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Renewable Energy Good Practice Guidance

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Foreword

Most local authorities already have some experience of renewable energy generation, usually through building mounted solar PV systems. The confidence that owning and operating these systems has brought is leading an increasing number of local authorities to consider owning larger renewable energy generating assets, either solar farms or wind turbines. Getting involved in these projects offers local authorities potential reductions in greenhouse gas emissions, and more certain energy pricing.

This is an updated version of the guide, originally published in September 2020 to provide additional information in relation to industry and policy changes. This guide has been updated to help both members and officers of local authorities who are considering asset ownership to understand the potential risks and benefits and how these can be managed.

Since the original publication of the guidance there have been significant changes, both in terms of UK energy markets, but also in relation to Council investment activities through changes to the guidance on use of Public Works Loan Board funds. Councils are keen to meet their decarbonisation targets and locally generated electricity will be a key part of that mix. Generating electricity, on a scale that is proportionate to a council's needs, and in line with meeting decarbonisation goals, is not an activity primarily for commercial gain and therefore should not fall foul of the new lending criteria.

If the UK is to meet its' legally binding net zero emissions targets, it will need to accommodate at least a fourfold increase in renewable energy generation by 2050. This will be across all technologies, from offshore wind projects to domestic rooftop solar. The Government's British Energy Security Strategy published in April 2022 sets out the ambition that by 2030, 95% of British electricity will be produced by low-carbon means, and by 2035 the Government aims to have a fully decarbonised electricity system.

Energy security is high on the political agenda and recently led to the creation of a new Energy and Net Zero Department. Furthermore the Government's own, MISSION ZERO - Independent Review of Net Zero (publishing.service.gov.uk) includes 129 recommendations aimed to help the UK secure net zero investments and meet its net zero target in an affordable manner – many of which relate to the production of carbon free electricity. Local authorities are significant consumers of electricity and by investing in generation to meet their own needs, can make a significant contribution to the delivery of that green generation.

Written to be accessible to a non-technical audience, the guide also provides practitioner insights for the more technical reader. A wide range of topics are covered and illustrated with case studies to provide peer learning and insights on turning aspirations into real projects with guidance at a more practical level in some areas.

I hope you find this updated guide useful and that it encourages you to understand what ownership of renewable energy generation could bring to your authority.

Councillor Linda Taylor

Leader, Cornwall Council

1 Executive summary

Several local authorities already own either large solar farms or a wind turbine, with many of these benefitting from financial support from previous subsidy regimes. A significant increase in renewable energy provision in the UK will be required if legally binding targets to be carbon neutral by 2050 are to be met. The Government's British Energy Security Strategy (ESS), published in April 2022, sets out the ambition that by 2030, 95% of British electricity will be produced by low-carbon means, and by 2035 the Government aims to have a fully decarbonised electricity system. As part of the ESS, the Government has increased its ambition for offshore wind and solar and aims to improve the planning process for onshore wind.

Furthermore the Government's own, MISSION ZERO - Independent Review of Net Zero (publishing.service.gov.uk) includes 129 recommendations aimed to help the UK secure net zero investments and meet its net zero target in an affordable manner. The review proposes that the Government should take forward ten priority missions, of which four relate to renewable energy generation and local authority deployment:

1. Grid and infrastructure: a strategic framework and delivery plan for the critical networks of the future to turbocharge development.

2. Solar: Full-scale deployment of solar including a rooftop revolution to harness one of the cheapest forms of energy, increase our energy independence and deliver up to 70GW of British solar generation by 2035.

3. Onshore wind: Pave the way for onshore deployment, working closely with communities to deliver local benefits.

7. Net Zero Local Big Bang: Unlocking the planning system and reforming the relationship between central and local government to give local authorities and communities the power they need to act on net zero.

The ESS deployment targets, coupled with the priority missions, provides opportunities for more local authorities to own renewable energy generating assets, to offset their own carbon emissions and provide stable energy pricing.

This document focuses on wind turbines and utility scale solar PV farms.

1.1 Size and technology choice?

For English local authorities, solar PV is more likely to be a viable option due to the significant planning constraints associated with the development of new onshore wind turbines.

In the main, to work without subsidy, solar farms will either need a corporate style power purchase agreement (PPA) (which could be with the authority), a private wire connection or to be larger than 10 MW.

Where wind turbine opportunities do exist, these will need either a private wire connection or to be larger than 10 MW.

Local authority projects are often smaller than commercially led schemes, as the drivers for their development are different. Smaller scale solar PV schemes are relatively common in local authorities wanting to produce some or all of their own electricity, to contain costs and decarbonise supplies, whilst providing a visible representation to their communities of their activities to tackle climate change. Recent changes in the lending criteria for Public Works Loan Board (PWLB) make it increasingly important that the scale of local authority schemes is proportionate to their electricity supply and decarbonisation goals.

Where a local authority has already secured a decarbonised electricity supply, there is still scope for 'in area' schemes which contribute towards wider decarbonisation goals, and private wires

which can provide price certainty for local businesses or utilities.

1.2 Develop or Acquire?

For local authorities looking to own a renewable energy asset there are four basic options:

- Develop a project on owned land
- Develop a project on third party land
- Acquire project rights (land agreements, planning consent and grid connection offer) from a commercial developer
- Acquire a fully built and commissioned project

Aside from these options, some local authorities may be offered opportunities as part of an approach from a developer to lease land. This type of opportunity will need to be carefully evaluated in terms of procurement options.

Developing small schemes on local authority land holdings can be an effective use of land which has no other purpose, but local authorities considering this should bear in mind that small schemes may not have the same economies of scale that larger ones do. In addressing their own emissions, a local authority may need to bring forward a series of smaller developments to meet their targets.

Table 1 below sets out the main considerations when deciding which is the best route for your authority.

Table 1 – Options for Project Acquisition and Development

Option	Potential Advantages	Things to consider
Self-develop on your own land	• No rental payments • No need to acquire land rights and establish clean title • No onerous restrictions or lease end date • Likely to be within the geographical boundary of the authority • Smaller schemes can be considered, and projects can be sized to match an authority's own consumption	• Do you have a site which is suitable in terms of size, location, and planning policy? • Will you be forgoing an existing income stream? • Do you have another use for the site? • Is a suitable grid connection available? • Reputational issues if the site is in proximity to housing or has been promised for another use • Do you have the skills and capacity for the development? • Are you prepared to risk the development costs? • Design, procurement and construction risks to be managed
Develop a site on third party land	• Identify site for its suitability (both size and location) rather than its ownership • Wider search area and therefore more chance of finding a viable grid connection or private wire	• Viability model will need to account for landowner rent • Capacity to acquire the site on appropriate terms for the development • Time constraints introduced through the land acquisition period (for example option periods) • Asset lifespan limited by lease arrangements • Do you have the skills and capacity for the development? • Are you prepared to risk the development costs? • Design, procurement and construction risks to be managed
Acquire project rights from a third party	• Removes development risk, avoiding potentially abortive costs and providing certainty • Land rights, accepted grid offer, and planning consent will be in place significantly reducing capacity required in the authority to deliver the project	• Viability model will need to account for the landowner rent and for costs of acquiring the project rights • Asset lifespan limited by lease arrangements • Design, procurement and construction risks still to be managed • Project rights are well sought after in a competitive market. A local authority can potentially lack credibility as a purchaser compared to a financial institution who has undertaken several similar transactions • Rights are unlikely to be available at a scale or location which is preferable to the authority (bear in mind for example managing construction of a project several hundred miles away) and flexibility may be required

Option	Potential Advantages	Things to consider
Acquire a completed project from a third party	• Removes development and construction risks, avoiding potentially abortive costs and providing certainty • Land rights, accepted grid offer, planning consent and functioning asset will be in place significantly reducing capacity required in the authority to deliver the project • Private sector developers often prefer to sell post construction and commissioning • Private sector contractors can procure more freely and consequently often build at a price significantly lower than the public sector. Quality may also be higher due to ongoing relationships with construction companies	• Viability model will need to account for the landowner rent and for costs of acquiring the project – although this may be less than the combined cost of acquiring project rights and constructing the asset through public procurement • Asset lifespan limited by lease arrangements • Projects are well sought after in a competitive market. A local authority can potentially lack credibility as a purchaser compared to a financial institution who has undertaken several similar transactions • Authorities will only have the ability to bid on existing projects and cannot therefore drive scale or location

1.3 Risk Management

Development of renewable energy projects carries a number of risks which need to be managed and mitigated. Key areas of risk are:

1. Development risks – particularly in relation to land rights, availability of grid connection, planning risks and viability. Whilst local authorities possess many of the necessary skills in relation to land rights and planning, they are likely to require specialist support in obtaining and managing grid connection offers and in assessing project viability.

2. Construction and procurement risks – these relate to ensuring that the asset delivers the levels of electrical production anticipated by the business case. There are a wide range of challenges associated with the construction and operation of a renewable energy project. Much of this risk can be mitigated by selection of an appropriate form of contract with suitable production guarantees, accompanied by the appointment of competent technical and legal advisors.

3. Operational risks – these largely relate to ensuring that revenues are as anticipated in the business case. Many of these risks can be mitigated against by appropriate forms of contract, strong technical support and contractual guarantees on availability.

4. Income risks - These are a combination of production and price. Production risks can be mitigated against by strong build and maintain contracts transferring as much production risk as possible to the contractor. Price risk is key in assessing viability. The Department for Energy Security and Net Zero produce forecasts for wholesale electricity prices, but the information is not technology specific. Local authorities considering renewable energy projects should consider the acquisition of commercially available price forecast data which is technology specific (see Section 1.4).

1.4 Forecasting renewable energy prices

Following a decade of falling prices, the post pandemic period has been characterised by supply constraints and price increases. The long term trend is that technology prices will continue to fall (especially for solar) leading to increased appetite. The pace and scale of future local authority renewable energy deployment will ultimately depend on the confidence of the expected return from a project's business case, the revenue and economic factors of which many remain volatile. Subsidy-free development carries higher revenue risk. This is a big challenge to local authorities who need to understand and quantify complex price risks, especially around forecasts. The change to a fully commercial landscape has also fostered innovation such as combining energy storage and solar PV on the same site and an evolving power purchase agreement market, which have been crucial in establishing commercial viability of projects.

To be confident in investments, local authorities need data and insight to allow better investment, strategic, and operational decisions for projects. Climate Response - Local Partnerships has an agreement with Aurora Energy Research (Aurora) to give councils access to a technology specific dataset for inclusion within a final business case at a discounted rate. Aurora is at the forefront in modelling and forecasting renewable technologies in the UK, European and global markets.

1.4.1 Electricity supply

Councils are already dealing with significant financial pressures that have resulted from reductions in government funding and rising demand for services for a decade or more. These pressures were exacerbated throughout 2022 as the UK economy witnessed rising inflation and a growing crisis in both food and energy markets, alongside a slower-than expected recovery from COVID-19 and Russia's invasion of Ukraine. Volatile and rapidly increasing energy prices have added real pressure to many council's budgets.

The Aurora January 2023 baseload wholesale electricity price forecast shows prices decreasing between 2023 and 2030 due to lower gas prices. Notwithstanding, this pricing is still sensitive to further changes in Russian gas flows as geopolitical tensions remain high. This makes energy procurement more complex than other local authority procurement categories, particularly as price forecasts remain elevated (over £250/MWh). Councils needing to renegotiate contracts soon should therefore consider:

- Energy efficiency and demand reduction measures.
- The use of an Electricity Consumption Forecasting Tool to better understand procurement needs after considering the effects of decarbonisation interventions and areas of growth (Local Partnerships are due to publish a tool in early spring[1]).
- Reassessing attitude to risk – clearly councils will be aiming to achieve best value in terms of pricing. However, a balance may need to be struck between stability (e.g. contract length) and value for money.
- Maintaining regular dialogue with suppliers or procuring organisations. Market conditions are still likely to affect the price that can be achieved. Procuring organisations should be able to advise when it is a good time to go to market, and how best to package the council's requirement.
- It is important to note that energy supply contracts, entered into by local authorities, are subject to procurement rules. Each Council therefore needs to be mindful of procurement metrics already established e.g. supplier performance (both environmental and social performance).

- Ongoing alignment of the needs of all the councils (not just the lead council) where energy is being procured through collaborative frameworks/ procuring organisations.
- Benchmarking of offers.
- Eligibility for the Governments' Energy Bills Discount Scheme - GOV.UK (www.gov.uk)

1.5 Income from Electricity Generation - Subsidies and Power Purchase Agreements (PPA)

Two forms of subsidy support are potentially available to new renewable energy generating stations:

1. The Contracts for Difference (CfD) scheme is the Government's main mechanism for supporting low-carbon electricity generation. The CfD scheme is a price guarantee mechanism, providing the generator with a guaranteed price for a fixed period of 15 years. The guaranteed price is secured via an auction process, with generators offering their best (cheapest) price for the electricity supplied. Sealed bids are ranked regarding their submitted strike prices (from low to high). Each project is then assessed against the capacity cap and maximum capacity limit criteria. If neither are exceeded, that project is deemed successful and will receive the clearing price for the delivery year. The auction utilises a pay as clear approach (subject to the capacity cap and capacity limit criteria), which means that each delivery year will have a clearing price and successful projects will be uplifted to the strike price level of the last affordable project in that delivery year.

