significant investment in the asset beyond the purchase price, or generating additional activity beyond what would have happened without the LA's intervention
        - Preventative action: Protecting jobs, or preventing social or economic decline
- Each LA has set a total borrowing limit for itself, in accordance with the Prudential Code. This is based on the revenue streams available to that LA, with which it will repay the debt, and applies to all LA borrowing, not just energy projects
    - Competition between various LA priorities to secure debt under this limit can be considerable and allocation of new debt is generally a political decision[3]. However, given the declaration of a climate emergency by many Councils, there is a general supposition that a proportion of an LA's capital budget will be allocated to energy projects, although this may be spread amongst generation, efficiency, heat and transport
    - In any case, securing budget within this limit for the project may prove a barrier to PWLB funding for some LAs[4] (see Section 2.4.2)
    - In addition to the overall borrowing limit, LAs must not borrow ahead of need, with the intention of profiting from this behaviour by temporarily investing these funds – again this prohibition is designed to block borrowing to invest, and is compatible with procurement and build timescales
- Looking at an individual project, the LA will need to satisfy itself that the business case in place has an appropriate level of risk (predicated on the route to market as well as other factors) and delivers appropriate returns. We discuss this issue, focusing on the duration of projects and required payback periods, in Section 2.4.3
- Approvals processes are different for each LA and often for different types or sizes of project. In discussion with GMCA authorities, we identified two routes for approval: pre-approved capital budgets, and ad hoc requests for capital
    - Where a capital budget has not been pre-approved, approval may be needed at several stages throughout the development process, with increasing levels of detail potentially necessary
        - This process allows the senior officers and political members of the LA to keep control of the process and ensures that decisions involving public money are properly scrutinised
        - However, it is slower and can lead to projects not being delivered in the most efficient manner

[3] Several of the LAs we spoke to had allocated capital budgets for renewable energy generation investments. However, many had not and some said that capital budgets were too constrained to permit further borrowing
[4] Other financing routes, which can be secured against ring-fenced individual projects rather than the LA's total revenue, may be preferrable in this instance

- Where a capital budget is pre-approved, the development team may only need to seek approval from senior officers and/or the political members for large projects at the final stage and not at all for smaller projects, where the project meets pre-set criteria such as an investment rate of return or level of carbon reductions
  - This allows projects to move more smoothly through stages, and precludes some of the re-approval of projects required when minor details change
  - However, it does put significant amounts of public money to a team which, while suitable qualified and experienced, is below CEO or Cabinet level, for investment into projects which bear a level of risk of not repaying the initial investment or delivering wide returns
- Engagement with LAs (in the GMCA region and beyond) has seen a trend for larger LAs (particularly Combined Authorities) to be more likely to have pre-approved budgets, while LAs at lower tiers have not yet done this
- We do not consider either approach "best practice", as this implies a level of judgement of LA finances which we are not equipped to make
  - However, we do note that pre-approved budgets – where delivered correctly – may be more efficient, whereas step-by-step approval is more aligned with usual LA practices and may offer benefits in terms of fiscal prudence
  - On the other hand, the pre-approved process puts decision making in the hands of the LA energy experts who are most qualified to make decisions, and the step-by-step process allows the elected officials closer supervision of large investments

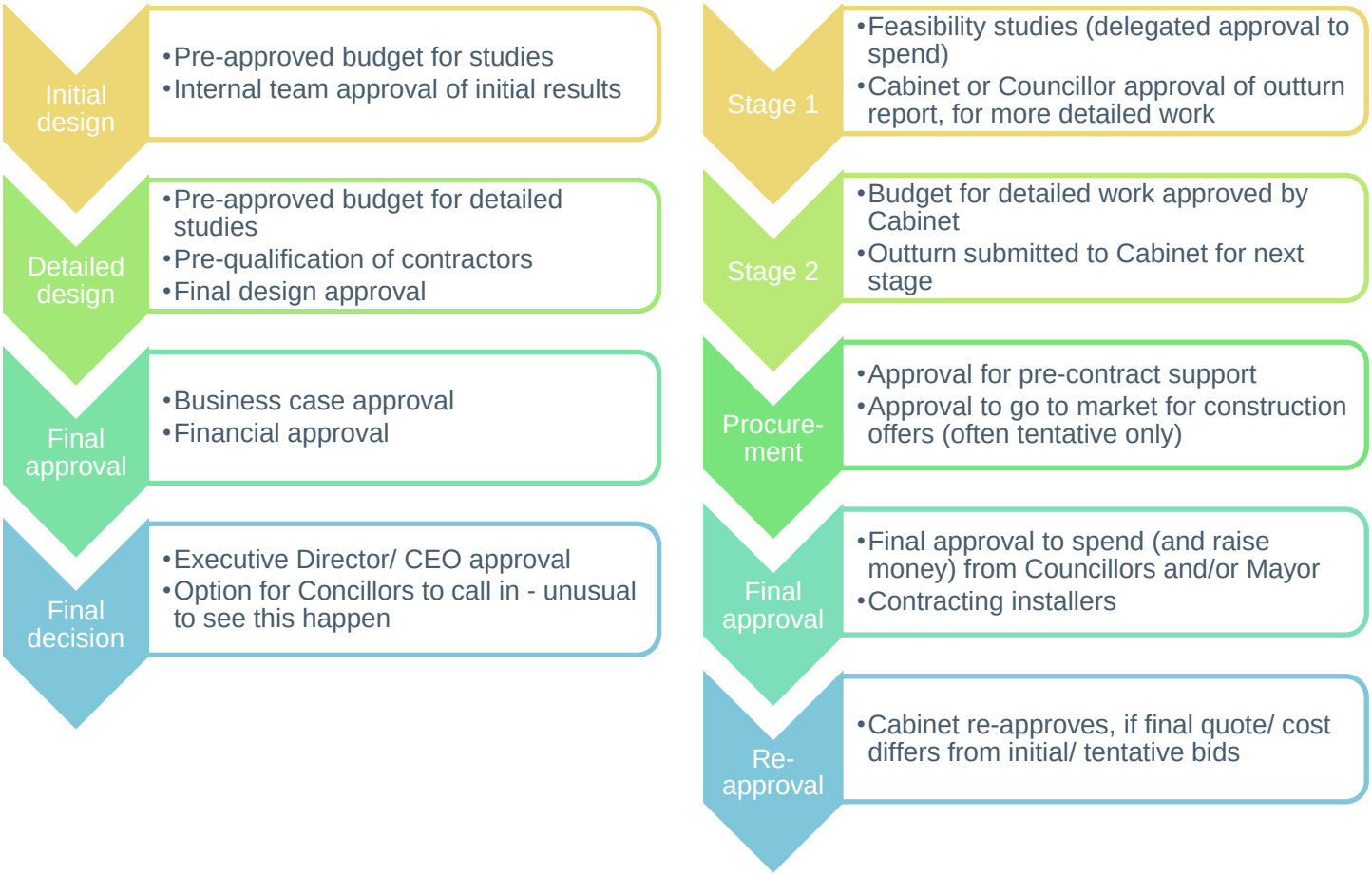
2.2.1 Internal approvals process

Based on our discussions with LAs, the PWLB process is not the key barrier to obtaining finance. Instead, the barrier is the internal approvals process at the LA, before PWLB (or other) funding is sought. There are two main processes for this – one where the LA has approved a capital budget for renewable energy or decarbonisation, and a more intense process where there is no pre-approved budget.

In the former case, there is typically funding in place for commissioning feasibility studies, planning work and similar early-stage activities. The Officers running the project, and their immediate superiors, would be empowered to procure and deliver these studies, and move forwards with projects which appear viable. Under this route, relevant Council executives and Councillors would be kept informed of progress, but would only intervene by exception. The final permissions to go out to procure final design and delivery of the solution would require signoff by the Council Chief Executive, or Mayor, or possibly approval by Councillors.

Figure 2 overleaf describes the steps, based on examples provided by two GMCA LAs.

Figure 2: Approvals processes: approved capital budget (left) and no approved capital budget (right)



Source: Cornwall Insight, from discussions with GMCA LAs

As shown in Figure 2, processes which require multiple approvals and do not have pre-approved budgets are longer and consequentially slower. This means that market conditions, equipment costs and similar may have changed significantly during the approvals process, changing the business case which underpins the investment and requiring further approvals – which themselves delay the investment. Our conversations with LAs indicate that this is, for some bodies, posing a barrier to get projects underway.

Of course, all approvals rely on a positive financial case for the asset being provided. While LA finance officers have historically looked for commercial payback periods – e.g., in the range 8-12 years, depending on the type of project – they are reportedly now willing to consider the full lifetime of the project when looking at net financial benefits. In the case of solar PV generation, this might be 25-30 years.

2.3 UK Infrastructure Bank

The UK Infrastructure Bank (UKIB) is also, in its interim pre-legislative phase, using PWLB approval as a route to providing finance. The UKIB funds projects in five areas: clean energy, transport, digital, waste and water. It offers a rate 0.2% below the equivalent PWLB rate, and has £4bn of funds for the purpose of lending to local government. Unlike PWLB, it has a minimum loan value of £5mn, which means this funding route will only be available for larger projects or collections of projects.

While it does not have a current route for delivering funding to collections of projects owned by multiple LAs, it has indicated an interest in providing funding to this sort of innovative arrangement and working with partners to deliver this to market.

Enabling legislation was *brought forwards* in the House of Lords on 12 July, to create a direct route to access its financing; this is now at third-reading stage in the House of Commons. UKIB remains committed

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to offering support to LAs to build out various projects, but particularly to support them to generate renewable energy. It is currently reviewing options on how it will provide additional support to LAs seeking loans, providing additional value-adding services beyond simply lending money. It initially expects that these services will include helping LAs create detailed investment cases and providing insight into the value of generation over its lifetime, alongside supporting them to understand and enact routes to market.

2.4 Potential barriers to delivery

From our conversations with LAs both within and beyond the UCEGM group, we have identified a number of barriers to the ability or desire of LAs to deliver investments under PWLB:

- Prohibition on investing for yield
- Capital adequacy/ existing debt
- Uncertainty on project returns and investment term

We address these, and mitigations, in turn in the remainder of this section.

2.4.1 Prohibition on investing for yield

The wording in the *Prudential Code* on investing for yield changed in 2018 from "*purely for yield*" to "*primarily for yield*". This reduced test enables LAs to invest in projects which deliver a purpose – for example, making progress against a policy decision like a declaration of a climate emergency – as well as delivering overall positive contributions to the LA's financial position.