   On 7 July 2022 the results of the CfD Allocation Round 4 (AR4) were announced, which awarded contracts to 10.8 GW of new-build low-carbon capacity, representing the largest volume of capacity procured in all CfD auction rounds held to date. Note all the prices quoted below for CfD are in 2012 prices. The key insights of the AR4 auction include:

   a. Pot 1 (Established technologies): Established technologies were eligible to participate in the allocation round for the first time since AR1 was held in 2015. 0.9 GW of onshore wind capacity secured contracts at a strike price of £42.47/MWh and 2.2 GW of solar PV capacity secured contracts at a strike price of £45.99/MWh. For onshore wind the most cost-effective projects in the auction were those located in Scotland.

   b. Pot 2 (Emerging technologies): 0.6 GW of remote island wind capacity secured contracts at a strike price of £46.39/MWh (16% increase from AR3). The auction also featured the first procurement of floating offshore wind (32 MW) and tidal stream (41 MW) at a strike price of £87.3/MWh and £178.5/MWh respectively.

   c. Pot 3 (Offshore wind): A record 7 GW of offshore wind capacity secured contracts at a record low price of £37.35/MWh (8% lower than AR3). The addition of AR4 capacity brings GB's total contracted offshore wind capacity to 27 GW by 2026/27, leaving a remainder of 23 GW to be secured in future allocation rounds in order to reach the Government's ambition of 50 GW by 2030.

In February 2022, the Government announced a change to the frequency of auctions for funding through the CfD scheme. The auctions will now take place every year rather than every 2 years. The change will take effect from March 2023, when the next CfD round (AR5) opens. Government appetite for future rounds of CfD for mature technologies appears to have increased as a price stabilisation mechanism. The accepted strike price for CfD is generally expected to be below the prevailing price forecast for wholesale electricity for the period. CfD is likely to be more effective for larger projects where fixed costs can be spread over a larger development.

2. On 1st January 2020, the Government introduced the Smart Export Guarantee (SEG) scheme, which will enable anaerobic digestion, hydro, micro-combined heat and power (with an electrical capacity of 50kW or less), onshore wind, and solar photovoltaic exporters with up to 5MW capacity to receive payment for exported electricity. The SEG scheme replaces the old Feed in Tariff (FiT) scheme that closed in Q1 2019. Under the SEG scheme, all licenced energy suppliers with 150,000 or more customers must offer at least one SEG tariff to small generators. There are currently 15 companies which are licenced to offer SEG rates. The Government has set out that in order to provide space for the small-scale export market to develop, there will not be any specified minimum tariff rate, other than a supplier must provide payment greater than zero at all times of export. The SEG licensees therefore decide how they want their SEG export tariff to work in terms of its rate, type and length. Storage is also eligible to receive export payments, although suppliers will be able to exclude 'brown' electricity from those payments and require the generator to put metering in place that isolates 'green' exports.

It is likely that smaller local authority projects will benefit from the SEG scheme , however in order to do so the power will need to be sold and the local authority is therefore unlikely to be able to count this as an offset against its' greenhouse gas emissions.

Aside from the CfD and SEG schemes generators are free to enter into other PPAs – including, amongst others, with large electricity supply companies, commercial companies, or even themselves. Where a local authority is either able to benefit from a private wire supply or purchase the electricity generated for its' own use there is the prospect of using this to reduce their greenhouse gas emissions footprint.

In the November 2022 Autumn Statement, the Government announced the introduction of a Electricity Generator Levy (EGL) and draft legislation was published on 20 December 2022. The key features of the levy are as follows:

- A temporary 45% levy on electricity generation revenues that exceed £75/MWh, a level far in excess of the SEG payment received by many smaller schemes.
- The levy will apply to revenues received between 1 January 2023 to 31 March 2028.
- A free allowance of £10 million per annum will apply per company or group, and groups generating below 50 GWh per annum are exempt, meaning that the vast majority of local authorities will not become liable for the payments as their generating assets will be below this threshold.
- The calculation will be carried out on an aggregate group wide level for a specific period (in-line with annual accounting periods).
- Payments will need to be made in line with the company's corporation tax payment dates.
- The levy applies to all generation volumes from nuclear, renewables, biomass and energy from waste generation which are not subject to a CfD with the Low Carbon Contracts Company Ltd (LCCC). So, for example, a local authority would need to consider its Energy from Waste (EfW) assets alongside any solar PV and other renewable energy assets when calculating its total generation for the purpose of the EGL.

The Government has published an updated technical note (the Electricity generator levy technical note - GOV.UK (www.gov.uk)) which gives further overview of the design of the EGL. We recommend each local authorities seeks to understanding if the EGL will impact on their scheme.

1.6 Conclusions

A number of local authorities have successfully invested in renewable energy generating assets and there are likely to be opportunities for other local authorities to follow suit. Whether it is better to seek to develop an asset, a series of smaller assets, or buy one from a commercial developer, will depend on the opportunities available and how each local authority responds to individual challenges. To remain compliant with PWLB lending rules, local authority schemes should contribute to a clear council objective and not be held for commercial gain.

Local authorities should not assume that it will be more cost effective to develop their own schemes. Solar PV and wind developers have worked hard to drive down costs in recent years and bring considerable leverage and expertise to the market. Some of these schemes are likely to offer better value for money, and at less effort, than development of schemes from scratch.
The most likely opportunities to be successful are commercial scale solar PV, either smaller schemes with a direct private wire to a customer, or larger schemes of 10 MW or more. Smaller schemes present challenges, with elements of fixed costs (such as switchgear and CCTV systems) making for increased prices per MW delivered and can be challenging to develop due to former uses or complex ecology. These sites should not be discounted – but careful consideration of risk and reward and robust financial modelling should be undertaken at an early stage.

Opportunities to develop new wind turbines in England appear to be limited at the present time, although in December 2022 the Government launched a technical consultation to explore how local authorities demonstrate local support and respond to views of their communities when considering onshore wind development in England. The consultation ran up until 2 March 2023, and forms part of a wider call for feedback on the Levelling-up and Regeneration Bill.
When considering where to sell the power the local authority will need to balance financial returns with their potential to offset the authorities' carbon emissions. Those authorities who have developed or purchased assets advise that good quality external advice will be needed, which ever route you are taking.

2 INTRODUCTION

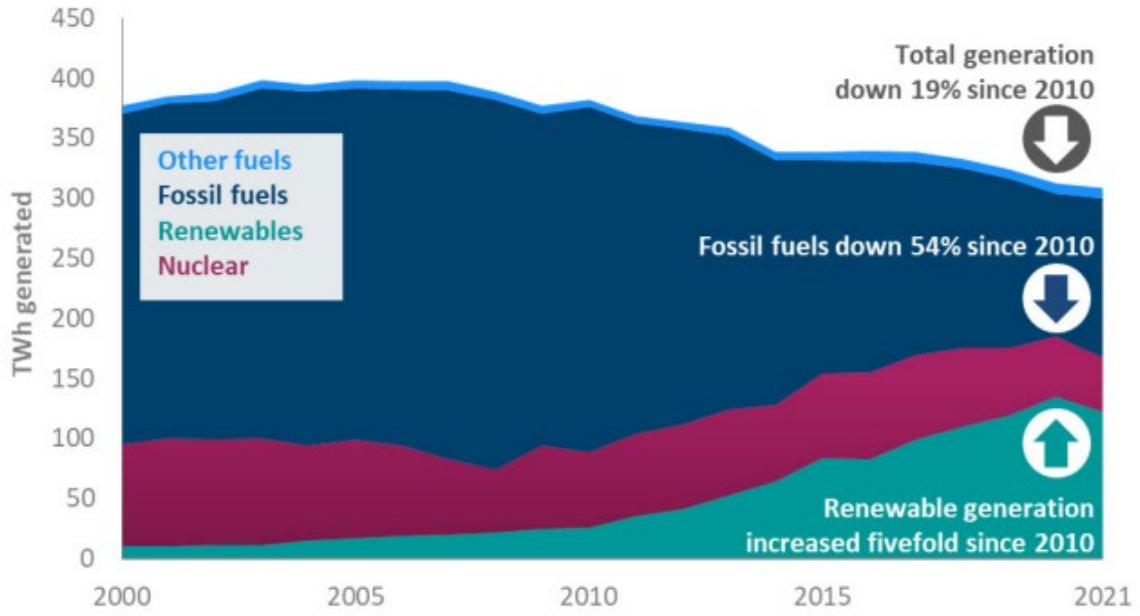
This guidance has been produced to help local authorities to understand the risks and opportunities associated with the development, purchase and ownership of large-scale renewable energy generation assets. Most local authorities already have some experience of renewable energy, through building mounted solar PV systems – however fewer have existing large-scale grid connected generating stations and it is these which this guidance is focused on. The most attainable technology is utility scale solar PV, although there may be opportunities for wind development for some local authorities. This guidance is focused on these two technologies.

The withdrawal of subsidies for energy generation through the Feed in Tariff (FiT) and Renewables Obligation Certificate (ROC) regimes means that large scale projects in the future will be delivered either without the benefit of subsidy, or with support through either the CfD) or Small Export Guarantee (SEG) schemes. The CfD is a price guarantee mechanism that is only likely to be available to larger generators, and in particular wind schemes in Scotland. The SEG is a mechanism that guarantees that small schemes will be able to sell the electricity produced but does not set a firm price.

2.1 Background

Renewable energy deployment in the UK has increased fivefold since 2010, largely in response to government subsidies. Figure 1 below shows the overall mix of UK electricity generation from 2000 until 2021.

Figure 1 – UK Electricity Supply, 2000-2021



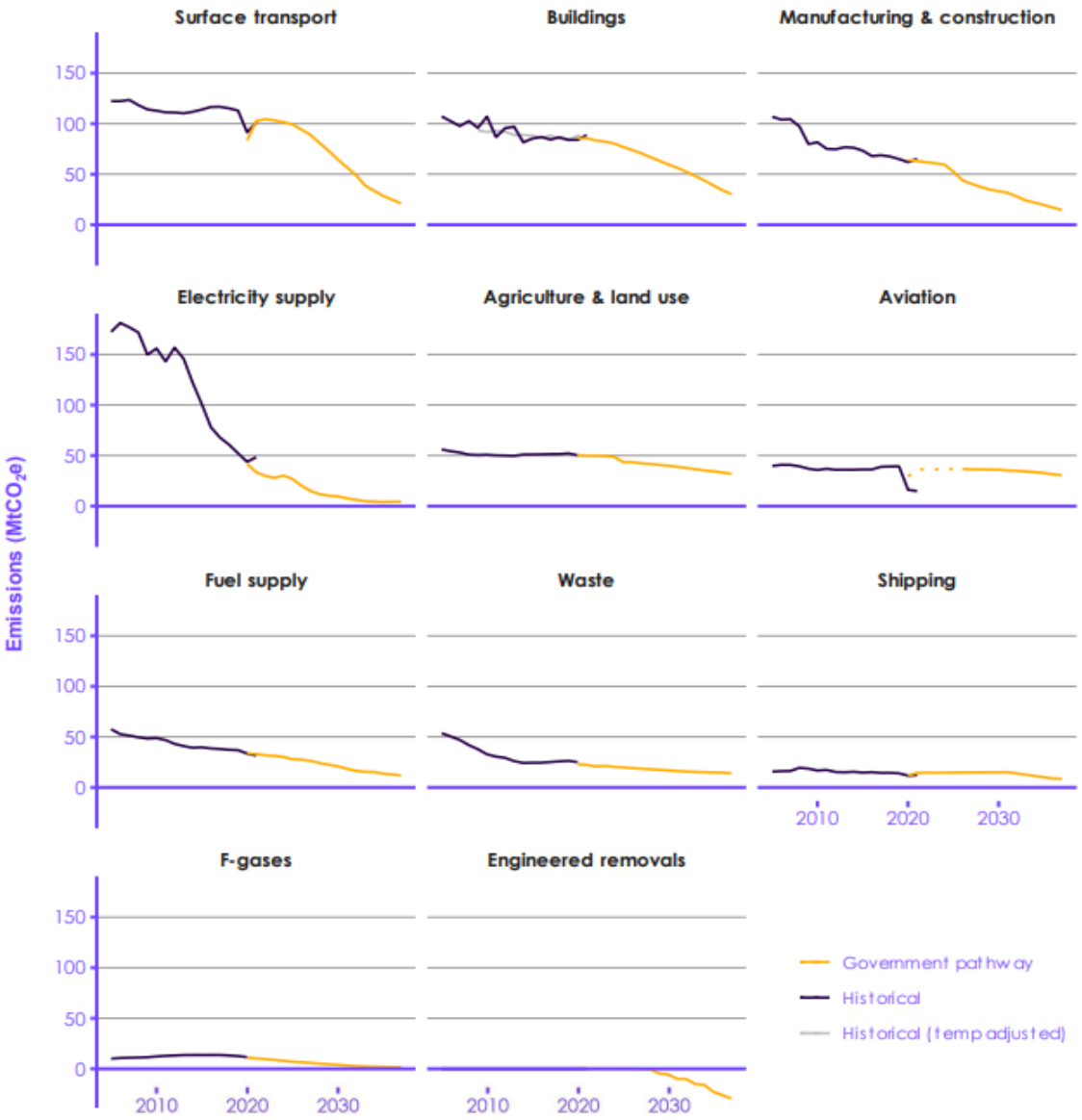
During the period 2015-2020, the overall proportion of renewable energy has continued to rise due to increases in offshore wind, supported through the CfD price guarantee mechanism, with very little new deployment for either onshore wind or solar PV following the withdrawal of the ROC subsidies in March 2017. The proportion of electricity generation coming from renewable sources decreased in 2021 but was still the second highest share on the published data series. The renewable share was 39.6% down by 3.6% compared to 2020. The reduced share for renewables was driven by a decreased share of generation from wind, as average wind speeds were unusually low for most of 2021.