According to guidance set out by Treasury, investing for yield has one or more of the following characteristics:

- Buying land or existing buildings to let out at market rate
- Buying land or buildings that were previously operating on a commercial basis which is then continued by the LA without any additional investment or modification
- Buying land or buildings other than housing that generate income and are intended to be held indefinitely

Therefore, developing renewable generation assets would not be classified as investing for yield. Further, Example 10 in the updated guidance note *issued in May 2022* specifically confirms that purchasing land in a neighbouring LA region for the purpose of wind generation would be supported, as this is delivering a service (advancing environmental and climate change objectives). Example 12 further explains that an investment for the purpose of decarbonising the LA's activities would be eligible for PWLB funding.

Breach of the requirements might require unwinding the investment, repayment to PWLB, or blocking access to future PWLB monies. However, it is not clear that Treasury has ever used powers to do this.

We also note that Treasury mentions several times in the guidance that these rules *"apply to all capital spending, whether it is within the local authority's borders or outside and whether it is financed through PWLB borrowing or another source."* Therefore, whether PWLB funding is being sought has little bearing on whether the investment should be made, as LAs will almost certainly use PWLB loans in their overall capital structures and if the LA considers that the investment will be primarily for yield – and therefore ineligible – it will not be able to secure PWLB funding for other areas of its estate.

2.4.2 Capital adequacy

LAs borrowing from the PWLB are taking loans against their future income, i.e. against their balance sheet. Like any large organisation, the balance sheet of future income will only support so much debt – the total

borrowing limit – and many LAs are now approaching the limit of debt which they can viably take on for capital projects. This interrupts their ability to take on further debt to the balance sheet.

As Figure 3 indicates, most UCEGM LAs which have issued Treasury Management Strategy Statements are not currently in danger of breaching borrowing limits, with the exception of Stockport, which is within 5% of its allowed limit. However, we note that rising costs of capital may reduce the ability of LAs to take on more debt, and this may impose restrictions on borrowing in general as well as the viability of specific projects looking for funding.

Figure 3: Capital Adequacy of UCEGM LAs for 2022-23

Local Authority	Stated capital adequacy limit	Total borrowing
Greater Manchester Combined Authority	£2,800mn	£1,500mn
Manchester City Council	£2,000mn	£800mn
Rochdale Borough Council	£730mn	£540mn
Salford City council	£1,200mn	£780mn
Stockport Metropolitan Borough Council	£920mn	£920mn

Source: LA publications, as linked

Other financing routes, which accrue debt against project-specific special purpose vehicles, may allow LAs to raise further ring-fenced debt and, even with a higher cost of capital, may be a preferable route to raising finance to further PWLB raises. Several LAs have set up SPVs to own generators or other energy projects; examples include Warrington Borough Council's investment into large solar farms, which it *owns through an SPV* to which it made a loan, and Colchester Borough Council's wholly-owned subsidiary Colchester Commercial (Holdings) Ltd, which owns several SPVs including Amphora Energy – its district heating company. We expect that most LAs will be very familiar with these structures, which are widely used outside of the energy space, in development of new housing and commercial premises or delivery of services like elderly care, waste collection, and similar activities.

Given that generation assets produce an income, once the asset is operational this income could be used to underpin further debt raises. When selling to the national markets, we note that volatile merchant pricing of power may create questions on revenue certainty over the long term and therefore the ability of the investment to underpin debt.

However, several of the business models proposed by ESC for UCEGM create various levels of revenue stability, whether this be by selling to the LA's own consumption portfolio (an "invest to save" model), or selling to another type of user at a fixed price over the long term. This may – at the s151 officer's discretion – be considered sufficient and educating this individual on the business model and level of revenue certainty may be important to getting their buy-in. Commercial developers and investors will seek assurance on this point using wholesale price forecasting models, to understand likely pricing over the long term. Investors would regard wholesale curves provided by reputable third parties as "bankable", i.e., sufficiently solid to make investments against.

Price certainty is also sought in the commercial sector by delivering business models including long-term price guarantees, such as long-term Corporate Power Purchase Agreement (CPPA) with a fixed price, providing revenue stability and sharing the risk of changes to wholesale pricing between the generation owner and the corporate end-user. Investors may be more willing to accept a level of risk on investment than an LA, which is spending public money, and certainly some LA investments in energy (particularly in energy suppliers) have not delivered the hoped-for returns, which may have increase risk adverseness.

Treasury *issued guidance* in May 2022 in order to restrict the ability of LAs with high levels of debt burden to acquire further debt from PWLB. This document clarifies Treasury's position, with regards to the requirement of the PWLB not to lend where there is a more than negligible risk of non-repayment. It explained that it would intend to contact LAs based on their capital investment and financing plans, which they are required to submit via the Certainty Rate return, ahead of applications for PWLB finance.

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It retains the right to contact the LA to discuss the application, if necessary, but considers this eventuality highly unlikely and intends to continue to rely on the prudential system to control LA borrowing.

2.4.3 Uncertainty on project returns

Historically, LA consideration of investment in energy projects often foundered on the requirement for projects to pay back in relatively short periods. For example, returns sufficient to deliver payback in 8-12 year periods were generally considered necessary to allow an investment to proceed. Renewable energy generation projects are unlikely to achieve this in any but the best-case scenarios, unless substantial elements of grant funding are included, though the current paradigm of very high wholesale electricity prices has reduced payback periods. In part, this is due to LAs (and indeed the wider economy) not pricing carbon emissions into economic decisions, but other factors included limited understanding or acceptance of the risks inherent in many merchant energy market business models, where power is sold on the short-term wholesale power markets.

However, increasingly finance officers are recognising that renewable energy generation brings greater benefits than the financial, and are willing to consider investment which demonstrate net benefits over the expected lifetime of the assets – for solar generation, which could be 20 years, or even longer with appropriate maintenance and component replacement. For example, one Metropolitan Borough Council in the GMCA area told us that it would consider lifetimes of up to 30 years for large ground-mounted solar arrays, and no LA which we talked to had a minimum rate of financial return[5] to make an investment.

We note, however, that LAs are not yet pricing carbon emissions into their decisions in a meaningful way.

2.5 Suitable projects

Given the non-prescriptive nature of the PWLB funding route, it is a suitable source of finance for any investment with net-positive return which is not solely made for yield. In particular, the low external administrative burden to accessing finance make it suitable for multiple small fund raises, for example to invest in rooftop solar, solar carports or a small-scale generation portfolio which comes to Final Investment Decision (FID) at different times.

2.5.1 Historically successful projects

Perhaps the most prominent example of PWLB investment in energy generation assets is Warrington Borough Council's (WBC's) purchase of two solar and storage assets in 2019, and a third in 2022. These assets, which have a total generation of capacity of approximately 80MW with accompanying battery support, are located outside of WBC's own region. They were pre-developed by private developers, with construction undertaken by third party contractors arranged by the turn-key final stage developer.

Regarding business models, part of the power is being sleeved into WBC's consumption portfolio, with the remaining energy sold into the wholesale electricity market. The investments and development are not underpinned by any subsidy or out-of-market support, and critically **were not grant-funded**.

West Sussex County Council *decided to invest* £11.6mn in a 20MW battery storage site in 2019 - this being financed by PWLB in conjunction with a £4.1mn grant element. When this grant was withdrawn, the project was *amended in 2021* to reduce it to 12MW, and again in 2022 to increase it to 24MW. This flexibility, in the face of changing funding and energy market scenarios, illustrates the benefit of funding through a flexible instrument. However, the delivery of this – by returning to the approval process and running through this

[5] Also known as a hurdle rate – a minimum level of income, compared to the capital, operational and financing costs of the project, as well as a risk premium, which an investment must beat in order to be made. Usually considered over the full investment period.

again – did extend timelines and limit the ability to make swift decisions on project changes. Striking a balance between a level of autonomy on the part of project teams and central control of budgets would seem vital to delivering projects rapidly in an uncertain energy market.

2.6 Alignment with business models

In this section, we consider how well PWLB financing aligns to the four short term business models proposed by ESC which require financing[6]. The PWLB loans against the LA's entire balance-sheet, so here we include the consideration of a secondary loan using PWLB money to a special purpose vehicle owning the assets and using the business model in question.

Figure 4: Summary of financial and business model considerations

	Sleeved PPA	Private wire	Storage	Solar carports
Revenue level	Average – aligned to current/ forecast prices	High – savings vs public networks	High – wide range of revenues available	Average/ High – higher if onsite consumption is high
Revenue stability	High – fixed price for duration of arrangement	High – fixed price for duration of arrangement	Mid – each stream low certainty, but range gives overall stability	Mid/ Low – uncertainty on EV demand (higher stability if other onsite demand
Risks	M/id/ Low – flexibility on destination of power	Mid – local offtaker risk	Mid – local offtaker risk	High – level of EV take-up, local offtaker risk
Payback period	Mid/ High – marginal business case for small-scale assets, but more suitable as scale increases	Mid – higher revenues reduce payback, though wire adds cost	Low – high revenues expected will drive low payback periods[7]	Mid/ High – marginal business case unless energy is consumed onsite, e.g., as car charging increases
Overall alignment	High – where finance offers are comfortable with investment over asset lifetime rather than looking for swift payback	High – where finance offers are comfortable with investment over asset lifetime rather than looking for swift payback	Mid/ High – higher risks but shorter paybacks	Mid/ Low – revenues from EVs currently too uncertain, though other offtakers could stabilise the case

Source: Cornwall Insight

2.6.1 Sleeved PPA

By sleeving power into its own portfolio, the LA is setting a value for this power over the term of the PPA deal. As the organisation is effectively selling to itself, the LA can structure this price to just cover the cost of the project (taking value from reduced power prices throughout its operational budgets) or to maximise project returns (creating income to allocate to various purposes).

In either case, the known and fixed income to the project should allow the S151 officer to sign off the project with these revenues, which are much more certain than typical merchant wholesale market revenues.

[6] Note that the solar and storage licensing agreement model is expected to be financed by third parties rather than the LA, and therefore is excluded from this financing report
[7] Though note asset lifetimes for batteries, without significant re-investment, are 12-15 years versus 25 or more for solar generation assets

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2.6.2 Private wire

This business model has similar characteristics to the sleeved PPA, as the LA will control both generation and consumption and be able to allocate value as it thinks best. There are likely to be slightly higher revenues, due to the avoidance of public network charges and policy levies, but there are also slightly higher costs (building the private wire) and risks (the project is tied to a single site and if the LA reduces demand at this site, it may not require all of the power produced.