Rapid increases in the fleet of gas fired power stations, alongside the deployment of renewables has seen significant progression in decarbonisation of electricity with the last remaining coal fired power stations due to be decommissioned over the next few years.

The emissions reductions seen so far (see Figure 2 below), are only the start of a longer journey to decarbonise the production of electricity. With the effective removal of coal from the network the next stages will require the removal of gas generation and its replacement with renewable energy and storage.

If we are to approach net zero emissions, more activities, such as heat and transport, will need to be electrified at the point of use, potentially increasing demand in the UK.

Figure 2 – UK historical emissions compared to the Government's pathway by sector



Source: Committee on Climate Change: [Progress-in-reducing-emissions-2022-Report-to-Parliament.pdf (theccc.org.uk)]

National Grid (NG) produce National Grid Future Energy Scenarios (FES) on an annual basis (the most recent being published in June 2022):

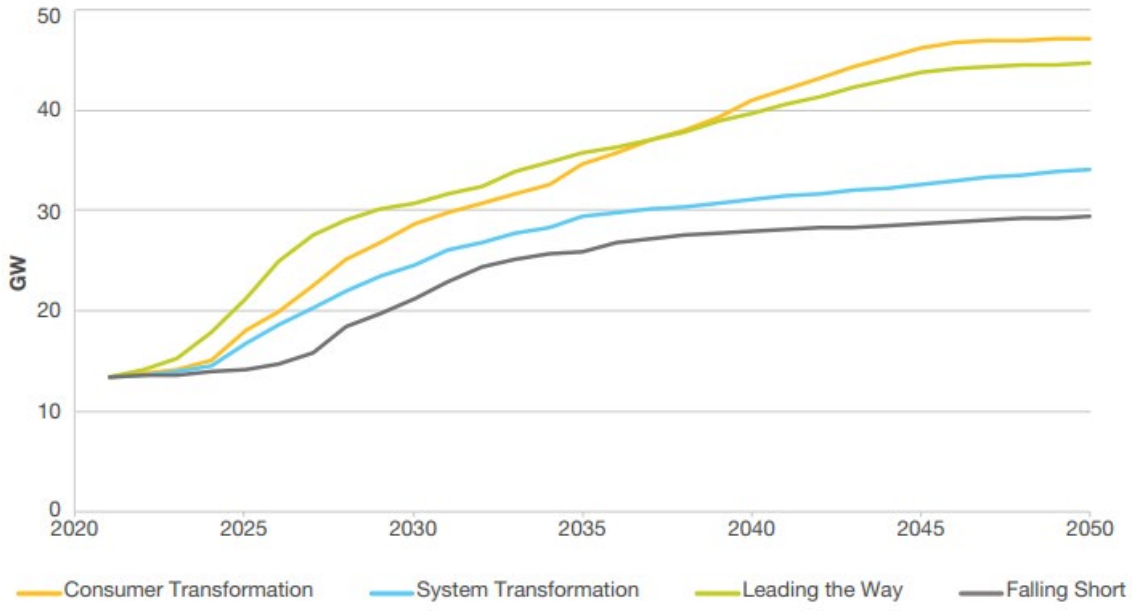
- The “Leading the Way” scenario describes the fastest credible decarbonisation journey, achieved through a combination of higher consumer engagement with world leading technology and investment. Leading the Way reaches net zero by 2047 and results in net annual emissions of -30 $MtCO_2e$ by 2050 (i.e. 30 $MtCO_2e$ are removed from the atmosphere). To put this into context, total UK emissions in 2020 were 426 $MtCO_2e$. This scenario includes more energy efficiency improvements to drive down energy demand, with homes retrofitted with insulation such as triple glazing and external wall insulation, and a steep increase in smart energy services.

- The “Consumer Transformation” and “System Transformation” scenarios represent two different ways to reach net zero by 2050 – either by changing the way in which energy is used or by changing the way it is generated and supplied. Under the Consumer Transformation scenario, a typical homeowner will use an electric heat pump with a low temperature heating system and an electric vehicle. Under the System Transformation scenario, a typical consumer will use a hydrogen boiler with a mostly unchanged heating system and an electric vehicle or fuel cell vehicle.

- The “Steady Progression” scenario has been renamed as “Falling Short” to reinforce how the scenario does not meet net zero by 2050. Whilst decarbonisation is slowest in Falling Short, emissions in 2050 are reduced by almost 80% of 1990 levels which would have been close to meeting the previous carbon reduction target. Under this scenario there is still reliance on natural gas, particularly for domestic heating. Electric vehicle take-up grows more slowly displacing petrol and diesel cars for domestic use; however decarbonisation of other vehicles is slower with a continued reliance on diesel for heavy goods vehicles.

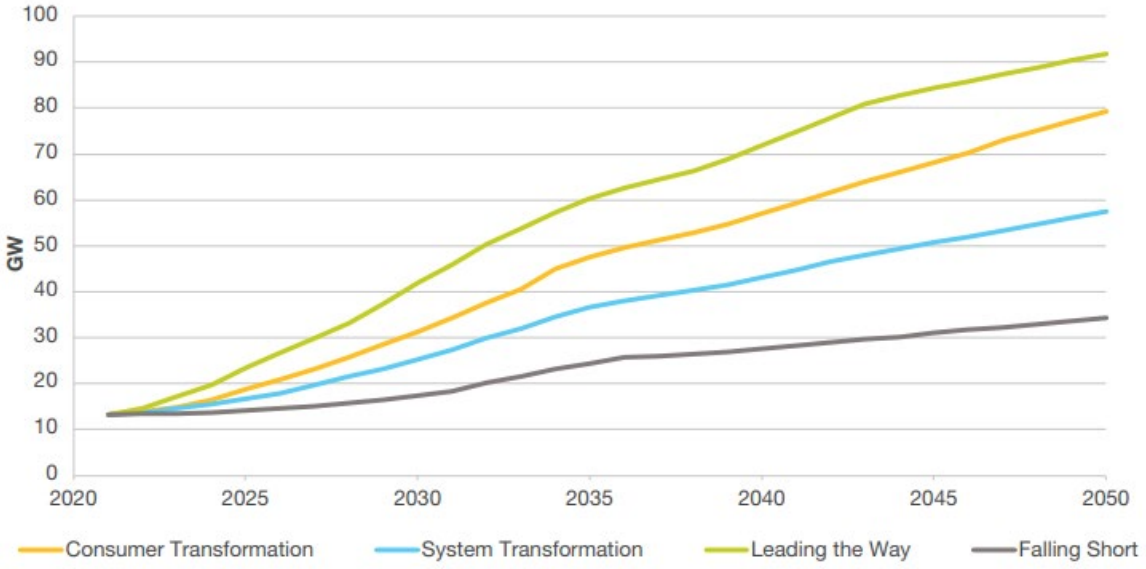
The UK has installed over 14 GW of onshore wind capacity to date. The Consumer Transformation scenario (see Figure 3 below) shows a near doubling of onshore wind capacity to 29 GW by 2030 and reaching 47 GW in 2050. In System Transformation and Falling Short, lower levels of societal change result in greater local opposition and difficulty gaining planning permission but capacity still increased to exceed 29 GW by 2050 in all scenarios.

Figure 3 – Onshore wind generation capacity



According to figures from the Government the UK reached 14.3 GW of installed solar PV capacity in December 2022 (link to Solar photovoltaics deployment - GOV.UK (www.gov.uk)). The FES scenarios show a wide range of outcomes for solar development (see Figure 4 below) which is dependent upon factors including price reductions of solar panels and electricity network capacity. The Consumer Transformation scenario shows a doubling of solar PV capacity to 30 GW by 2030 and reaching 80 GW in 2050. The Leading the Way scenario shows solar PV capacity reaching 91 GW in 2050.

Figure 4 – Solar generation capacity



The Government's ESS, published in April 2022, details plans to accelerate the development of renewable power generation. The Government expects the measures detailed in the ESS to result in an electricity generation mix that is 95% low-carbon by 2030. Furthermore, the ESS expects a five-fold increase in deployment of solar generation by 2035, with up to 70 GW installed. This is almost 10 GW higher than the NG Leading the Way scenario.

In 2022 the Government received MISSION ZERO - Independent Review of Net Zero (publishing.service.gov.uk) which includes 129 recommendations to Government. Recommendations which relate to renewable energy generation include:

- Recommendations 24, 26 and 30 - Government, regulators and industry should set up taskforces and develop deployment roadmaps for onshore wind and solar respectively in 2023 to reach required deployment levels for 2035 net zero grid.
- Recommendation 25 - Government should work with regulators, devolved administrations, local authorities, industry and key stakeholders to streamline the planning and environmental permitting processes to ensure new power generation can come online as soon as possible.
- Recommendation 28 - Government to ensure there is clear guidance to support case-by-case decisions, for example on sensitive issues such as siting and to allow new, innovative solutions, instead of technology-specific restrictions
- Recommendation 29 - Build up UK solar capability and provide the necessary training and certification.

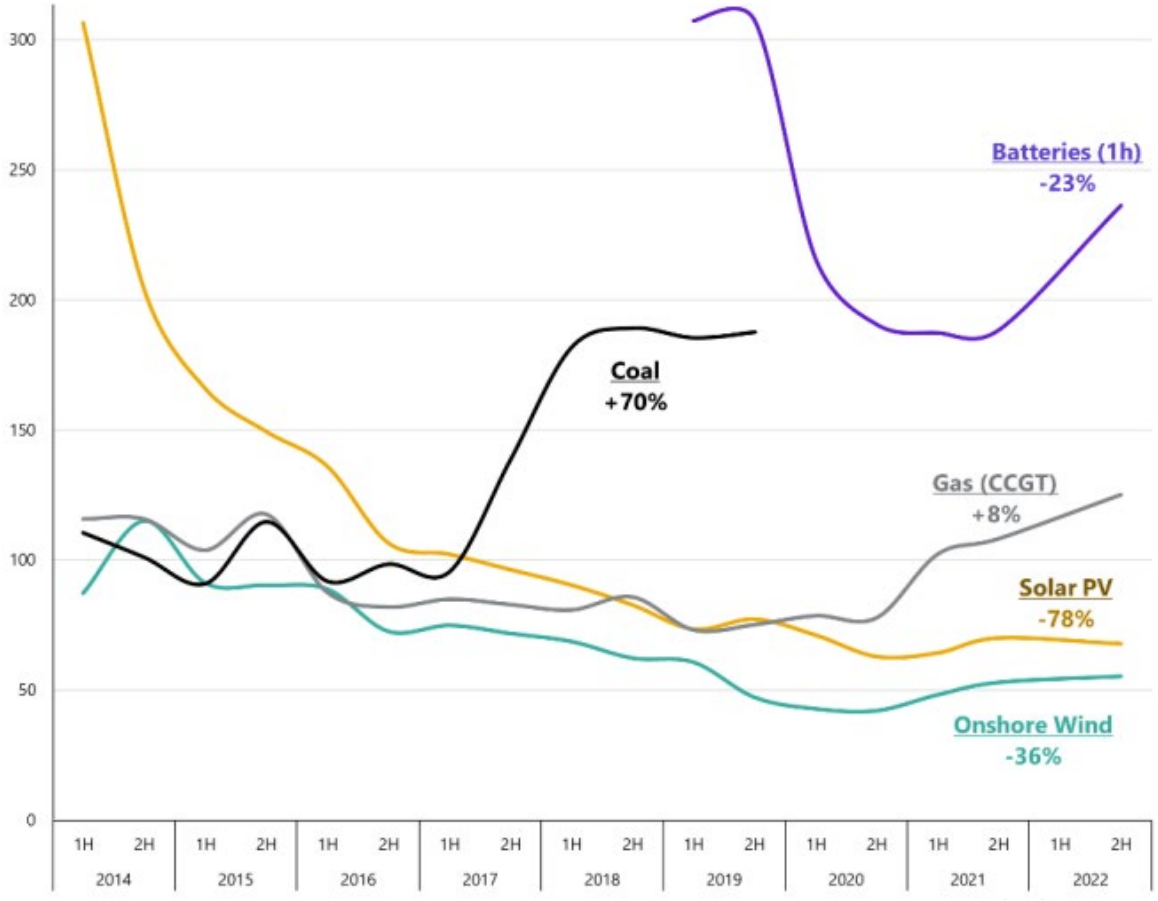
- Recommendation 30 - Build up UK wind capability and provide the necessary training and certification.