Alongside the higher revenues is a higher level of risk. The cost of private wires, deployed to connect the generators to end-users may be a stranded asset if the end-user leaves the premises. Where the LA is connecting to its own assets, there may be a high degree of certainty regarding the long-term use of these, along with potential plans for changes to energy use. For example, energy efficiency installations which reduce the volume of energy consumed may change the economics of the generator, as more energy would be spilled to the grid and remunerated at a lower rate.

However, where this certainty does not exist, or where a third-party end-user is being connected to, this additional risk should be born in mind when considering whether the end-user is sufficiently credit-worthy to permit investment through PWLB fund raises.

2.6.3 Storage & site optimisation

The addition of an electricity storage asset to an existing generation or consumption site provides the opportunity for the site owner/developer to access a number of potential revenue streams, including:

- Wholesale arbitrage: Batteries can buy low and sell high across different time periods, increasing the value, or reducing the cost, of wholesale energy
- Balancing Mechanism (BM): Batteries can earn revenues from the Electricity System Operator (ESO) for participation in the BM, either absorbing or outputting energy onto the system; there is a minimum size threshold of 1MW to enter the BM, though assets can be aggregated to meet this
- Balancing Services: Batteries can earn revenues from the ESO and potentially Distribution System Operators (DSOs) for providing services to help keep the network in balance; again there are minimum size criteria of 1MW, and units can be aggregated to meet this
- Network and policy cost optimisation: When located on consumption sites, energy use can be flexed in order to minimise exposure to higher bands of network charges and some policy levies (particularly the capacity market levy)
- Connection reinforcement avoidance: Where consumption or generation is larger than the grid connection, across a period of the day or year, batteries can mitigate the need to reinforce the network connection. Depending on the cost of doing so, this can underpin some or all of the cost of the batteries
- Capacity Market revenues: £/kW/year income can be secured either by entering batteries or, on consumption sites, demand reduction, into the capacity market. This is for a single year for existing or 15 years for new-build assets

While these revenues are mostly merchant and uncertain, the range of different revenue sources and terms over which they can be accrued has led to batteries being increasingly regarded by investors as viable. This includes the traditionally risk-averse sector of banks and infrastructure funds.

This indicates that – where batteries are properly operated by an expert aggregator/ optimiser – revenues can be sufficient to underpin investment. Highest revenues reported in 2022 were around £170/kW/year, or £150/kW/year on average, *according to* revenue optimiser Arenko, though we note that 2022 was an exceptional war for battery revenues due to unprecedented volatility. Given difficulties in forecasting and guaranteeing future revenue, we note that future revenues may not be considered viable to borrow against as part of the balance sheet unless investment is being considered as part of a wider installation including generation.

However, rates of return are expected to be high and assets likely to pay off in close to the length of time which convention assets might – perhaps eight to 10 years. This means that the debt commitment can be of a shorter duration, and further investment considered around the end of the decade. The lifetime of batteries is also much shorter than that of solar panels (12-15 years for batteries, compared to 25-30 for solar), and to match lifetimes would require a re-investment. This future investment is likely to come at a lower capital cost than the original, however, due to improvements in battery technologies in the intervening period.

2.6.4 Solar carport

The currently considered projects under Workstream 1 include the deployment of solar carports on sites where solar generation can be exported to the networks or on parking adjacent to LA offices or depots. This effectively leaves the underlying business model and financeability similar to the sleeved PPA and private wire models. There may be additional value on offer through EV charging, particularly in the longer term or where deployment is aligned to electrification of LA fleets, but the additional risks of this model can be set against its potential for additional income.

In the wider private market, EV charging is currently regarded as a relatively high-risk investment by most investors, and finance officers may consider revenues too unreliable to underpin future borrowing, at least for the next 2-5 years as the EV market continues to grow.

However, there is an option for LAs to charge fleets of heavy duty vehicles, such as buses or refuse collection vehicles. By charging its own vehicle fleets, there will be more certainty of demand and this allows a more secure business case to be put in place – effectively the EVs can be viewed as akin to any other demand (e.g., an office building), rather than as uncertain EV demand. Some types of vehicle may be more suitable for this than others – in particular, refuse collection vehicles, which complete their duty by late morning and are available for charging over the midday solar generation peak, may be very suitable.

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3 Crowdfunding

3.1 Overview

Crowdfunding, a form of crowdsourcing, is a method of accessing alternative funding. It generally uses online platforms to raise capital from a large number of people which are then used to fund projects and businesses. It is mainly used for smaller innovative and community-based projects to raise capital for investments and businesses where it would be difficult to raise adequate capital at favourable terms through traditional routes.

There are multiple investment types in crowdfunding, and those seeking investments can choose which route they want to take while putting up their proposal on a crowdfunding platform. These are:

- Donation-based crowdfunding: Funders donate to a project, person, company or campaign with no expectation of return of capital or payback. This is often used by individuals or charities for charitable ends
    - Typical fund raises might be in the range of thousands to low tens of thousands of pounds
- Rewards-based crowdfunding: The donors receive a product or service as payment for their investment under this method. The size of the reward payment is linked to the size of investment in order to encourage larger investments. This is the “Kickstarter” model, often thought of as a pre-order of products in development
    - Typical fund raises might be in the range of tens to low hundreds of thousands of pounds, though some have reach millions; the largest rewards-based crowdfunding project ever[8] closed in March 2022, raised over $45mn for a series of novels. Energy crowdfunding has reached several millions, previously, with projects like Ripple’s second wind farm (which offered rewards in the form of energy) have raised multiple millions
- Debt-based crowdfunding: This method mimics the traditional borrowing arrangements with a bank or financial institution, whereby the borrower pays the investor back their capital investment amount along with interest payments. In a variation of this method, the investment can be sought against a debt instrument issued by the borrower
    - There is a wide variance in possible fund raises, from tens or hundreds of thousands of pounds, up to the low millions. Large raises are now considered more viable than historically
- Equity-based crowdfunding: Via this method the company or business raising debt is allowed to give away a share of their business to the funders, in proportion to their investment. This is appropriate for small businesses and is not the norm amongst crowdfunding platforms, as it is a more advanced instrument
    - Similar in size to debt-based crowdfunding

For LAs, debt-based crowdfunding is the most useful form. Debt-based crowdfunding has the advantage of structurally being no different from a traditional investment proposal, but gives the LAs control over the terms such as the capital to be raised, term of repayment and interest rates offered. While all these factors must be based on market trends and norms during the time the funds are being sought, the LA has discretion to amend these.

Equity-based crowdfunding may not be an appropriate route as divestment of shares in the project(s) may not be possible, where a project is held within the overall portfolio of LA assets. If a project or portfolio of projects is set up as a separate, independent company – for example, using a special purpose vehicle (SPV) to own the assets – this may be possible.

[8] Excluding blockchains

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Rewards-based crowdfunding is unlikely to be apt as there is no physical, discrete product available for distribution. The Ripple *crowdfunded wind farms* have offered funders access to wholesale power, which may be an option.

Donation-based crowdfunding can be a difficult route, as it favours solutions which are smaller, innovative or first mover projects with strong non-financial benefits. There may be opportunities to receive donations where there are clear public goods to the local community, for example investment in a local amenity. Alternatively, some crowdfunding raises have offered the opportunity for funders to forgo their returns into a community benefit fund or similar initiative.

At present, the interest rates on some of the larger crowd sourcing platforms with renewable energy or net-zero related investment offers average between 4% and 5% (fixed or floating). Since investors are attracted to the investment based on the terms of financial repayment (though most platforms do not guarantee returns) this type of offering may give the LAs a wider reach for their fund raise. Individuals within the community and more broadly across the UK may be attracted, based on the competitiveness of the terms and proposal, and most crowdfunding raises achieve most of their capital from beyond the immediate local community.

3.2 Enabling delivery

There are some considerations to be made when raising funds through the crowdfunding route. These considerations ensure the investability and soundness of investment at every step of the process. Figure 5 sets out the key steps to take to secure crowdfunding. As with other methods of raising finance, it is usual to go to the financiers (in this case, the community) fairly late in the development of projects, once there have been identified and costed. In order to deliver a successful crowdfunding campaign, however, there is a need to engage the community before seeking funding for the specific project(s) under consideration.

Figure 5: Key steps to receiving crowdfunding

Source: Cornwall Insight

Industry has produced a range of guides and support documents to help parties in setting up and operating community energy groups. These include *the Centre for Sustainable Energy's guide*, *BRE's guide*, and materials provided by *Community Energy England*. All emphasise the need for quality and ongoing engagement with local people, and the inclusion of local communities in the decision-making process.

3.2.1 Pre-investment community engagement

One of the key steps towards a successful crowdfund raise is to engage with and raise interest among potential funders at the outset. Using investor outreach measures, digital, paper based and on the ground, it is key to generate interest around the project that is being considered. The focus should be on the contributions it is making towards net zero goals, community benefits, innovation in the business case.

The interest generated through these endeavours will also guide the LAs regarding the suitability of this approach, before they invest wholly into it. Most crowdfunding platforms have experience with these campaigns and will assist the project, company or individual with it for a specific fee.

Some LAs have also found it useful at this stage to set up or sponsor community energy groups, or build relationships with existing local groups. This enables them to tap into existing interest groups and community relationships, and/or to share the responsibility of building this interest.

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3.2.2 Choosing the crowdfunding platform

There are various crowdfunding platforms available, some with a focus area in energy and renewables and some with a wider scope of innovation, technology and environment. Most platforms also offer a range of investor manager tools, such as investor due diligence, profit and fund management, etc. For the LAs to decide on the platform of choice they need to consider several factors:

- Credibility: The past record of the platform having successfully raised funds for a similar project with similar terms. The footfall on the platform along with their outreach to different geographies and demographics needs to be analysed by the LA seeking to raise funds. While in most projects, many funders come from the local community who have a 'buy-in' in the project, investment interest in general raises visibility and brings investment from outside the community. The outreach of a crowdfunding platform is important to enable this
- Cost: The crowdfunding platform will charge the fund raiser for hosting their fund raise on their platform. The terms of this cost needs to be understood for its impact (if any) on the project's viability and compared before a choice is made. Charges are typically in the range of a few percent of the money raised, although there are also likely to be ongoing costs
    - If fees are "per investor", then this may impact on the minimum investment amount sought from each individual
- Due diligence: Before potential investors can be allowed to invest money, the *Financial Conduct Authority* (FCA), which regulates investments in the UK, requires that due diligence checks are conducted on these investors. These come in two parts: "know your client" and money laundering checks, and "retail investor" checks. The latter are important as they asset whether the potential investor understands the investment and can stand to lose the money invested. Failing to deliver these checks can result in penalties and fines, as well as reputational damage, for all of those involved in raising funds
- Ongoing management: Investor management, such as making regular interest payments and returning capital to investors, is supported by some but not all platforms. Given the administrative overheads which this could create for large numbers of investors, the ongoing management services which are provided (and the cost of these) may also be an important consideration

3.2.3 Choosing the crowdfunding type

As discussed, there are four main types of crowdfunding, and LAs must decide on the route that is to be taken before issuing an investment proposal. This decision, along with considerations such as viability of raising funds in line with their proposal, community engagement, any legal/regulatory restrictions, also needs to consider the project's projected internal rate of return (IRR). The higher the IRR, the more suitable it is to raise the investments through the debt-based route, while a low project IRR might make a donation-based route the only viable option.

The level of community benefit will also be an important consideration here, as the public are unlikely to fund via a donation model a project which is simply designed to reduce the energy bills of an LA – although they may do so for a local school, community building or hospital.

3.2.4 Creating the investment proposal

The investment proposal needs careful consideration and assessment of the project's financial viability. Typically crowd funding fund raises have been limited to small projects, but this trend is changing with higher value projects looking for investment through this route. One of the standard terms in most platforms are that the individuals investing in the projects are aware that returns are not guaranteed under any of the types of fund raise.

The key considerations that need to be made by the LAs when creating an investment offering are:

- Details of investment proposition and company into which the investment will be made
- Investment target, i.e. the total target after which the proposal is closed for raising additional funds
    - Note that some fund raises fail, if they do not reach a target, and some close with the money raised. If the LA has another route to meet the remaining capital requirement, the latter option may be suitable
- Close date for investment achievement. This may be an open ended fund raise with no close date, though this is less usual
- Close date for project. This date signifies the date by which the investors will fully realise their paybacks or profits from the investment
- Minimum level of investment. This is minimum sum which any individual investor can put into the project
- Terms of investment:
    - Interest charged or underlying bond terms in case of a debt based fund raise
    - Rewards
    - Equity share, in case of an equity based fundraise
    - Payback period and when payback on the money raised begins

An investment prospectus must be created to convey this information to potential investors in a clear and standardised format. The fund raiser will be responsible for this, though most crowdfunding platforms will offer a level of support in creating and reviewing this document. Depending on the type of investment being sought, the FCA may have requirements for the publication of information and disclaimers as well. The chosen crowdfunding platform will provide support and templates to help fund raisers meet requirements here.

Some crowdfunding has been seen where there is no specific project to invest in, or where part of the fund is to be invested in one or more specific projects, with the remainder to be invested in projects yet to be identified. Equally, some groups have raised funds to repay loans not raised through crowdfunding and take projects which were part-financed through conventional means more fully into community ownership. We note that fund raises for new entities are more successful where they are to be invested into specific named projects, but that organisations with a track record of raising and investing money, and paying returns, can be more flexible in which projects are to be delivered. Further, raising money to expand community ownership is generally less popular than investing in new projects, which we presume is due to the lack of new renewable generation buildout.

3.2.5 Platforms and partners

The following are some crowdfunding platforms which have in the past raised funds for renewable energy projects or which have existing investment options for renewable projects on their platforms. These are generally regarded as reputable, and we note that this is not an exhaustive list:

- *Seedrs*: One of the largest platforms, which has raised over £2bn across 1,700 deals, including many in the renewable energy space. This includes both business-as-usual (e.g., solar rooftop) and innovative (e.g., tidal turbines) projects
- *Triodos*: A UK-based bank which launched in 2018 and has a focus on 'for good' projects, whether these are for the benefit of the environment or for people. It has raised £187mn to date for projects and people whose objectives align with these requirements; as a bank it can offer tax efficient investments which may make it more attractive to some potential investors
- *Abundance*: Similar to Triodos, it also has a number of projects offering financial returns and has raised £137mn with over £50mn paid in returns. The typical fund size for this platform is also generally larger than other platforms, and the platform has a focus on renewable energy

3.3 Potential barriers to delivery

Our research has shown us that the following are the key barriers to the ability or desire of LAs to deliver investments using crowdfunding:

- Capital realisation
- Raising community interest
- Innovativeness of proposal
- Choosing the right platform

These are discussed in the following section.

3.3.1 Capital realisation

The project seeking investment sets a target investment and a minimum investment level on the crowdfunding platform based on its financial requirement. However, there is the risk that due to lack on interest in the project, small community size, investor appetite at that time and terms of the investment proposition, the project is unable to raise adequate funds.

Prior engagement with the community and research into investor appetite may lower this risk and aid decision making. Furthermore, setting a flexible target, with the intention to make up funding from another source (e.g., PWLB loans) may make the crowdfunding effort more likely to succeed.

3.3.2 Raising community interest

The members of the community in which the project is being built are generally the main target contributors and investors. They see value in some level of 'buy-in' or a reward factor in the investment they are making. The project needs to balance financial and reward-based incentives, especially for smaller community based initiatives. A key mitigating measure is to generate and gauge investment interest before launching the investment proposal in a crowdfunding platform, notably amongst the potential or target investor base.

Building support for a community energy organisation is one way to engage the community, and some LAs – for example, Plymouth City Council (PCC) – have created organisations which have been able to deliver a range of projects, both with and without direct LA support. PCC created Plymouth Energy Community in 2013, initially engaging with local residents to provide support on energy bills, before expanding in 2014 to deliver rooftop solar on local schools following a share offer and loan from the Council.

One of the key benefits of a crowdfunding raise is also demonstrating community interest and engagement to the planning process, and activities conducted by those seeking planning permission and those seeking crowdfunding should be correlated.

Another factor is the involvement of a community energy group, or other community organisation. LAs in isolation may not have the correct image or brands for some sorts of crowdfunding raises, or for developing and deploying community benefit funds. Partnering with, or creating a new, community energy group may support local interest, as well as creating additional capacity for further future projects in the local area.

3.3.3 Innovativeness of proposal

Most crowd funding platforms are able to promote and draw stronger investment interest for projects which have a factor of innovation or environmental and/or community impact from the renewable energy project. A first mover project based on a new business model or technology generally gains more traction.

For those proposals not able to adequately define the innovation or benefit quotient, crowdfunding may not generate strong interest in a competitive market with other potential projects, and therefore may be secure adequate levels of funding.

3.3.4 Choosing the appropriate platform

This is one of the most important factors that need to be addressed before choosing this route given the high-level similarities across the available platforms. In order to help determine an appropriate funding approach, it is recommended that LAs investigate the following parameters, as well as undertaking a reputational review of the provider:

- Number of active investment proposals in the same domain
- Past success with proposals in that domain
- Costs of running an investment proposal on the platform
- Terms and conditions and the fine text

3.4 Suitable projects

The suitability of projects for crowdfunding depends in part on the type of funding being sought. For donation-based projects or projects with low financial returns, a strong level of community benefit and low level of overall project financial returns is required, to demonstrate why investment grade-returns are not available.

The Greater London Assembly *found that* projects which are more likely to appeal to the community include ones benefiting schools, hospitals, community centres, leisure centres, public EV chargers and other public amenities. Projects which are primarily targeted at reducing LA energy bills ("invest to save") or providing fleet charging to refuse vehicles at a council depot are not likely to be appealing to crowdfunders, unless very good financial returns are offered.

Though fund raises of increasing sizes have been seen – some examples include Thrive Renewables is *currently crowdfunding* for £5mn to expand its portfolio, on an equity basis, with target returns at 5-8%. Iduna, working with Transport for Greater Manchester, *reportedly raised* £4mn through a 9% fixed return bond in 2021, to pay for rapid EV charges around Manchester; it is now seeking a further £6.5mn. Low Carbon Hub *raised over £3mn* in 2021; while much of this funding was allocated to the Ray Valley Solar Farm, the group was also using the money to re-finance debt on earlier projects and to develop new projects, and the lion's share of the £10mn cost of the 19MW solar farm was paid by a separate loan from Triodos Bank.

However, we would note that these are the exceptions and this compares with a typical crowdfunding raise of less than £1mn and most commonly below £100,000. This means that mid-sized rooftop solar arrays or small hydro plant are the ideal size, but larger investments and portfolios of investment may be less suitable. Where larger funds are raised, we see that the raising parties have a track record of raising and deploying capital via crowdfunding, and making payments to investors. Low Carbon Hub, for example, has conducted six rounds of crowdfunding, in steadily larger mounts, in 2014, 2016, 2018, 2019, 2020 and 2021. Alternatively or in addition, investors are offered a specific reward linked to the investment, like lower cost and greener energy in the Ripple Energy example. Furthermore, community investors are re-assured that projects are viable because other professional investors – specifically banks and LAs – are also willing to invest substantial amounts of funding in the project, at the same returns as crowdfunders[9].

[9] It is possible for investors to secure "senior" terms, i.e., to have priority call on funds when dividends or income coupons are paid, and/or to have first call on remaining funds if a project were to fail. This provides additional security to these investors. Some of the most successful projects do not appear to have senior debt, though others do.

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However, LAs may wish to consider seeking part of the funds needed from crowdfunding, topping these up from other sources. This may provide to projects some of the benefits of the crowdfunding model, in community engagement and support building, and enabling local people to own part of their community infrastructure, while also achieving larger total project values and keeping down the cost of financing by using cheaper PWLB money for most of the costs of the project.

3.5 Alignment with business models

In this section, we consider how well crowdfunding financing aligns to the four short term business models proposed by ESC which require financing[10].