2.2 Costs of Renewable Energy Installations

As global deployment of renewable energy technologies increases, their capital costs have seen dramatic reductions. This has enabled deployment to continue, even as subsidies have fallen away in many countries.

As scale of production has increased the global prices for equipment have fallen significantly, leading to much cheaper installations at all capacities. According to Mission Zero, in the last decade, costs for solar PV and onshore wind in the UK have come down by 78% and 36%, respectively (see Figure 5 below). For most of the world's population, solar and onshore wind are the cheapest source of new-build power generation, and most renewable technologies are now cheaper than coal-powered plants. Once installed, renewable energy generation typically needs no further fuels and therefore reduces dependence on volatile fuel prices.

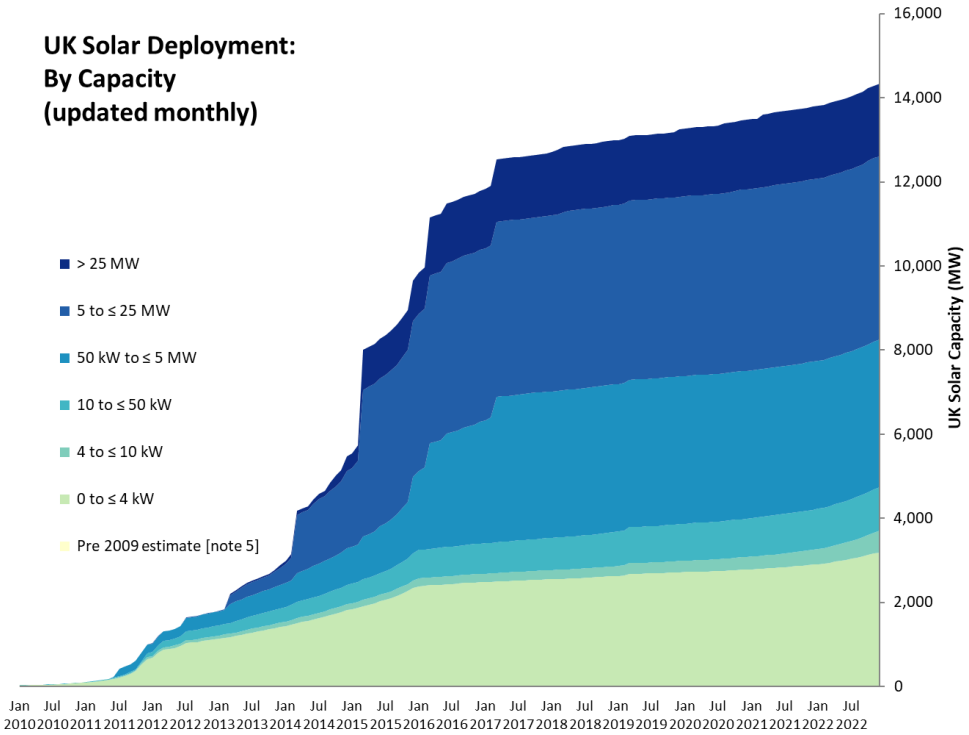
Figure 5 – UK Levelised Cost of Electricity (LCOE) data



2.3 Solar PV market overview

In December 2022, the UK had a total installed capacity of solar PV of 14.3 GW across 1,259,713 installations. This is an increase of 4.0% (555 MW) since December 2021. Of this utility scale solar PV (solar farms larger than 5MW or approximately 25 acres) makes up 42% of the total. A significant number of the early solar farms were just under 5 MW to meet subsidy qualification criteria. These are included in the 50 kW to ≤ 5 MW band in Figure 6 below.

Figure 6 – Solar Photovoltaics deployment in the UK - December 2022



Source: [Solar photovoltaics deployment - GOV.UK (www.gov.uk)]

The first UK solar farms, connected in 2010, were all under 5 MW as this was the maximum size allowable under the FiT scheme. The original FiT schemes ran for a period of 25 years, and this also came to drive both the lease periods for land and the 'temporary' periods granted for planning consent.

The rapid level of uptake of the FiT led the Government to close the scheme to larger solar generators in 2011. In order to make schemes viable, developers then looked to the alternative subsidy regime used to support wind development, the ROC. Unlike the FiT, the ROC scheme had no upper limit on size. Subsidises under the ROC were significantly smaller than under the FiT and so to achieve the necessary economies of scale the size of solar farms increased dramatically, with the first large scale solar farm (33 MW) connecting in 2013, at Wymeswold in Leicestershire.

The rate of build out has slowed significantly since the complete closure of the subsidy regimes in early 2017. The installations post Q1 2017 are largely backed with either private wire connection directly supplying a customer, or longer-term corporate PPAs. This certainty enables them to borrow money more cheaply and scheme viability is improved.

Explainer

- Installing a private wire directly supplying a customer provides a potentially higher price for the electricity as the customer does not have to pay the ongoing costs for using the electricity network.
- Investors seek corporate PPAs to provide security of income and investment certainty over time.

The interest in the corporate PPA market had led developers to actively re-enter the market. Solar Power Portal currently estimate that new solar sites, being scoped and planned, reached a total planned capacity of more than 68 GW (as of December 2022) up from around 20 GW in December 2021. Much of this development is in larger scale solar farms, sized in order to benefit from economies of scale and to cover the increasing cost of connections, which are more frequently requiring connections back to substations and on higher level networks.

The announcement from the Department for Business, Energy & Industrial Strategy (BEIS) that solar PV would be eligible to participate in the 2021 CfD auction (and future auctions) took the market by surprise. The levels of development observed over the last 2 years were not contingent on obtaining the CfD subsidy. However, the 2021 CfD auction has shown that solar PV developed in the right locations can be competitive.

Commercial developers are focusing on larger schemes (20 MW+) due to economies of scale however smaller schemes can be financially attractive if they have a private wire connection which uses most of the power generated.

Local authorities have developed a wide range of schemes, from small carport schemes up to 25 MW+ field scale projects. As drivers are different for public sector organisations i.e. carbon reduction and price stabilisation, as opposed to profit maximisation it is likely that local authority schemes will be smaller than commercial ones. The planning register suggests that local authorities in England and Wales have developed around 44 projects with an average size of 5.73 MW. By comparison current private sector developed projects are typically 40 MW+ in size.

The most promising opportunities for solar PV development are schemes with a private wire customer and schemes of 10 MW and above

Questions for Councillors: Why do we want to do this project and how does it deliver against our organisational priorities?

Questions for Councillors: Is this project large enough to have economies of scale? Or could it supply a customer directly?

Questions for Councillors: Improved financial returns can be achieved by selling to an external customer – but if we buy the electricity ourselves, we can claim the carbon benefits, which is more important?

2.4 Onshore Wind market overview

Onshore wind turbines are also potential projects in which a local authority could invest to produce renewable electricity. However, in comparison to solar PV, there are very few examples of local authority commercial scale development of onshore wind projects, with deployment being at the single or two turbine level and benefitting from niche land assets. Bristol City Council became the first local authority in England to develop and own wind turbines. The two-turbine project was installed at the former Shell Tank site at Avonmouth and was commissioned in December 2013.

The most recent example is Cornwall Council's commercial investment into a single turbine (2.3 MW) project which became operational in September 2020. The turbine is sited on Cornwall Council land at Ventonteague, near Carland Cross, on the A30. The rationale for the turbine is to help Cornwall better manage its energy supply and power the equivalent of around 1,180 Cornish homes, representing a significant contribution towards the Council's climate emergency agenda. Cornwall Council own and operate the wind turbine.

The UK has around 14.3 GW of operational onshore wind capacity. The first commercial wind farm in the UK was built in 1991 at Delabole in Cornwall. From the late 1990's onshore wind saw

sustained growth as the industry matured and the scale of turbines and size of developments increased.

Growth in the onshore wind sector has historically been supported by government revenue support mechanisms. The Non-Fossil Fuel Obligation (NFFO) was introduced in 1990 and covered renewable energy technologies, including wind energy. The NFFO was replaced by the Renewables Obligation (RO) in 2002 and the RO played an important role in stimulating growth in the onshore wind sector.

The cost of onshore wind energy has dropped significantly since the RO was introduced. In response to a reduction in the cost of onshore wind energy the level of support through the RO was reduced over time and was closed to new onshore wind power projects in April 2016. Following the closure of the RO, the CfD scheme was introduced. CfDs work by fixing the prices received by low carbon generation, reducing the risks they face, and ensuring that eligible technologies receive a price for power generated that supports investment.
Onshore wind was included in the first CfD allocation round in 2014 but was subsequently excluded from the second and third allocation rounds (in 2017 and 2019).

Onshore wind is an established technology and offers one of the least-cost options for renewable energy supply, delivering electricity cheaper than conventional fossil-fuel technologies. Despite the strengths of onshore wind energy, widescale deployment of the technology in England and Wales has been largely restricted since 2015 due to the local and national planning requirements. In 2015, the then Business Secretary, Greg Clerk made a ministerial statement setting two further tests for onshore wind development in England; firstly that new proposals should be in areas identified in local or neighbourhood plans as being suitable and secondly that following consultation applicants must be able to demonstrate that all planning impacts identified by local communities have been fully addressed and that the proposal has their backing. This was followed up in 2016 with legislation introduced under the Energy Act 2016 which provided local authorities with the final say for all onshore wind energy projects. These changes effectively provided local communities with a veto to block the development of wind turbines.

Since the policy was introduced in 2015 only 11% of local authorities have allocated areas for onshore wind farms. More recently there has been consultation as part of the 2023 National Planning Policy Framework consultation on a slight relaxation in the current position, the outcome of the consultation was not known at the time of publication. One such local authority is Stroud District Council which has put carbon neutrality by 2030 at the heart of its plans for the area, including a focus on renewable energy. The Council is encouraging new wind and solar installations having identified opportunities for wind and solar in the area as part of its local plan.

Figures from the UK Government Renewable Energy Planning Database show that between January 2016 and February 2022 (six years in total after the planning changes were implemented) just 14 planning applications for new onshore wind farms were approved in England, comprising a total of 31 turbines with a combined maximum installed capacity of 46.4 MW. This highlights the need for future projects to consider the influence of local communities within the proposals of onshore wind projects. In contrast, during the same period 139 planning applications for new onshore wind farms were approved in Scotland, comprising a total of 1,561 turbines with a combined maximum installed capacity of 5.94 GW.

Following the closure of the RO subsidy and exclusion of onshore wind from the CfD auctions in 2017 and 2019, the industry focus has been on driving down costs in order to reach a position where projects can be delivered based on revenue from commercial PPA's. This has largely been achieved through increasing the scale of projects, increasing the size of turbines and driving out cost from the development, construction and Operations & Management (O&M) phases.

In February 2022, the Government announced a change to the frequency of auctions for funding through the CfD scheme. The auctions will now take place every year rather than every 2 years. The change will take effect from March 2023 when the next CfD round (AR5) opens. Furthermore, the Government is to address restrictions on the development of onshore wind in England in its upcoming Energy Bill. A Private Member's Bill, that has been read three times in the House of Lords, aims to amend planning guidance introduced in 2015 (set out above) to enable local

authorities to grant more onshore wind applications for the purpose of meeting the UK's carbon targets. The Bill currently awaits its first reading in the House of Commons.

The Government's ESS, published in April 2022, also details plans for the Government to partner with local communities wishing to host new onshore wind capacity, promising them lower energy bills.

Whilst new grid connected projects will typically be relatively large, to provide the required economies of scale, smaller projects can still be viable when connected to local loads via a private wire.

The levels of community support required mean that very few schemes in England are likely to be deliverable. From a financial perspective small private wire schemes and larger (10MW+) grid connected schemes are the most likely to be deliverable.

The most promising projects for onshore wind are likely to be outside England and either be <5MW with private wire connection or larger (10MW+) grid connected schemes.

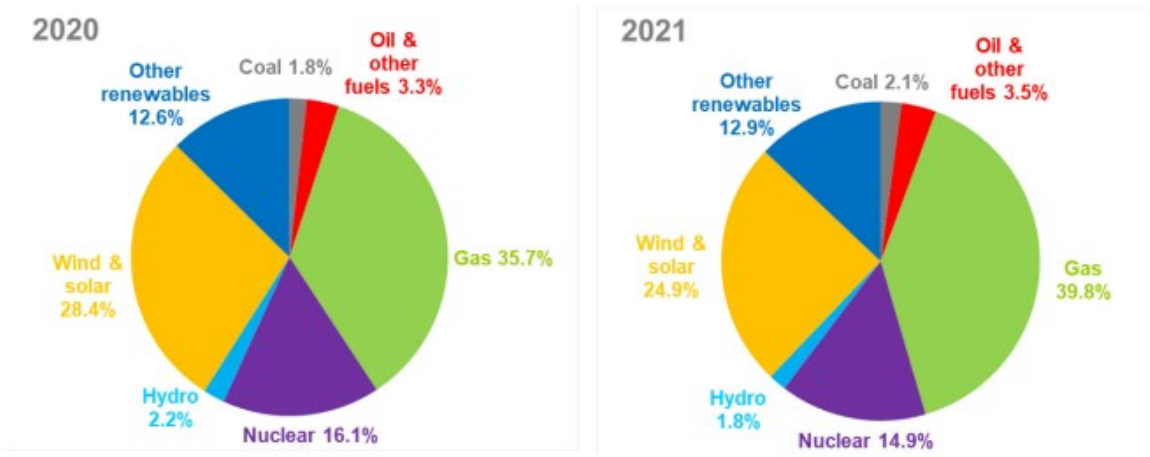
Questions for Councillors: What gives us the confidence that we can obtain the level of community support necessary for wind development in England?

Questions for Councillors: Should we consider investing in projects outside our geographic boundary?

2.5 Other renewable energy technologies

As Figure 7 below shows renewable energy and nuclear contributes over 50% of UK energy supplies.

Figure 7 – Electricity generated by fuel type, 2020 and 2021 (figures from UK Energy in Brief 2022 (publishing.service.gov.uk)



This guidance only covers onshore wind and solar PV which, in 2021 represented 24.9% of the UK energy mix. Other renewable energy technologies such as hydro and bioenergy are out of the scope for this guidance note.

3 Should you develop or acquire?

A number of local authorities already own solar farms and wind turbines, and these are a combination of those who have developed their own and those who have bought assets which were developed and built by private sector companies.

In this section we explore the relative merits of each approach and identify key points to consider in selecting a preferred option. Option selection will largely depend on the opportunities a local authority has on its own estate, its appetite for taking on new leasehold assets and its willingness to work outside its own geographic area.

3.1 Developing sites on your own estate

To establish whether a council has any suitable sites under ownership it needs to undertake an asset review, looking for suitability. If potential sites are identified, then it will need to establish whether there is a viable grid connection.

Following the ministerial statement in 2015, onshore wind schemes in England remain difficult to develop successfully. For solar PV, developing sites without subsidy will generally either require sites to be of a relatively large size, or to have a private wire customer as an off-taker for the power generated. The private wire customer could be the authority itself if the site is in the right location. Key factors to look for would be sites of 25 acres or more, which are not near housing and without planning designations or protections. As a rule of thumb 5 MW of solar PV will require around 25 acres of land, provided the ground is flat and unshaded.

Landfill sites can be suitable for solar PV development, provided the ground is stable. These sites are typically more complex and expensive to construct. Due to their often-overgrown nature mature landfill sites may also have complex ecology which will also need to be assessed as part of any planning application. Landfill sites are unlikely to be suitable for wind development, unless there is unfilled ground available. Where there is an existing grid export connection for generation of electricity produced from landfill gas there may be opportunities to use this as a cheap connection for a smaller scheme. Landfill schemes are likely to require a geological assessment and may also require earlier engagement of a specialist solar PV engineer. Examples of smaller local authority sites on landfill include two sites developed by Flintshire Council at Castle Park Landfill (2MW) and Crumps Yard (0.9MW).

Oldham Council have planning consent for a 0.9MW solar farm on former landfill and are in the process of procurement. This scheme is located within a built up area and there are likely to be opportunities to directly connect the supply to third parties via a private wire connection. The economics of small schemes are likely to be significantly enhanced if the Council can connect to a local customer via a private wire.

If sites of suitable size or location are identified, then the process highlighted in section 4.3.1 of this report can be followed to establish the potential for development prior to applying for a grid connection offer.

3.2 Options for Councils with no suitable land

Where a local authority is unable to identify any suitable land on its own estate there are three further options to consider:

- Find a suitable site on third party land to develop
- Acquire project rights from a third party
- Acquire a completed project from a third party

Table 2 below sets out the pros and cons of each of these options.

Table 2 – Options for Project Acquisition and Development

Option	Potential Advantages	Things to consider
Self-develop on your own land	• No rental payments • No need to acquire land rights and establish clean title • No onerous restrictions or lease end date • Likely to be within the geographical boundary of the authority	• Do you have a site which is suitable in terms of size, location and planning policy? • Will you be forgoing an existing income stream? • Do you have another use for the site? • Is a suitable grid connection available? • Reputational issues if the site is in proximity to housing or has been promised for another use • Do you have the skills and capacity for the development? • Are you prepared to risk the development costs? • Design, procurement and construction risks to be managed
Develop a site on third party land	• Identify site for its suitability (both size and location) rather than its ownership • Wider search area and therefore more chance of finding a viable grid connection or private wire	• Viability model will need to account for landowner rent • Capacity to acquire the site on appropriate terms for the development • Time constraints introduced through the land acquisition period (for example option periods) • Asset lifespan limited by lease arrangements • Do you have the skills and capacity for the development? • Are you prepared to risk the development costs? • Design, procurement and construction risks to be managed
Acquire project rights from a third party	• Removes development risk, avoiding potentially abortive costs and providing certainty • Land rights, accepted grid offer, and planning consent will be in place significantly reducing capacity required in the authority to deliver the project	• Viability model will need to account for the landowner rent and for costs of acquiring the project rights • Asset lifespan limited by lease arrangements • Design, procurement and construction risks still to be managed • Project rights are well sought after in a competitive market. A local authority can potentially lack credibility as a purchaser compared to a financial institution who has undertaken several similar transactions • Rights are unlikely to be available at a scale or location which is preferable to the authority (bear in mind for example managing construction of a project several hundred miles away) and flexibility may be required

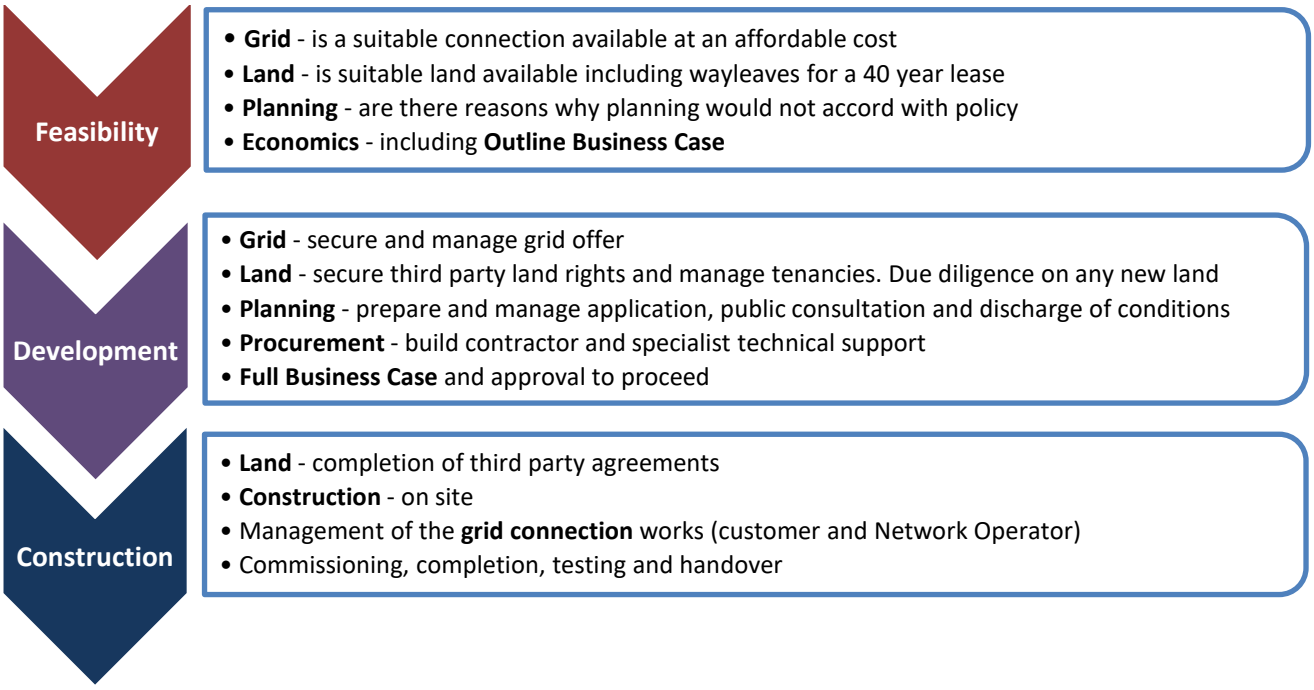
Option	Potential Advantages	Things to consider
Acquire a completed project from a third party	• Removes development and construction risks, avoiding potentially abortive costs and providing certainty • Land rights, accepted grid offer, planning consent and functioning asset will be in place significantly reducing capacity required in the authority to deliver the project • Private sector developers often prefer to sell post construction and commissioning • Private sector contractors can procure more freely and therefore often build at a price significantly lower than the public sector. Quality may also be higher due to ongoing relationships with construction companies	• Viability model will need to account for the landowner rent and for costs of acquiring the project – although this may be less than the combined cost of acquiring project rights and constructing the asset through public procurement • Asset lifespan limited by lease arrangements • Projects are well sought after in a competitive market. A local authority can potentially lack credibility as a purchaser compared to a financial institution who has undertaken several similar transactions • Authorities can only bid on existing projects and cannot therefore drive scale or location

4 Developing your own site

Whether you are developing on your own land, or on a third-party, site the principles of development are very similar, albeit the scope of some of the activities in relation to land rights will differ.

Unlike the development of projects, such as schools or housing, which a local authority may be more familiar with, renewable energy projects carry a relatively high degree of development risk, so the attitude to the management of the process needs to be a risk based one to avoid unnecessary abortive costs in the event of project failure.

4.1 Development Process



4.2 Risk Management approach to development

The nature of risk changes throughout the development process, but can be broken down into three main phases;

- Development risks – which occur up until the site has planning consent
- Construction risks – which occur from the point planning consent is granted until the facility is fully commissioned
- Operational risks – risks during the lifetime of the facility

4.3 Development Risks

The development phase entails bringing together the three elements of land rights, planning consent and a viable grid connection offer. The main risks during this phase are:

1. A failed scheme leading to the loss of costs spent to date
2. Reputational damage from a poorly managed process

4.3.1 Managing Development Risks – Feasibility Screening for Solar PV

The first step is to undertake a preliminary assessment of the potential of the site and screen for key risks. Table 3 below sets out the initial screening tests for both solar PV and onshore wind projects.

Table 3 – screening tests for potential projects – Solar PV

Risk Category	Action and Information Sources
Viability	Viability modelling will depend on how much sun the site receives (irradiation), cost of development and construction, operating costs, the amount of power produced, and the sale price of the power produced. As a rule of thumb solar PV sites with a forecast irradiance of less than 950kwh/kwp are unlikely to be viable. The irradiance forecast is constant, the other factors vary over time and specialist advice is likely to be required to indicate overall viability at feasibility stage. Irradiance data can be found at the PVGIS website (JRC Photovoltaic Geographical Information System (PVGIS) - European Commission (europa.eu))
Planning	Planning designations (greenbelt, Area of Outstanding Natural Beauty (AONB) etc) – local plan Sites allocated for housing – local plan Proximity to housing – we would recommend at least 300m to the nearest residential property – Google Earth Transport and access constraints – review local network via Ordnance Survey (OS) maps and Google Earth Ecology – any local designations from local plans and OS maps.
Land	Agricultural land grade 3b or below. Where 3a or above is indicated commission an early site survey. Indicative land grade is provided by Natural England (http://publications.naturalengland.org.uk/category/5954148537204736) Land ownership including underlying interests and covenants, tenancies etc – Land Registry and deed packets Does the land have direct access to the public highway – Land Registry and deed packets
Grid	The Distribution Network Operators (DNOs) and Distribution System Operators (DSOs) generally have information on their websites in relation to potential to connect new generation schemes which can be reviewed. In addition to this, the DNO's run a 'budget estimate' service which provides an outline price for connection (3-week turnaround). The budget estimates cannot be relied on but will generally highlight connections that are either viable or not. The budget estimate service is free to users

Provided nothing in the screening exercise rules the site out then it should be subject to a more detailed assessment, which will start to require investment.

4.3.2 Managing Development Risks – Feasibility Screening for Onshore Wind

As set out earlier in this guidance, onshore wind is one of the most established technologies and offers one of the least-cost options for renewable energy supply and delivers electricity cheaper than conventional fossil-fuel technologies. Despite the strengths of onshore wind energy, widescale deployment of the technology in England has been largely restricted since 2015 due to the local and national consent processes. Proposals often face local opposition, with visual impact, noise, site access and ecological impacts cited as reasons for objection.

Onshore wind turbines are typically located in areas with adequate wind speeds and in exposed locations free from obstacles, such as trees or buildings that can interfere with turbine performance. Table 4 below sets out the screening criteria for potential wind development projects.

A RARE EXAMPLE

In September 2020, construction completed on Cornwall's first, smart grid-connected wind turbine (2.3MW),sited on Cornwall Council land at Ventonteague, near Carland Cross, on the A30.

The rationale for the turbine is to help Cornwall better manage its energy supply and power the equivalent of around 1,180 Cornish homes, representing a significant contribution towards the Council's climate emergency agenda.