Figure 6: Summary of financial and business model considerations

	Sleeved PPA	Private wire	Storage	Solar carports
Revenue level	Average – aligned to current/ forecast prices	High – savings vs public networks	High – wide range of revenues available	Average/ High – higher if onsite consumption is high
Revenue stability	High – fixed price for duration of arrangement	High – fixed price for duration of arrangement	Mid – each stream low certainty, but range gives overall stability	Mid/ Low – uncertainty on EV demand (higher stability if other onsite demand
Risks	Mid/Low – community buy-in possible	High – community buy-in/participation, local off-taker	High – community buy-in/participation, local off-taker	High – level of EV up-take, community and local off-taker risk
Payback period	High – longer payback periods due to higher costs. However, business case for small scale crowdfunded projects might exist	Mid – higher revenues, though might be balanced by private wire costs	Low – revenue stream diversification may result in shorter payback terms, encouraging funding	High – uncertainty around EV take-up and community buy-in
Alignment with crowdfunding	Mid – community unlikely to understand the business model, but will accept. Can deliver easer that financing routes with high due diligence	Mid/ High – community more likely understand model. Higher revenues more likely to cover higher crowdfunding costs	Mid – higher risk, but higher returns benefit crowdfunders. Less likely to understand business model but more likely to accept due to higher returns available	High – adds an implicit community benefit and may allow rewards for local EV drivers or enable local EV take-up, which other models do not support

Source: Cornwall Insight

One of the key aspects to keep in mind while considering crowd funding is the limited availability of funds. Since the funders are individuals and since the amounts are small, it is important to understand that for a proposal to be successful it needs to be a good fit for this route of investment. There are some key factors that determine a 'goof-fit' proposal for a crowdfunded project. They are: innovation factor, environmental and social benefits, community engagement and the level of risk the investor will be bearing since crowdfunding platforms generally do not guarantee returns.

In the rest of this section, we consider the business models in more detail.

[10] Note that the solar and storage licensing agreement model is expected to be financed by third parties rather than the LA, and therefore is excluded from this report

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3.5.1 Sleeved PPA

Sleeving PPAs offer more revenue certainty that the fully merchant route, dependant on wholesale market volatility and uncertainty. From a crowdfunding perspective, a project with a sleeved PPA may prove attractive from an investment standpoint due to its ability to add certainty around possible returns. This level of certainty on returns may make the project more attractive on crowdfunding platforms, where revenue models are often highly uncertain and variable.

Also, since the LA is sleeving power into its own portfolio, there is the potential to add in a benefit or reward sharing scheme with community based investors where power is provided to other local offtakers. This could be akin to the “Power Pool” model considered under the long-term ESC business models, or to the extant Ripple Energy model.

3.5.2 Private wire

Similar to sleeved PPAs, there is a high degree of revenue certainty, and a lowering of costs incurred due to public network charges, which may support higher returns to crowdfunders. This may catch additional interest on crowdfunding platforms and make it easier to raise money.

As may be the case with a PWLB submission, the private wire business model’s higher revenues are accompanied by some higher risks. Appropriate communication with investors will be needed to ensure that the risk-reward balance of this model is understood. This is not necessarily a barrier to crowdfunding for these projects, though the LA should be clear on these risks when creating its investment brochure. Many crowdfunded projects to date have been rooftop solar (effectively a private wire model) which carries the same risks.

3.5.3 Storage & site optimisation

Crowdfunding for a battery asset aligned with generation capacity is more likely to be regarded as innovative by potential crowdfunders. The diversified revenue streams that are available to a battery asset will allow the LA to spread their risk over multiple markets and revenue streams, thus lowering the payback period, and making it a more lucrative offer for crowdfunders.

However, due to the exposure to merchant prices, there is still a risk of not being able to achieve their shorter payback periods that may see some impact on investor interest. There is also the possibility of passing on some rewards to the community which can also attract investment from local investors.

3.5.4 Solar carport

The solar carport business model with its integrated EV charging option presents risks but is ideal for a crowdfunded proposal as it is high on the innovation quotient and can also include elements of community rewards to crowdfunders, for example an allowance of free or low cost charging per month or similar concept, which could also potentially drive customers to use these EV chargers in preference to other chargers, or could provide chargers which enable low EV take-up to increase.

Similar to the sleeved PPA route, this model can show a firm line of revenue, albeit with the risk of the EV chargers incorporated. Other sources of investment will hold the LA s accountable for crystallisation of these risks, but crowdfunding platforms do not generally assure returns and the investors have a higher risk appetite – especially for projects which are innovative and have environmental and community benefit. For projects such as this an investor interest exercise could be carried out to understand whether there would be any uptake for a hybrid, debt-donation based crowdfunding model.

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4 Municipal Bonds

Note that, in this section, we consider a municipal bond raise solely for the purpose of delivering renewable generation. We would expect that in the real world it may be more likely for an LA to raise a bond to finance or re-finance other debt and capital programmes, rather than for the sole purpose of financing renewables.

4.1 Overview

The UK Bonds market trades around £2tn of Government (Gilts) and £2tn of Corporate bonds every year. The Green Bond market has grown from around £1bn in 2012, to over £35bn in 2021. Also in 2021, the UK government issued £10bn of Green Gilts. This offer was oversubscribed by £90bn, indicating a very high level of desire for the products.

Municipal bonds are those issued by LAs to meet their funding requirements. The UK Municipal Bond Agency (UKMBA) was set up in 2014 to meet a need for lower cost borrowing for LAs, during a period when PWLB rates were increased by 1%. The UKMBA could, at the time, provide capital at around 1% below the rate, close to the original PWLB rates. This compensated for greater difficulty in securing UKMBA funding, which is a more complex, slower and more costly exercise than obtaining PWLB financing.

The UKMBA offers three types of loans:

- Pooled loans over £1mn, for maturities over one year and with more than one LA jointly and severally liable[11] for the debt. Only light-touch credit checks would be required, not a full credit rating
- Standalone loans to a single LA of over £250mn, with the LA required to obtain a standard credit rating from one of the major rating agencies
- Short-term pooled loans under one year, with no credit rating

The UKMBA eases access to bond markets for small-scale loans by removing the requirement for LAs to obtain a credit rating, when they are seeking a pooled investment, as well as undertaking many of the associated administrative requirements. The pool approach also allows LAs to combine to meet the large size requirement of the bonds, which is necessary to allow a significantly lower cost of finance to be achieved than direct access to markets.

As the 1% uplift on PWLB rates has now been removed, and UKMBA rates are now expected to be in line with these rates, the additional complexity makes UKMBA less attractive than PWLB; no deals have been signed since the single March 2020 issue, on behalf of Lancashire County Council.

4.2 Enabling delivery

The internal process of deciding to take a loan will be similar for the Municipal Bond as for the PWLB, with the exception that a very large portfolio of assets would need to be secured in order to justify the additional complexity. UKMBA suggests that at least £250mn is the target for a standalone loan. Pooled loans may be smaller, at least £1mn, but still require the overall cross-LA target for issuance to be £250mn.

The process for securing a loan is set out in Figure 7. UKMBA indicates that it should take around 6 weeks to secure a credit rating from one of the principal credit rating agencies: Moody's, Standard & Poor's (S&P) and Fitch. The timescale for issuing a pooled bond to market is 6-8 weeks from reaching the minimum benchmark of £250mn, and the timeline for issuing a standalone bond is 2-4 weeks, assuming that a credit rating is in place for the LA.

[11] Jointly and severally liable means, in this case, that if an LA defaults on the debt, the remaining LAs would be liable for repayments. Each LA would be liable for a share of the default, in proportion to the size of the initial loan made to that LA.

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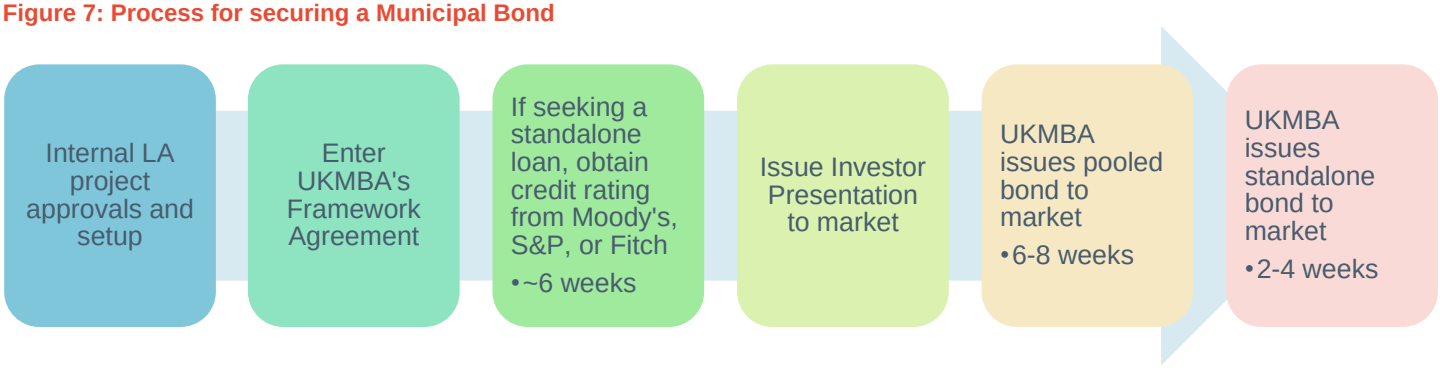
We note that the timeline for the UKMBA to issue bonds has historically been longer than this, but that this may have been due in part to the fact that this was the first issue conducted by the organisation. Delays are likely to arise around securing a credit rating for the LA (or, in case of the pooled structure, the bond itself), and writing and issuing the investor presentation or information memorandum. Once this is done, the raise will proceed in short order.

Figure 7: Process for securing a Municipal Bond



Source: From UKMBA

While it may be possible for LAs to go directly to capital markets to issue a bond, due to the complexity of this process, this is not recommended without specialist assistance. Likewise, it is possible to use another party to provide financial advice and support to issue a bond directly. These parties may be able to deliver smaller bond values and make issuance more viable for the purpose of financing renewable generation assets. However, the fees for issuance would be much higher than the UKMBA fees, and the process may be less well-organised than by the specialist party.

4.3 Potential barriers to delivery

The difficulty and level of due-diligence required by the UKMBA – and their investors – is much higher than the due diligence conducted by the PWLB. However, in either case, the LA is expected to have conducted the due diligence appropriate to the size and nature of the investment. Further, as – like PWLB financing – the loan is against the LA rather than the individual project, potential investors will be more interested in the financial position of the LA as a whole than the specific assets which the loan would be invested in.

Historically, LAs have been regarded as extremely creditworthy, and UKMBA notes that no LA has ever defaulted on a loan. This supports the supposition that they would attract a low cost of capital from investors. However, we note that the UK is entering a more economically uncertain period, and there have been recent *media reports* that some LAs may declare bankruptcy. This, along with the wider economic changes resulting in higher interest rates may impact on investor confidence and availability of capital to invest in LA bond issues. This may result in failed attempts to raise finance.

There are also considerable costs for due diligence. Obtaining a credit rating from *Moody's* can cost up to $2.4mn, *S&P* charge $7,500-$500,000 for a public finance bond up to $500mn, and *Fitch* charge $1,000-$750,000. While fees are likely to be towards the lower end of these cost ranges, this is still a considerable extra expense. There will also be costs of staff time and other overheads, to liaise with UKMBA and with potential investors.

Finally, we note that LAs may borrow from the UKMBA in order to invest to seek returns. However, if this is done, they will not be able to attract PWLB financing for any activities, so the wider LA financing need should be considered before undertaking this. As mentioned in the PWLB section, we do not (and believe Treasury would not) believe that borrowing to invest in renewable generation in order to decarbonise the LA's portfolio would be viewed as investing for return, and several case studies support this.

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4.4 Suitable projects

Due to the scale of the finance available, with a £250mn issue size, only very large projects or aggregations of projects should be considered for bond issues. For example, a group of LAs may wish to consider issuing a bond for full replacement of waste and bus fleets with EVs, and development of attendant chargers, solar and batteries. LAs may also wish to consider issuing bonds as part of corporate re-financing, which could include pre-allocated funds for renewable development which would then be held on account until required.

Projects on the scale considered under UCEGM, even if these are aggregated across all regional LAs, would not meet the scale required to raise finance via this route.

4.4.1 Historically successful bond issues

The only bonds issued to date by UKMBA have been a pair for Lancashire County Council, for a total of £600mn. These consisted of a £350mn, 5-year bond and a £250mn, 40-year bond. Both have fixed interest rates, with the former set at 0.8% above Gilt and the latter at 1% above Gilt, a 0.73% reduction against the comparable PWLB rate[12].

Considerable interest was shown from the markets for both instruments, with demand reaching £700mn for the five-year bond, twice the sought investment. Tranches of £100,000 were made available to investors. As this was a stand-alone bond (as opposed to one on behalf of a pool of LAs), credit checks were implemented, with Moody's rating the Council at Aa3 negative – an investment-grade credit rating[13].

No specific projects have been financed by the finance raises, which were to fund the long-term operations of the Council. The returns will be paid by the Council's full array of income streams. The funding was used to minimise calls on the PWLB, which was charging a higher interest rate at the time of the investment being sought. Aside from the Lancashire loans, no transactions have been successfully completed, and the UKMBA is significantly behind in its *reporting cycle* on its website.

UKMBA has been on the verge of issuing pooled bonds for multiple LAs on a number of occasions. A coalition of councils led by Warrington Borough Council cancelled an issuance in December 2020, instead funding the acquisition of solar farms via the PWLB (see above). Barnsley Metropolitan Borough Council and Westminster City Council were also announced to be participants in a pooled bond in April 2020, although the lack of successive announcements implies that work on this matter has been suspended. UKMBA suggested in July 2021 that it hopes to issue its first pooled bond "before the end of the year", although this appears did not happen within the designated timeline. However, LAs continue to sign up to the agency's framework agreement, for example *Cambridgeshire* in November 2021.

4.5 Alignment with business models

In this section, we consider how well issuance of local authority financing aligns to the four short term business models proposed by ESC which require financing[14]. Like the PWLB, bonds would be raised against the LA's entire balance-sheet, so here we include the consideration of a secondary loan using PWLB money to a special purpose vehicle owning the assets and using the business model in question.

[12] However, note that this would now represent a 0.27% uplift on the PWLB rate
[13] Moody's considers any rating over Baa3 as investment-grade
[14] Note that the solar and storage licensing agreement model is expected to be financed by third parties rather than the LA, and therefore is excluded from this financing report

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Figure 8: Summary of financial and business model considerations

	Sleeved PPA	Private wire	Storage	Solar carports
Revenue level	Average – aligned to current/ forecast prices	Average – savings vs public networks so potential additional revenue but can't pay off early	High – wide range of revenues available	Average/ High – higher if onsite consumption is high
Revenue stability	High – fixed price for duration of arrangement	High – fixed price for duration of arrangement	Mid – each stream low certainty, but range gives overall stability	Mid/ Low – uncertainty on EV demand (higher stability if other onsite demand
Risks	Mid/ Low – flexibility on destination of power	Low/Rising – investor appetite apparent, but more risky environment going forward	Mid – local offtaker risk	High – level of EV take-up, local offtaker risk
Payback period	Mid/ High – high risk business model, though investors are not lending against the project so will be less concerned	Mid – higher revenues reduce payback, though wire adds cost	Mid – high revenues expected, will drive low payback periods but no opportunity to return capital early, so would have to take risk on issuance	Mid/ High – high risk business model, though investors are not lending against the project so will be less concerned
Overall alignment	Key factor is the small size of each LA's potential portfolio against the around £250mn minimum financing size of the bond. Raising capital through bond issuance probably relies on either grouping several dozen LAs, each looking to invest several or even tens of millions of pounds in the near future, or a small number (or single) which is looking to raise capital as part of a wider re-financing It is also worth noting that bond issuance is more difficult, less flexible, slower and more expensive than obtaining PWLB financing, while also not currently offering a reduced cost of capital against PWLB loans			

Source: Cornwall Insight

Refer to sections 0 to 2.6.4 for more in individual business models – the key differences between PWLB and bond issuance in terms of business model alignment are that there is typically no option to re-pay bonds early, unlike the PWLB, and the larger minimum fund size and higher repayments which are currently the paradigm for LA-issued bonds.

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5 Project structuring and location

5.1 Asset holding structure

In terms of raising finance, the holding structure of assets can have significant impacts on the costs of capital and the ways in which LAs will look to access finance. In particular, many LAs have found that the private sector practice of establishing one or more asset-specific Special Purpose Vehicles (SPVs) a useful tool.

SPVs are companies which hold the assets, and may employ directly related staff, but which are legally separate from the main body of the organisation. This means that any risks or debt is ring-fenced, which can lower the risk of the investment, and make it more easy to bring equity and some forms of debt into the project – though this is less relevant to LAs which have very low cost routes to financing through the balance sheet.

LAs can invest either by transferring assets to the SPV, by loaning money to the SPV to build assets at favourable rates compared to the rates which the SPV would be able to access commercially, or by buying an existing SPV which owns assets. It would retain ownership of the company, which in turn owns the assets.

This SPV structure may also make it easier for multiple LAs to each own part of a project, or aggregation of projects, without increasing the level of risk to which they are exposed. This would ease the creation of a joint venture (JV) between two or more LAs, or a partnership between LA(s) and private sector entities.

Finally, the SPV structure may make it easier to sell assets and realise capital value, if there is a need to do this in the future.

However, there are certain drawbacks. Contractually, this is a more complex structure than simply holding assets on balance sheet, and there may be different incentives for the company and the LA, over the long run. This may particularly have an impact on setting power prices (where the SPV will wish to maximise profits, whereas the LA may wish to reduce costs), and how power is distributed between the LAs who own the SPV in case of sleeving.

There may also be tax implications which we cannot comment on, but again we believe that these are well understood by LAs.

We also note that the large-scale routes to raising finance discussed in the report – the PWLB and municipal bonds – raise capital against the LAs balance sheet and income. Money raised would then be invested in the SPV. This does dilute some of the benefits of an SPV, which are often used to ring-fence a project away from the balance sheet and protect the main company in the event that the SPV fails. The SPV would still provide protection to other LAs, in the case of a joint venture, if one LA was to fail.

LAs may find that they are able to access the bond markets directly through an SPV, though at the scale discussed this is not likely to be a beneficial or low-cost route to financing, compared to the options discussed in this report.

5.1.1 Examples

Many LAs have established SPVs for holding assets or to use as arms-length vehicles for regional service delivery. Examples include Colchester Borough Council's *Colchester Commercial Holdings Ltd*, which has three subsidiaries: Colchester Amphora Trading, which is a service provider to LAs and other private clients, Colchester Amphora Homes, a housing developer, and Colchester Amphora Energy, which provides energy consultancy services and operates a *district heating network*, as well as delivering energy efficiency services.

In the UCEGM region, the Manchester Civic Quarter Heat Network is held and operated by a structure of SPVs. This allows the network to operate on a more flexible basis and access some of the efficiencies of a private company, such as lower procurement requirements (regarding procurement rules as best practice guidelines rather than enforced restrictions, for example) and more freedom to engage specialists on a full-time or contractual basis to build expertise.

Warrington also owns its three solar farms via SPVs. The structure in this case allowed its partner Gridserve to develop and build out the assets, before Warrington bought ownership of the SPVs and with them the assets.

5.2 Building out of area

In our discussion with UCEGM LAs, several noted that they intended to develop renewable generation assets only within their areas. Given the urbanised nature of much of the Greater Manchester region, and particularly of the regions of several of the LAs, this does intensely restrict the opportunities for developing renewable generation on a large scale.

5.2.1 Benefits of out-of-area approach

We note that limiting the area available for building out projects is extremely detrimental to the economics of projects – comparing solar generators on rooftops to similarly-sized ground-mounted arrays sees a capital saving of 30%-50%, compared to *rooftop array costs* of c.£1,100-1,200/kW, for small arrays of 10-50kW. Scaling up to the "typical" merchant array size, now in the range of 30-50MW, could deliver a further capital saving, of costs in the region of £400-500/kW, installed on a turnkey basis[15]. Reducing these investment costs would drive lower levelised costs of electricity generation and thus improve the overall business case.

There are also opportunities for deployment of onshore wind (and potentially, if a sufficiently large aggregation of LAs could be assembled), offshore wind in the north west region. This may also offer a lower investment cost per unit of electricity, compared to deploying solar. Wind generation, or a mix of solar and wind generation sites, may also deliver a generation profile which is better aligned to the consumption profile of the LAs then solar alone can. Matching these profiles is key to delivery of value in several of the routes to market, particularly sleeving models.

If a LA can invest in large ground-mount arrays instead of smaller replace rooftop arrays, this may present a better business case, even when considering that it may be required to pay third-party charges and levies to sleeve power into the LA's portfolio. Given the risks around policy levies being removed from retail electricity bills, this should be considered in business planning.