Cornwall Council made a £3 million investment and wholly own and operate the wind turbine.

Table 4– Screening criteria for wind development

Key consideration	Comment
Wind resource	Required levels will ultimately depend on whether a subsidy is available, and how the power is sold. Notwithstanding a minimum average wind speed of 7m/s+ at hub height will be required to obtain a reasonable return.
Monitoring wind speed	Wind speed monitoring is advisable prior to developing a wind energy project, to obtain more accurate data on wind speeds at the height of the proposed turbine. Wind monitoring also allows energy output for the project to be estimated. For commercial developers seeking project finance, this monitoring will be undertaken for a full year. Planning permission is also likely to be required for the wind monitoring mast. As an alternative to erecting a met mast on site and measuring wind speed over a sustained period, developers are increasingly using virtual met mast reports, especially for smaller projects. These provide significant cost savings and are often accepted by banks for project finance.
Spacing	If more than one turbine is being installed, a space should be allowed between turbines to optimise power output by reducing wind shadowing and turbulence. A typical spacing is five times the rotor diameter of the turbine.
Access	Access for the installation also needs to be considered. More remote locations will typically have a better wind resource, however, access for vehicles to construct the turbine foundations and transport the turbine blades and other components to the project site may be constrained.
Grid connection	One of the main challenges faced by wind farm developers is the cost of procuring access to local grid infrastructure. Underground or overhead power lines can be very expensive, so the closer the site is to a suitable connection point the better.

Sites identified for planned wind farms are subject to a formal application assessment. The National Planning Policy Framework aims to protect Areas of Outstanding Natural Beauty, Sites of Special Scientific Interest and areas of high national heritage value from negative impacts of wind farm development. In addition to this, most commercial scale onshore wind turbine applications

will require an Environmental Impact Assessment (EIA), which assesses the potential visual impacts and changes to landscape and biodiversity that could result. Other areas the EIA covers include:

- archaeology, hydrology and geology
- aviation and radar
- noise and shadow flicker impacts
- ecological impact

New onshore wind projects in England cannot receive planning permission unless an area is identified as suitable for wind energy in a local or neighborhood plan. In Wales, the National Development Framework (NDF) published in 2021 (Future Wales: The National Plan 2040) sets out the direction for development in Wales to 2040. The NDF includes ten Pre-Assessed Areas (see Figure 8) for wind energy. The Welsh Government has already modelled the likely impact on the landscape and has found the ten areas to be capable of accommodating development in an acceptable way. There is a presumption in favor of large-scale wind energy development (including repowering) in these areas. Furthermore, in determining planning applications for renewable and low carbon energy development, decision-makers must give significant weight to the need to meet Wales's international commitments and the target to generate 70% of consumed electricity by renewable means by 2030. Outside of the Pre-Assessed Areas a positive policy framework still exists, subject to Policy 18 of the NDF, which contains 11 detailed criteria-based policies.

Following the publication of Future Wales, TAN 8: Planning for Renewable Energy and the Wales Spatial Plan have been revoked.

Figure 8 – Pre-assessed areas for wind energy in Wales

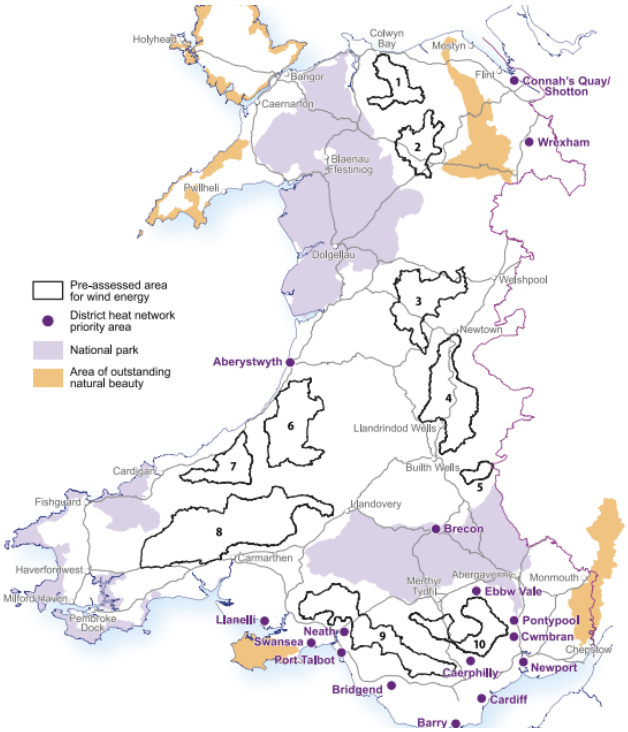


Table 5 sets out key designated areas which need to be avoided along with some typical set back distances for onshore wind projects.

Table 5– Key Designated Areas and Set Back Distances for Onshore Wind Development

Key consideration	Comment
Designated nature conservation areas	Designated nature conservation areas should be avoided. Where sites are used by birds, ecologists may recommend set back distances from the boundary of designated areas.
Designated landscape	Designated landscapes may or may not be suitable for wind turbines, depending on the reason for their designation and the impact that wind turbines may have on this. Views from designated landscapes to wind turbine sites will also need to be considered.
Bats	Hedgerows and woodland areas need to be avoided to reduce the potential impact on bats. Ecologists will recommend separation distances.
Residential properties	A setback distance of at least 600 - 800 metres from residential properties for large wind turbines is recommended. However, as local communities have a veto to block the development of wind turbines, engagement with the local community should be sought on setback distances.
Infrastructure	Minimum distances from roads, power lines, gas pipelines and other infrastructure, which are required by the Highways Agency and other infrastructure operators including Nation Grid.
Exclusion areas	Exclusion areas around airports, airfields and Ministry of Defence (MOD) land exists. Depending on the nature of the project, this should be determined in advance in consultation with the relevant body.
Communication links	Communications links need to be considered in consultation with the relevant telecoms' operators such as Openreach

There are very few examples of local authority commercial scale development of onshore wind projects, with deployment being at the single or two turbine level and benefitting from niche land assets (such as ports or old collieries).

In England, we would recommend that local authorities look closely at their local plans and land assets to identify if any suitable areas exist that could potentially support one/two commercial size turbines, or the deployment of micro turbines as part of a wider council estate retrofitting programme, especially where there is an opportunity for a private wire connection.

In Wales, where there is a broadly supportive planning environment and the NDF includes Pre-Assessed Areas for large scale development. A review of land assets in relation to these areas should be carried out. In addition, local authorities should review the potential for smaller scale developments which are likely to be located outside the Pre-Assessed Areas. Opportunities to connect projects to local energy loads should also be explored in order to increase project revenue.

Section 5 of this guidance considers private wire PPAs and other income available from subsidies that could support local authority onshore wind development.

Bearing in mind the significant challenges in developing onshore wind it is recommended that specialist advice is sought prior to proceeding with any development.

4.3.3 Managing Risks During Development

Considering the difficulties associated with the development of onshore wind and the requirement for specialist support, we have focused the remainder of this chapter on the development of solar PV assets.

Each scheme is different, and it is necessary to understand the nature of the risks associated with a specific site. The initial screening should identify the significant risks, as well as any potential project show stoppers. The general approach, for any scheme, large or small, should be to manage out the risks in order of significance, whilst spending as little as possible. Table 6 below sets out the most common risks and potential mitigation measures for solar PV development. A programme of work needs to be drawn up for the key stages such as grid, viability, planning etc. Each work area needs to be allocated a reasonable amount of time to complete. If a timetable is too tight, the project falls behind and never catches up.

Under normal circumstances, a solar farm development will take a local authority 12-18 months to complete. For complex or larger capacity projects, it will be longer. Councils need to be mindful that this is how long it takes and need to be prepared for scrutiny. Councils also need to be willing to take others on their journey as developing at scale means that knowledge needs to be transferred to a wider set of people within the community. Councillors are likely to feel more comfortable with the risks being taken if officers have built up their understanding of how projects work. Similarly council staff will need to be upskilled in relation to technologies, business models, establishing supply chains, and the risks and issues associated with implementing large energy projects.

The recommended approach is to review the project on a frequent basis to ensure that costs are incurred sequentially to remove risks and that full-scale development only commences when potential show stoppers have been identified, quantified and if possible, eliminated. Even when a decision to proceed to development has been taken, an open mind should be maintained about whether that development should continue. Being flexible and anticipating surprise changes is crucial when overseeing renewable energy projects as the market and political landscape is always evolving.

This guide is not exhaustive, and it is recommended that technology specific expertise is sought to assist in risk identification/management.

Table 6 – Common development risks and mitigation – solar PV

Risk	Significance	Mitigation	Indicative Cost*
Grid – either costs are too high, or connection is not available	Major – show stopper	The availability of a suitable and affordable grid connection is essential to any project. Apply for grid connection offer as soon as possible. If a viable offer is received this should be accepted as quickly as possible. The DNOs will immediately cancel any offers which are not accepted within the acceptance period. Be aware that grid offers will contain development milestones, which enable the DNO to withdraw the offer if the milestones are not met. There is generally scope to negotiate these if you are well armed with information and able to demonstrate that you are making progress. Councils should also consider the costs of their retained part of the connection i.e. customer switchgear, transformers and high voltage infrastructure. These are significant fixed cost elements that do not vary proportionally with size of the scheme. In developing a viability model ensure that these elements of fixed costs are accurately factored into smaller schemes. The example on page 37 shows how Cambridgeshire County Council managed to find a grid connection when one was not available from the DNO.	£ 5-20k
Viability	Major – show stopper	Produce a proper financial model complete with suitable energy price forecasts. This will need updating between Outline Business Case (OBC) and Full Business Case (FBC).	Vary depending on model and income forecast sophistication

Risk	Significance	Mitigation	Indicative Cost*
Agricultural land grade	Major – potential showstopper	Step 1 – commission an agricultural land report of the specific site based on site sampling. If the report shows the site is 3b or below safe to proceed. Sites of grade 1-3a – the only potential mitigation is via a sequential test to demonstrate there is no better alternative site – usually recommend not to proceed. There is generally no need to undertake an agricultural land grade assessment for landfill sites.	< £ 5k
Ecology	Occasionally significant – potential showstopper	Ecology can often be dealt with through design, although some measures are expensive, and mitigation is not always possible. Ecology studies are seasonal, and it is important to establish, at an early stage, what further study-based work will be required. Delays can be encountered in producing ecology reports for planning applications. For example, where breeding birds are involved, reports can only be undertaken a certain time of the year. Recommend type 1 habitat survey as soon as grid and agricultural land issues are resolved. An ecologist should be able to advise whether there are any potential showstoppers and next steps. Sites that have been abandoned for a considerable period may well present challenging ecology which could be difficult to clear.	£ 5-10k (for type 1 survey)
Land	Significant – potential showstopper	When the grid offer is received it will provide details of the connection – both location and any other design features. The offer does not include the acquisition of any necessary rights over third party land to reach the point of connection. Any third-party land rights should be explored as soon as the need for them is identified. Acquisition costs can be significant. Many councils, particularly county councils, own land forming smallholdings or farms. Usually, such land has a resident/farming tenant. To build the solar farm, the council needs possession. Depending on the nature of the tenancy this may be straightforward or very difficult.	Cost to investigate <£ 5k

Risk	Significance	Mitigation	Indicative Cost*
Sundry planning risks	Medium – most can be mitigated	Pre-application discussion with the local planning authority to identify both potential showstoppers and specific requirements for the planning application. The grid offer may also introduce potential planning risks that need to be considered, including the need for any new overhead lines, or the need for a communications tower. EIA screening opinion (note this will put the scheme in the public domain and should only be requested once local member and community consultation activities have commenced).	<£ 5k
Community consultation and engagement	Medium	Good sites should be manageable provided there are no major planning policy issues. Early and structured community consultation, ideally where there is still some flexibility around selection of the final parcel of land. The Building Research Establishment good practice guide is a useful structure (https://www.bre.co.uk/filelibrary/pdf/Brochures/BRE-NSC_Good-Practice-Guide.pdf)	£ 5-10k

*Indicative costs are provided only to give an idea of the relative scale of costs, they will vary considerably site to site

The Solar Trade Association has developed Ten Commitments that demonstrate good practice (see table below) these are available at https://www.solar-trade.org.uk/solar-farms/ and will help to mitigate development risk. The Ten Commitments are set out in table 7 below.

Table 7 - Solar Trade Association – Ten Commitments for Solar PV Development

Solar Trade Association - Ten Commitments for Solar PV Development
1. We will focus on non-agricultural land or land which is of lower agricultural quality. 2. We will be sensitive to nationally and locally protected landscapes and nature conservation areas, and we welcome opportunities to enhance the ecological value of the land. 3. We will minimise visual impact where possible and maintain appropriate screening throughout the lifetime of the project managed through a Land Management and/or Ecology plan. 4. We will engage with the community in advance of submitting a planning application, including seeking the support of the local community and listening to their views and suggestions.

5. We will encourage land diversification by proposing continued agricultural use or incorporating biodiversity measures within our projects.

6. We will do as much buying and employing locally as possible.

7. We will act considerately during construction and demonstrate solar stewardship of the land for the lifetime of the project.

8. We will offer investment opportunities to communities in their local solar farms where there is local appetite and where it is commercially viable.

9. We commit to using the solar farm as an educational opportunity, where appropriate.

10. At the end of the project life we will return the land to its former use.

Further guidance on good practice in solar development can be found on the Solar Trade Association website at https://www.solar-trade.org.uk/solar-farms/

4.4 Managing Grid Connections

4.4.1 Summary

Obtaining cost effective grid offers and managing them through to the completion of a scheme is of critical importance. The purpose of this section is to set out the processes used and important points to watch out for. We would recommend that you employ a specialist to manage this on your behalf, but this section should provide you with sufficient information to ask the right questions of that specialist along the way.

Key points to note include:

1. Understand what part of the network you will be connected to and the basis for charging.

2. Grid offers are a very formal and competitive process, you need to adhere to the terms of the offer, or it will be taken away. Once a grid offer is rescinded it is unlikely you would be able to obtain another on the same terms.

3. Most offers provide you with the opportunity to appoint a third-party contractor to undertake some of the work. This will involve additional procurement but may give you more control or a better price.

4. Other consents may be needed, and you will be responsible for obtaining them. These include land consents to lay cables and host a substation, planning consent (in some instances), highways consents and potentially consents under the Electricity Act 1989.

5. The network operators use a lot of technical language and will require technical information to even consider an application for grid connection, you are likely to need a specialist, so consider engaging one early in the process.

Grid costs are a major consideration for new onshore wind developments. As the UK grid network becomes more heavily utilised, significant reinforcement is often required, to allow new capacity to connect. If the cost can be covered by a project or cluster of projects connecting to the grid, then this will often be a key consideration in assessing the viability of a project. From April 2023, Ofgem are introducing changes to reduce the overall connection charge for those connecting to the distribution network. As part of this, Ofgem will remove the contribution to wider network reinforcement for demand connections as well as reducing the contribution for generation connections. This is likely to generate a high number of new applications for connections that will be submitted immediately after the implementation.

The UK grid infrastructure is starting to feel the strain of decarbonisation and requires significant reinforcement at NG transmission level. Once offers from the network operator are accepted, they are aggregated and passed up to NG through a 'statement of works' or 'project progression' process. Increasingly, connection dates are being pushed back through this process. Local authorities looking to implement smaller schemes may need to be creative in how they find a suitable grid connection that can be delivered within their net zero timescales. The example below shows how Cambridgeshire Council implemented a smart grid and a connection to a local customer to enable this at their site at Babraham Park and Ride.

Getting Creative with Grid Connections – Cambridgeshire County Council

Cambridgeshire have shown significant ambition in the development of renewable energy including significant solar PV and battery storage projects.

Babraham Park and Ride

Babraham is a long established park and ride site on the west of Cambridge. The council's project brings together battery storage, solar car ports and EV charging. Through the project development process, it became apparent that there was not a suitable grid connection – either for export of the power from the solar PV or for import of power for the EV charging.

Rather than abandon the project the council looked for other ways to bring power to and from the site. The eventual solution involved a private wire connection to a large local customer requiring a complex PPA agreement to allow for both the export of energy from the solar PV and battery and also the import of power to support EV charging at times of low irradiance.

This demonstrator project will generate up to 2.5MW of clean electricity which will provide an income stream for the county council, expand local renewable energy generation, and provide additional charging points for electric vehicles (EVs).

The business case is based on selling energy to electric vehicle owners, a local customer and reducing on-site operating costs. The Re:fit 3 Framework is being used to provide guaranteed performance and significantly reduce the financial and performance risk to the Council. Under that framework, the Council are working with design and build contractor Bouygues E&S Solution Limited.

This project could pave the way for public transport to move away from fossil fuels, a known contributor to poor air quality, through providing a location to charge electric buses in the future.

Planning permission for the project was received in late 2020. The same team has been designing a similar project for the St Ives Park and Ride, on the northern end of the Guided Busway. These projects form part of a larger vision of smart energy grids around Cambridge's transport network.

Once construction gets underway, work will be conducted in stages to keep as much of the car park open as possible.

Key benefits include:

- Project: 2.5MW Solar Farm plus battery energy storage
- Timescales: planning permission received late 2020, construction 2022
- 54,000 MWh of energy generated over 25 years
- Avoids the release of over 5,400 tonnes of CO2 over its life
- Provides a self-powered solution saving on energy bills
- Overcomes local energy grid constraints
- Renewable power for on-site EV charging, attracting new customers
- Supports local businesses and develops local supply chain - Integration of energy and transport solutions.

4.4.2 Different types of grid connection

Connections for renewable energy generation can be made at either distribution or transmission network level. Until now, most renewables projects have had connections on to the distribution network via the local DNO or DSO. Increasingly large schemes are connecting at transmission level with offers from NG.

For this guidance, we are concentrating on offers from the DNO or DSO. It is worth noting that NG offers are materially different and a local authority considering this route or considering purchasing projects or project rights with an NG offer should seek specialist advice.

4.4.3 Making a grid connection application and accepting an offer

Grid connection offers are made through an application to the DSO. Grid specific expertise should be sought to make the application and to ensure that sufficient technical information is provided for the work to be assessed. Once an application has been made it cannot be changed without making a new application. As such, before making an application, a decision is needed on the technology to be used along with the import/export capacity required. Increasingly, renewable energy applications have a larger requirement for electrical import to allow sites to accommodate battery technology as well as the base renewable technology.

Fees are charged by the DSO for evaluation of the application, whether or not a suitable connection is ultimately available. A schedule of the fees should be available on the DSO website. Making a formal grid application is the only way you can secure a connection. Grid connections, at an affordable price, are highly sought after and are the main constraint on the development of renewable energy projects.

Once a valid application is submitted the DSO has up to 65 working days to issue an offer. The offer is a formal contract document and should be read carefully prior to acceptance. The DSO will not vary the terms of the offer.

Generally, the applicant has up to 65 working days to accept the offer and to make the first payment. There is no flexibility on this and failure to return the correct paperwork or make the payment will result in the offer being cancelled.

Capacity on all networks is scarce. Some indication of availability can be obtained by looking at ‘heat maps’ on the DSO websites or by applying for a ‘budget estimate’ – however these processes take time and do not provide any degree of certainty.

Options exist to pay the DSO to undertake a network study to ascertain connection options, but again this does not reserve capacity. If other parties apply for capacity whilst the study is being undertaken, then they will be at the top of the queue when capacity is assigned.

Where there are competing requests for a connection in an area, the DSOs run a strict queueing system (i.e. first come first served). Queue place is determined by when you applied for the connection. Sometimes the DSOs issue “interactive” offers. This is where an offer to connect is made to several competing parties at the same time. In this instance, the timescales to accept are much shorter (often as little as ten days) and the capacity will be awarded to those who accepted and paid, based on their place in the original queue, until all available capacity is used when all other offers will be rescinded.

Explainer - Competition in Connections

DSO offers usually come in two parts; one is for the DSO to undertake all connection works i.e. from the project site on to their network (usually known as ‘all works’ offer). The second offer is for the DSO to undertake only those works on the network which others are not allowed to undertake (for example upgrading their transformers to facilitate the connection).

This second type of offer is known as a Competition in Connections (CIC) offer. This form of offer is likely to be cheaper but will require the procurement of an Independent Connection Provider (ICP) to undertake the remainder of the works.

Once the ICP has completed their element of works the DSO will formally adopt it and the connection becomes part of their network.

Another point to note is that works offers do not generally need to be included in the planning application as they fall under the statutory powers of the DSO. ICP connections on the other hand may require planning consent. Specialist advice should be sought in relation to this and which type of offer to accept, which needs to be confirmed at the point of offer acceptance.

4.4.4 Planning and Other Consents

As part of managing a grid offer, the local authority will be responsible for obtaining any additional consents required under the CIC offer. This could include planning consent (for either underground or overhead cable), or a consent under s37 of the Electricity Act 1989 for any new overhead lines including arrangements at the point of connection and highway consents associated with cable laying.

4.4.5 Managing a grid offer

The DSOs are keen to avoid people applying for and holding grid capacity that they are unable to use. For this reason, grid offers usually have a long stop date for connection and milestones. Sometimes these milestones are not entirely achievable (e.g. applying for planning consent within 2 months of accepting the grid offer).

It is important to start a dialogue with the DSO as soon as the grid connection offer is accepted. The DSO engineers will want to understand how progress on the project is being made and the anticipated connection date. The DSO will then build their own programme to try to ensure the connection is ready for when the project is ready to be energised. There will be milestone payments to be made and the DSO will not order key elements of equipment until these have been paid.

Where a CIC offer has been accepted, the local authority will need to procure an ICP with suitable qualifications on the NERS Register to deliver the connection. This ICP will then manage the process of design and design approval with the DSO. This element of the works should be procured as early in the process as possible as the grid connection works often take longer than the build of the renewable energy generating station itself. Even under a full works offer, it may be helpful to engage a suitably qualified high voltage (HV) engineer to liaise between the DSO, the contracting authority, and the build contractor.

4.4.6 Private wire connections

Private wire connections make a direct connection between a generating station and a customer's premises, without the need to use the local electricity grid. Financially these are very rewarding. However, a local authority will not be able to claim the generating station as a carbon offset for the authority if the electricity generated is sold to an external customer. Any local authority contemplating a private wire connection should engage with a suitably qualified HV engineer, as early as possible, as this will need to be properly developed from the outset and included in the grid application.

For small schemes, a private wire of this nature can be the turning point that allows the scheme to satisfy necessary investment hurdles, as the revenues from a private wire connection will be higher than a grid connected scheme.

Private wires do carry additional complexity and local authorities will need to consider land rights, cable ownership and maintenance, termination provisions (and long term grid access) and

Electricity Act supply licence implications. These can all be overcome but will require additional input and specialist legal and technical support.

Understanding the potential benefits of a private wire to the off taker is an important part of a successful negotiation on a direct PPA. The example below shows the benefit to the Morriston Hospital of its private wire to the 4 MW Brynwhilach solar farm.

The benefits of a private wire supply – Morriston Hospital

The UK's first solar farm owned by a health board and linked directly to a hospital has exceeded expectations by, at times, providing all the electricity needed to run the site, even during the winter months.

Health chiefs and Welsh government ministers had hoped the solar farm in south-west Wales would supply Morriston hospital in Swansea with a fifth of its energy consumption every year.

However, they were surprised and pleased that the Brynwhilach Farm, which is linked to Morriston by a two-mile cable, provided enough energy over one 50-hour period to meet 100% of the hospital's demands.

It is estimated that the 10,000-panel farm, which was switched on in November 2021, saved £120,000 in electricity bills during its first three months of operation. Since its connection UK energy prices have seen significant increases and savings are significantly higher than forecast and have provided a significant element of cost certainty to the hospital in uncertain times.

The £5.7m solar farm was built under a loan scheme set up by the Welsh government to decarbonise the public sector by 2030.

4.5 Construction Risks

The construction phase entails bringing together the following:

1. Detailed design or output specification – sufficient for both procurement and discharge of pre-commencement planning conditions
2. Procurement of a suitable construction contract
3. Sundry consents including Sustainable Drainage, s37 and necessary highway consents
4. Completion of Full Business Case
5. On site construction
6. Management of grid connection offer and interim payments
7. Connection, commissioning and handover tests

The key risks in the construction phase, other than normal construction risks, relate to the quality of the design and construction and ensuring that the plant will ultimately deliver the output anticipated in the business case.

4.5.1 Managing Production Risks

Solar PV is normally designed and built by specialist solar Engineering, Procurement, Construction (EPC) contractors. Key to the transfer of risk are bespoke EPC contracts, which are constructed to ensure that all design and construction risks pass to the contractor. The contracts

have provision for guaranteed levels of energy production, with financial penalties being applied after the first two years of operation if they fail to meet the specified guarantee. The contracts also contain detailed testing and handover regimes.

Tender assessments should be undertaken based on a levelised cost of energy. Different contractors follow different design ethos, and the evaluation therefore needs to assess the overall cost against the overall guaranteed performance, over the lifetime of the project.

Utility scale PV normally has a two-year hand over and testing regime. During this time, it will be necessary to let a separate O&M contract. The initial two-year O&M contract should be procured alongside the EPC build contract as a single package let to a single contractor. Appointing a separate O&M contractor for this period is likely to result in loss of all production guarantees.

If an authority wants to work with a standard form of construction contract, then careful consideration should be given to ensuring that production levels are guaranteed and a detailed testing and handover process (in line with solar industry practice) is adopted.
A suitable budget should be considered within the business case for specialist legal support where this cannot be provided by in house teams.

4.5.2 Managing Quality in design and construction

Prior to procurement, it will be necessary to set detailed output specifications for the asset. This will require significant specialist technical input. Ideally, this input will come from a suitably qualified solar PV engineer or technical advisor. This specialist can provide the technical documents for the specification, assist with tender evaluation, monitor quality of works on site and administer the handover tests on behalf of the authority.