Looking at location from a policy and regulatory standpoint, we observe several key take-aways:

- From an energy industry viewpoint, if energy is not being generated in the immediate vicinity of consumption (in general behind the same boundary meter), then it does not matter where in the country this is done. There is no benefit to local energy provision in the current market paradigm[16]
- In the May 2022 *PWLB guidance*, Treasury specifically provides the example of purchasing land in a neighbouring district for the purpose of deploying renewable energy generation as something which the PWLB is designed to support, noting that this is an example of service delivery in advancing environmental and climate change mitigation policies

[15] Note that these figures have been shared with us anecdotally by partners involved in solar array development at various scales; these figures are pre-2022 energy crisis and we understand that equipment and installation costs have increased throughout Q2 and Q3 2022, due to high demand and low availability. Nevertheless, the trend of larger assets built away from other structures being much cheaper has not changed

[16] Note that various policy and regulatory workstreams may alter this over the next decade, many of which are described in section 6

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- LAs – most notably Warrington – have delivered investment using PWLB funds into electricity projects which are located well out-of-area in the real world. Warrington's two initial projects partially route power to decarbonise the LA's own portfolio, and partly deliver power to national markets to support decarbonisation of wider national energy use
    - It is also key to note that Warrington purchased assets which had seen initial development by full-time solar/ storage developers, engaging in the market as a private sector investor/ corporate might. Looking out-of-area would expand the potential pool of projects an LA look to purchase or invest in
    - This route requires a level of sophisticated understanding of energy markets and investment practices which most LAs may lack, and does limit development of some skills at the LA, but also is likely to have delivered worthwhile cost savings by engaging the competitive development market which Invitations to Tender (ITTs) issued by LAs have struggled to access

5.2.2 Dis-benefits of out-of-area approach

We understand that LAs are looking for several benefits from the deployment of renewable generation. Reducing carbon emissions, as well as providing financial returns or savings, are the core of this. Providing local employment and value to local businesses, environmental co-benefits in, for example, biodiversity around solar arrays, and local regeneration are all also considerations. Siting a project out of region may provide additional value for the former elements, but would not target latter elements.

The siting of generation assets out-of-area also does not offer the opportunity for delivering local energy market models. These are not currently beneficial, but, as discussed in section 6, there are several workstreams ongoing which may improve the viability of local energy markets over the next decade or so, well within the lifetime of most renewable generation assets.

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6 Regulatory change

6.1 Policy levy re-allocation

Policy levies make up between 25-30% of the delivered cost of grid connected electricity. While schemes like Feed-in-Tariff (FiT) and the Renewables Obligation (RO) closed to new entrants in 2019 and 2017 respectively, and therefore the amount recovered from consumers bills is decreasing over time, the Contracts and Difference (CfD), the Capacity Market (CM) and the Climate Change Levy (CCL) are ongoing. Furthermore, due to the up to 25 years of support accorded by the FiT and RO schemes, these are expected to form part of customer bills well into the next decade.

In addition, there is a focus on developing CCS infrastructure and non-fossil fuels including large hydrogen storage facilities to enable the decarbonisation of energy intensive industries. The business models and associated costs are still being debated by Government, but this is likely to impose further costs on energy consumers to subsidise these technologies, in the form of new policy levies to enable the UK to meet its net zero target.

Levies are principally recovered from electricity consumers, as volumetric levies on electricity suppliers, which are passed through to electricity retail bills. However, with Government looking to the reduce the costs of electricity consumption, in part to levelise the operating costs of heat pumps with gas boilers (and also to mitigate the cost of living crisis), there are ongoing suggestions that some existing policy levies will be re-allocated from the electricity bill to either general taxation, a new carbon tax, or to the gas bill.

In the first two instances, the impact on the cost of generating power onsite or importing via a private wire would be minimal, while the cost of importing power from the grid (from a supplier or via a CPPA) would fall by around £45-50/MWh in 2025-26.

When such a re-allocation of policy levies might be implemented, and to what extent policy levies would be re-allocated, is not yet clear but we expect that there will be some action on this point by the end of the decade at the latest, unless the incoming administration changes the strategic direction of the sector.

6.2 Local Energy Markets and Licence Exempt supply

Several industry workstreams are underway which may impact the potential viability of local energy markets; particularly, we highlight code modifications *P441 Creation of Complex Site Classes* and *P442 Reporting Chargeable Volumes for Exempt and Licensed Supply*. Both modifications would allow end-users to avoid some of the current costs of policy levies and network charges.

P441 would enable aggregations of generation and consumption in the same local area – specifically, connected to the same substation – to net off volumes in each half hour, and only pay charges on the excess or shortage of generation. This could save perhaps £100/MWh of charges and levies on the netted power. The modification is currently ongoing, with an initial timeline looking for a decision from the regulator, Ofgem in late 2023 and implementation perhaps in April 2024; however, we note that this timeline is likely to slip. A business model would be enabled by this modification which would allow sale of power to local consumers on better terms than consumers not in the local area.

P442 would enable license exempt suppliers (i.e., small suppliers and those providing to non-domestic consumers) to avoid some policy levies on energy supplied anywhere on the national public network. This would formalise and automate an existing manual process, and could save around £50/MWh on relevant power. Again, the modification is currently ongoing, with the same proposed timeline as P441 and a similar likelihood of delay or slipping timelines.

There are strong arguments that Ofgem would not approve either modification in the form initially proposed, as this would advantage some consumers over others and may give them a “free ride” in terms of some

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costs to which they would otherwise be exposed. However, there are also arguments that the modifications would simplify processes and help deploy more renewable generation assets without need for subsidy.

6.3 Network charging reviews

Ofgem issued a *final decision* for its Access Significant Code Review (SCR) in May 2022. This set out its intention to reduce upfront connection costs for new users, with these costs socialised across all connected users. This is not likely to significantly impact the position of energy generation users.

However, the regulator had already (in February 2022) removed transmission network charging for small distribution-connected generators, and has also removed a wide-ranging review of distribution use of system charges from the scope of the review. Both elements remain under assessment but are being taken forwards under ongoing workstreams, rather than being completed alongside the rest of the Access SCR.

The transmission network charging for small generation workstream is expected to result in Transmission Network Use of System (TNUoS) charges being implemented for exports from distribution-connected generators under 100MW in capacity, from April 2027[17]. Depending on where in the country generation is being connected, this can be a cost or a benefit, with generators further north generally paying more and generators further south earning more.

The Distribution Use of System (DuoS) Charges SCR *was launched* in February 2022, as Phase 2 of the existing Access SCR. It will review charging methodologies for Low Voltage, High Voltage and Extra High Voltage users, including the balance between usage- and capacity-based charges, improvements to location signals on network costs and benefits, improved predictability of charges for EHV users, and protection for small users from sharper charging signals.

6.4 Contracts for Difference

While the projects considered under the current spread are intended to be under 5MW in size, and therefore ineligible for the Contracts for Difference (CfD) subsidy scheme, we note that the recent AR4 *results* saw many solar projects successfully receive subsidy. These were sized as small at 6MW, and secured a strike price of £45.99/MWh in 2012 money.

In February 2022, the government *announced* that it would be moving to annual CfD auctions (from the previous bi-annual intention), with this having two potential impacts. First, there may be a larger number of solar sites – and indeed other technologies – which will secure CfDs in these auctions and need to find partners to offtake power. This may increase the potential availability of CPPA deals to LAs, which could help with securing partners for the Solar and Storage Licensing Arrangement business model. Second, it may bring more projects to market for a source of finance, widening the pool into which LAs may be able to invest. Third, it may provide a more accessible revenue stabilisation route for LAs bringing generation to market, particularly as LAs consider larger projects, opening a further route to market for generation projects.

6.5 Network decarbonisation

The average emissions of the GB electricity system is targeted to fall to zero by 2035, *according to BEIS*. National Grid Electricity System Operator (ESO) forecasts in its Future Energy Scenarios (FES) that under scenarios which meet net zero emissions by 2050 (Consumer Transformation, System Transformation and Leading the Way), net carbon emissions from the electricity generation system will fall to zero in 2033 or 2034.

[17] These charges are already levied on transmission-connected generators and large distribution-connected generators

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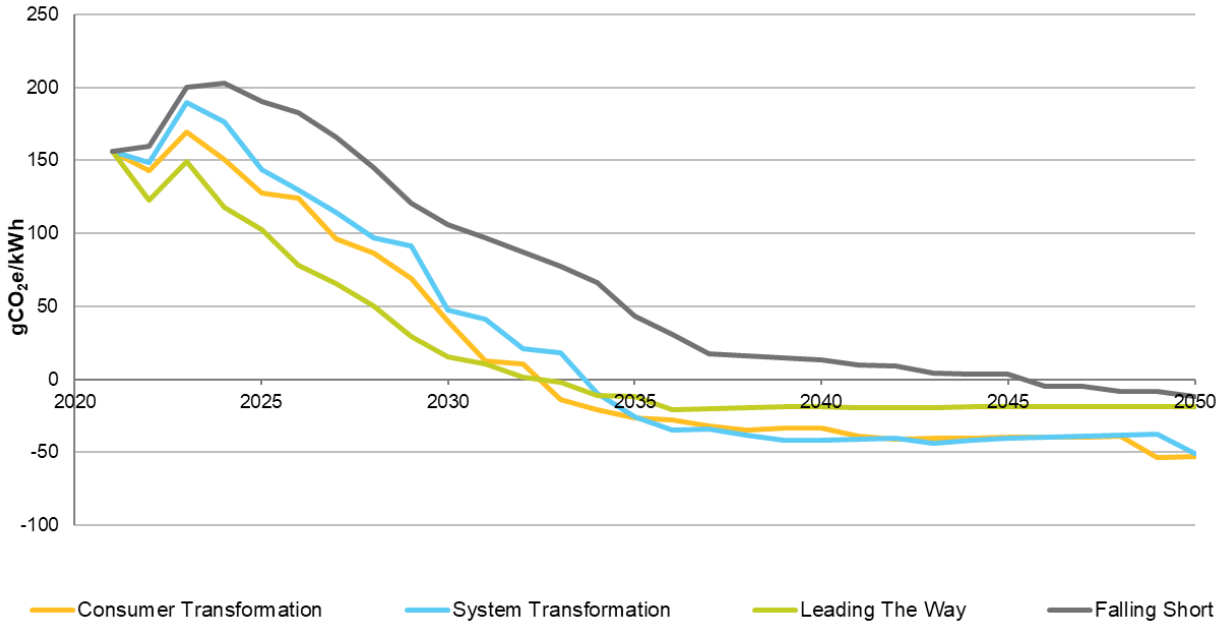
Figure 9: Net carbon emissions under various future scenarios, 2022-2050



Source: National Grid ESO

This effectively means that LAs looking to decarbonise their electricity supply simply need to wait, with the decarbonisation of the national system providing this service to them. In terms of their overall portfolio, they may then be better advised to spend their limited resources in converting their fleet and heating sources to electricity, in order to deliver decarbonisation across the estate.

In terms of arguments for delivery of renewable generation by LAs, early decarbonisation, cost reduction, cost stabilisation and creating local benefits should be prioritised over reaching net zero. Earlier decarbonisation increases likelihood of remaining within carbon budgets, meaning that this is still an important incentive for LAs to invest in renewable generation.

6.6 Locational Marginal Pricing (LMP)

Discussions of the potential reform of wholesale markets have increased over the past few months, to the point at which reformatting of the GB wholesale power market appears likely. ESC called for nodal pricing in October 2021, National Grid Electricity System Operator (ESO) suggested locational marginal pricing (LMP) as the best solution to wholesale market issues in May 2022, and Ofgem is currently running an assessment of the potential benefits of location pricing.

We reinforce that no decision has yet been made to do more than consider options for reform, but BEIS's Review of Electricity Market Arrangements, *launched July 2022*, discusses five potential options for reform of which two are LMP models.

6.6.1 What is LMP?

Under the current wholesale market, the British Electricity Trading & Transmission Arrangements (BETTA), there is a decentralised bilateral contractual model where all parties take positions through contracts to determine prices and manage risk. Generators "self-dispatch" – i.e., decide for themselves when they will run – and ESO balances the system and establishes a single imbalance price to recover the costs of uncontracted trades.

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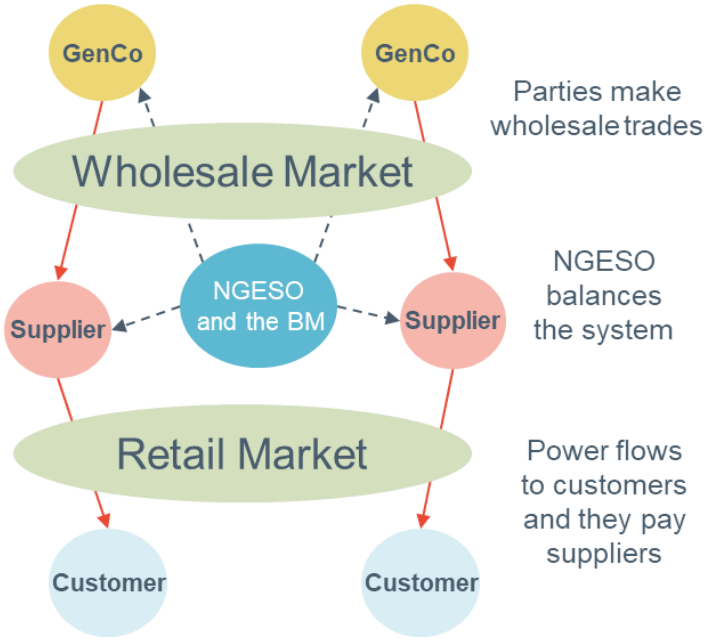
Figure 10: Current GB wholesale market design

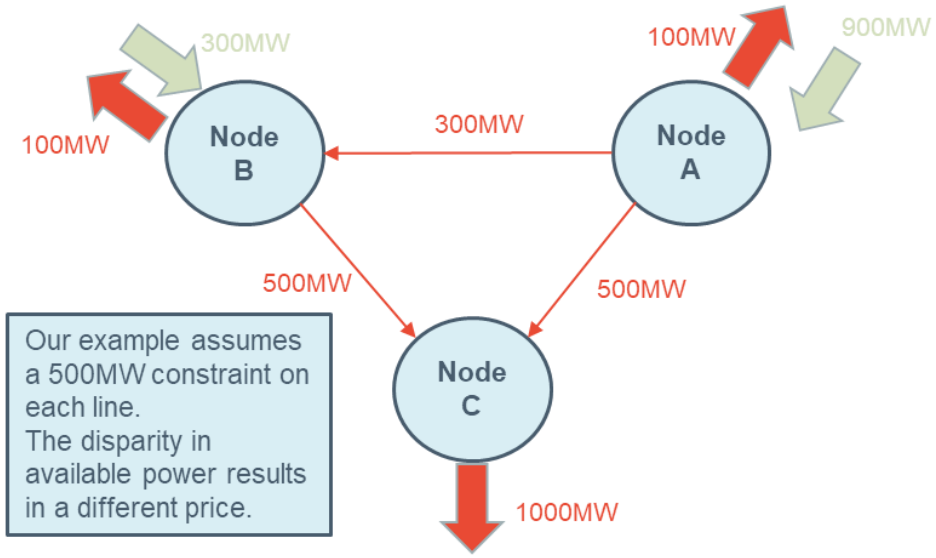


Source: Cornwall Insight

However, ESO and other parties including the regulator and government have expressed concerns that even with significant investment, constraint costs are rising at a material rate. Balancing the network is becoming more challenging and requires higher levels of re-dispatch, and interconnectors and storage are sometimes flowing in a direction that exacerbates constraints. Furthermore, current market signals will not unlock the full potential of flexibility which will be needed to deliver a net zero electricity system.

The **nodal pricing model** would see GB move to a wholesale market with central dispatch, where parties no longer contract bilaterally but are dispatched by ESO to take account of the physical characteristics of the system. Rather than a single national price, the Nodal Marginal Price is equal to the cost of supplying an additional megawatt of load at the node by the cheapest possible means – whether this be a local generator in the node or importing power from another node.

Figure 11: Nodal constraint and dispatch model



Source: Cornwall Insight

The decision for a fundamental reform sits with BEIS, but given the far-reaching impacts and large costs of a change, considerable work needs to be done before any change is implemented. ESO has estimated that implementation is credible within five years, but could take as long as eight.

6.7 PWLB changes

With *recent increases* to the Bank of England base rate, from a historic low of 0.1% in 2020 and 2021 to the current 1.25%, the PWLB rate and other lending rates have also increased. Raising the base rate is one tool for fiscal policymakers to tackle high inflation, such as that currently seen in the UK and global economies, and some analysis forecast continuing rate rises. These increases to the cost of debt will have significant impacts on the cost of renewable generation projects, where most spending is at project launch and the cost of capital a fundamental driver of overall project costs.

There also remains the possibility that central government may re-implement the 1% uplift to PWLB borrowing, which was seen October 2019 to November 2020. This uplift, which was a political decision, made PWLB finance less attractive compared to other potential sources of finance such as municipal bond agencies, and before the rate was lowered it is believed that several bonds were on the verge of issue.

Though alternative funding sources like municipal bonds will be available to LAs, they are attached to a greater level of administrative overhead and cost. These latter points mean that LAs are likely only to be able to raise funds as part of wider financing or re-financing efforts at the LA, again adding to administrative overheads.

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7 Glossary

Acronym	Term	Definition
	Arbitrage	Buying cheap and selling expensive power is the key source of revenue for battery storage. This term also covers the value of shifting generation to more high-priced times of the day.
BEIS	The Department for Business, Energy and Industrial Strategy	Government department responsible for, among other things, the electricity sector. Forthcoming *replacement* with the Department for Energy Security and Net Zero (DESNZ) was announced on 7 February 2023.
	Capital adequacy	The ability of an institution to cover the repayments on its loans. For LAs, this is an important measure because it sets a threshold on borrowing, based on available income to repay loans.
CfD	Contract for Difference	The current government mechanism for subsidising renewable power generation. Has run four allocation rounds to date, providing support for around 22GW of generation, as prices which – in the latest auction – are not out of line with usual wholesale prices. Was bi-annual, moving to annual from 2023. Generators have their income fixed to a "strike price", which is compared to a reference price to set extra income or a requirement to pay back earnings.
CPPA	Corporate Power Purchase Agreement	A contract between a generator and an end-user, usually a large corporate, to sell power directly, or to fix the price of power via a financial mechanism. Can be used by the largest corporates to underpin the construction of new renewable generation.
FiT	Feed-in Tariff	A closed government mechanism for subsiding renewable generation, which continues to operate for accredited generators. These plant are provided a payment for each MWh of power generated, and a further payment for power exported to the grid.
GB	Great Britain	The electricity systems of England, Wales and Scotland form a single market, with common rules, regulations and operations. The Northern Irish electricity system is distinct from this, forming part of the All-Ireland system and operating under different rules and its own codes and regulators.
	Generator	A producer of electrical power
kWh	Kilowatt hour	A unit of power, commonly used to express prices for energy tariffs.
LA	Local Authority	Local government entity which provides services to a regional community. There are several types: a two-tier system of counties, with districts and boroughs under them, untiered unitary authorities, and combined authorities which provide services to a wider region
LMP	Locational Marginal Pricing	A new wholesale market paradigm being considered under REMA, which would see multiple locational wholesale prices created, in place of the current national pricing model.
MWh	Megawatt hour	1,000kWh. A unit of power, commonly used to express prices for wholesale energy.
	Merchant	A generator business model where power is produced and sold on the wholesale markets. Revenues are very uncertain, changing with changing wholesale prices, and it can be difficult to finance projects on this basis
	Offtaker	A purchaser of electrical power, either for re-sale to end-users (suppliers), or for their own use (end-users)
PPA	Power Purchase Agreement	A contract between a generator and a supplier to offtake power, setting a value for the power and attendant characteristics, often including REGOs, over a set term. The value is often expressed in terms of a discount to the GB Day Ahead market price.
	Prudential Code	A framework supporting strategic planning, asset management and capital investment by LAs, published by the Chartered Institute of Public Finance and Accountancy (CIPFA).
PWLB	Public Works Loan Board	Funding line provided to LAs by HM Treasury, to finance capital projects.
REGO	Renewable Energy Guarantee of Origin	A certificate which carries the environmental credentials of a MWh of renewable power. It is traded separately from the power itself, and the power carries no environmental aspects without the REGO.

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Acronym	Term	Definition
REMA	Review of Electricity Market Arrangements	A root-and-branch review of electricity trading arrangements, announced in July 2022 by the Johnson Government. Considering various reforms which would fundamentally change how generators and consumers experience power pricing in GB.
s151	Section 151 officer	The finance officer responsible for signing off applications to the PWLB and, more generally, for proper administration of the LAs financial affairs. Named for section 151 of the Local Government Act 1972.
	Sleeving	See CPPA
SPV	Special purpose vehicle	A company set up to own and operate a specific asset or assets, mostly as a holding structure. Use can allow multiple owners to invest in a single project.
UKIB	UK Infrastructure Bank	An organisation set up to provide funding to LAs and private sector organisation

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