The technical advisor should also be able to provide cost information for incorporation into the full business case (for example maintenance costs and requirements) where the maintenance contract is not procured alongside the EPC contract and provide a detailed energy yield prediction.

The business case for the project should budget for this advisor as it is very unlikely that the authority will have the specialist technical skills to do this in house.

4.5.3 Technological Enhancements

Several improvements have been made by manufacturers, research centres and researchers to improve the performance of solar PV systems. These improvements are made either at the materials level, such as increasing the conversion efficiency of solar PV panels while minimizing manufacturing costs, or at the entire system level, such as maximizing or optimizing the power drawn from PV panels. Panel manufactures for example have continued to increase the efficiency of their technology. Technological advances such as bifacial modules and single-axis solar trackers provide greater land-use options and offer a higher yield.

Bifacial solar panels are an increasingly common technology that can improve electricity production by utilizing light irradiation from both sides of the panel. In comparison, conventional monofacial panels can only utilize light from the front. The use of conventionally mounted bifacial panels improves production due to the extra electricity produced from the light reflected or diffused to the rear side. Although production increases, the generation profile remains unchanged. Increasingly, alternative mounting arrangements are being deployed to shift production away from the middle of day peak.

Solar tracking systems are the most effective devices for increasing solar radiation collection. Solar tracking systems combine PV panels with a structure that moves in accordance with the sun’s position, ensuring that the panels are constantly perpendicular to the solar irradiation.
A single axis system moves the panels through one range of motion. The axis is typically oriented

north-south, so the solar panels can tilt east through west as the sun rises and sets, and therefore maximises generation.

It is also possible to install solar PV on floating rafts on reservoirs and other water bodies. Floating PV systems have several advantages over ground-mounted PV systems, including the absence of obstacles that block sunlight, high-energy production efficiency due to the lower temperature under the panels caused by water acting as a natural cooling system, as well as the preservation of land resources and the reduction of water evaporation. These advantages can be outweighed by increased maintenance costs and issues with nesting water birds.

4.5.4 Procurement

Procurement is one of the most important parts of the development process, culminating in the appointment of a contractor to design, build and operate the asset. Procurement officers need to be involved from the outset and be a key part of the council team. Normal procurement rules apply. There are some framework options available including:

- Crown Commercial Services HELGA (link to the HELGA website) or
- GLA/Local Partnerships owned ReFit (link to the Re:fit | Local Partnerships website)
- smaller solar specific frameworks or dynamic purchasing systems hosted by some local authorities

Specialist procurement advice will need to be sought as to the most appropriate form of procurement for your project. The framework finder at Net Zero Go is a useful resource to find a suitable framework.

Procuring the construction of renewable energy assets can be difficult as there are a shortage of specialist contractors and their capacity is often taken up, fulfilling the large pipelines of the commercial investors. In this market, stand alone procurements can be difficult as local authorities will be viewed as a one off customer with a small project looking for a complex tender submission. For many local authority schemes a framework procurement, especially in conjunction with other energy efficiency measures may represent a more certain route to success.

4.5.5 Full Business Case

Prior to accepting a tender, local authorities will need to complete a Full Business Case, ideally in the format of a Five Case model. This should include an updated financial model incorporating the capital costs from the tender together with the guaranteed production.

Valuing the long-term income is important and budget should be allowed to obtain suitable forward price forecasts for electricity. The Department for Energy Security and Net Zero do produce wholesale electricity price forecasts, but these are generic and not time specific. The commercial forecasters such as Aurora Energy Research, Baringa, Bloomberg and Poyry provide information which is significantly more technology specific and granular. If required, these organisations can also be commissioned to produce suitable investment grade financial models.

4.6 The site in operation

At the end of the construction phase the asset should be capable of generating a reliable supply of electricity for a significant period. This section considers how to ensure that best value for money is obtained during the operation period.

4.6.1 Costs in operation

The fuel source is free, however there are still a number of operating costs to be considered and contracts to be put in place. The ongoing costs are as follows:

1. Operation and maintenance contract (including real time monitoring and security monitoring)
2. Cyclical replacement costs of key components when they reach end of life
3. Business rates
4. Insurance
5. Asset Management

4.6.2 Operation and maintenance contracts

O&M contracts can last anything from a couple of years to the full lifetime of the project. When procuring these types of contracts, a balance needs to be struck between the resource required to re-procure the contract and ensuring the contractor is performing a value for money service.

Specialist advice (legal and technical) should be sought on the content of the operation and maintenance contact. It is normal to have a single O&M provider who is responsible for a range of services including security, grounds maintenance, system monitoring and reactive and planned maintenance.

The O&M contract should include a minimum availability clause, which for solar PV should be at least 98.5% or above. A separate maintenance contract will also be required for a private wire connection.

4.6.3 Cyclical replacements

Key components such as turbines, PV panels, inverters and transformers will all be provided with an initial warranty period. Depending on the nature of the component this will be somewhere between 2 (e.g. transformers and switchgear) and 25 years (solar panels).

An engineer or technical advisor will be able to advise as to the likely lifespan of key components which can then be factored into the projects' financial modelling.

4.6.4 Business Rates

Business rates are assessed by the Valuation Office (VO), who apply a Rateable Value (RV) to each separate unit of rating assessment. The RV is then used by the Billing Authority to calculate the amount of rates payable.

Sites are reassessed and new RV put in place at the start of each Rating Revaluation. Business rates for solar PV are subject to a Memorandum of Agreement (MOA) Revaluation 2017 between the Solar Trade Association and the VO (link to the MOA between the Solar Trade Association and the Valuation Office). Please note the levels vary depending on the size of the installation and whether it is in England or Wales.

We are currently in the 2017 Rating Revaluation, which commenced on 1 April 2017. The length of the List is currently under review and the date of the next Revaluation is unconfirmed, although we know it will not be before April 2023 due to the impacts of Coronavirus.

An important note to remember is that building integrated systems are subject to an entirely different (and substantially higher) RV. This applies to systems where the power generator is owned by the same entity as the user of the electricity. Where power is bought and sold the

values in the MOA are used. Where a local authority is planning to supply power to its operations through a direct wire, then arms-length arrangements should be considered to achieve value for money.

4.6.5 Insurance

It is recommended that insurance (Operational All Risks cover) is sought for the operational phase of the project and quotations for this can be obtained from many commercial sources.

4.6.6 Asset Management

Not all schemes will choose to engage an asset manager. Asset managers can be used to optimise performance by both pushing the O&M contractor to exceed their minimum service commitments and through proactive recommendation to optimise the use of the equipment.

Asset managers can act as an intelligent client and should ensure the increased earnings from the plant more than exceed their fees.

4.7 Decommissioning and re-powering

A typical solar PV installation should have a working life of around 35 years. During this time inverters will require replacement and efficiency will fall by up to 0.7% per annum. This reduction in power produced should be factored into your business case. For the first 25 years your solar panels should have a warranty that supports this level of production.

There will reach a point where it becomes necessary either to decommission and remove the solar farm or to replace key components. Where decommissioning is the preferred option, this should be a relatively straightforward operation as the construction methods are simple and most of the materials will have value in recycling.

Where the preferred option is re-powering and continued operation the solar farm will require either wholesale or partial rebuilding through replacement of end of life components, including panels, mounting structure etc. There is also likely to be a need to renew the planning consent and any underlying land agreements.

Case Study 1 – Solar Farm Development

Solar PV Development on Landfill – Lamby Way, Cardiff

Development of the Lamby Way solar farm has not been without its challenges for Cardiff City Council (Cardiff). Cardiff acted as developers for the project, bringing together the land, grid connection and planning consent for the development.

The initial proposal was for a 5 MW grid connected solar farm, however land was available for a larger scheme and during the development a further opportunity was identified to supply the local water treatment works electricity baseload. In total this, along with rapid advances in solar technology and efficiency, brought the size of the development to 9 MW.

Complexity
The site itself is capped landfill which has been left to settle for around 20 years and has previously been used for translocation of slow worms. The location is immediately adjacent to a coastal footpath and an estuary with the area providing valuable habitat for numerous species. The solar site itself has areas of woodland and an attenuation pond in the centre. The solar site forms around half of the land available at the Lamby Way site. This area was selected as it has been capped for the longest period and the ground is relatively stable.

The combination of landfill, complex ecology and two separate high voltage connections make this one of the most challenging solar projects in the UK. So much so that even prior to

construction it had won the Best in Show Solar Design Award at the UK Solar and Storage Awards in 2019.

The Business Case
Development of the business case was supported by Local Partnerships through the Green Growth Wales programme. Local Partnerships supplied industry expertise to help Cardiff understand both the financial business case and the management of risk.

The private wire PPA agreement improves the commercial case for the project, however the smaller 5MW scheme would have also met investment criteria.

Cardiff used the PWLB to fund the investment. The business case for the solar farm is modelled over a 30-year period, with the private wire PPA spanning the first 20 years.

Planning Consent
Cardiff project managed the planning consent through their in-house energy team, appointing planning and ecological consultants from local frameworks to support the development.

Cardiff also appointed a specialist solar designer and engineer who worked closely with the waste team to establish which areas of the site could be used for development, accommodating the existing landfill gas management system requirements within the design. The system installed cannot penetrate the 1m landfill cap across the site and has been designed as a ballasted solar mounting system and surface mounted cable trays.

The design and construction management processes also needed to work around the ecology on and around the site including surveying for reptiles and invertebrates and seasonal restrictions on working patterns to protect over wintering birds.

The development obtained planning consent in May 2019 and the site became operational in autumn 2020.

Private Wire
In order to supply the private wire customer there was a need to construct a complex private wire of around 3000m in length. The wire passes beneath a tidal estuary, past a primary electrical substation and over a substantial waste water main.
Development of the on-site high voltage switching and protection and the private wire connection itself were the most challenging parts of the entire programme.

Looking to the Future
Now operational, the solar farm presents an opportunity for Cardiff to provide electric vehicle charging for a significant part of its vehicle fleet, many of which are based at Lamby Way.

Top Tips for Would be Developers

1. Engage proper specialist advice at an early stage, you are likely to need it, these projects are harder to deliver than you might think.
2. Don’t be over optimistic around the costs.
3. Private wires can be difficult, especially with complex engineering issues to overcome, find a good expert to design it and start early.
4. Lots of ecology can be overcome, but you need to do the homework and properly understand the individual issues.
5. Don’t underestimate the workload and timelines for good procurement. A sound set of tender specification documents and smart performance-based evaluation criteria are essential.
6. Getting the contracts right is critical both for the ‘design and build’, and the ‘operate and maintain’. You can’t easily use an off the shelf contract, especially when there will be complex performance based operational measures to manage, so find someone with appropriate experience.

5 Working with third parties and acquiring assets

5.1 Background

In this chapter, we consider working with third parties to develop or acquire solar or wind projects. This might be because of a local authority seeking a development partner or a project to purchase, or as a result of a third party approaching an authority to lease part of its land holding to build a renewable energy project. We consider the potential procurement issues likely to be faced by authorities working with third parties. Each individual situation is likely to be different and specific advice should be sought in each case. Notwithstanding, table 7 should provide a local authority with sufficient information to seek more detailed advice and allow negotiations to be suitably structured.

Project acquisition is unlikely to be the first choice for a local authority which has opportunities to deliver projects on their own land and within their local area. It is important to consider whether the size of any proposed acquisition is proportionate to the council's needs, in terms of both electricity consumption and decarbonisation goals. The alternative would be to seek a corporate PPA with new third party sites. However, this route is only likely to provide part of a Council's supply due to the need for a 'take or pay' clause in private PPAs, which would tie the Council into paying for a fixed volume of electricity for the duration of the agreement.

5.2 An appropriately sized project

Without a renewable energy investment, a local authority would still need to purchase its electricity requirement from a supplier. Therefore owning an appropriately sized renewable energy generator is not primarily a purchase to provide the authority with an income stream, but a forward purchase of the authority's own energy requirements which also provides a natural hedge for the authority against any ongoing rise in the price of wholesale electricity. An appropriately sized project will have an asset size which matches as closely as possible a local authorities MWh annual demand.

Carbon displaced through renewable energy generation displaces carbon emissions through grid supplied electricity. The UK has seen significant reductions in the carbon intensity of grid supplied electricity over the last ten years, resulting from the retirement of most of the UK coal fired power stations and the introduction of gas fired power stations, renewable energy and nuclear. For the UK to achieve net carbon zero emissions by 2050, the complete decarbonisation of the electricity supply will be needed. This is likely to require a fivefold increase in renewable energy generation. As renewable energy generation increases the carbon intensity of grid supplied electricity falls. If a local authority has a net zero emissions date of 2030 (for example) then the carbon intensity of grid supplied electricity will have fallen significantly. For example the forecast carbon intensity of grid supplied electricity in 2024 is 0.236 Kg CO2e/kWh but reduces to 0.127 Kg CO2e/kWh by 2030.

5.2.1 Calculating the appropriate size of a solar PV scheme to meet example target (2030 net zero target, 5,000 tCO2e).

Worked Example

Converting the 5,000-tonne requirement into the equivalent grid supplied electricity can be calculated as follows:

1 Kg/kWh = 1 tonne/ MWh therefore: 5,000 tonnes/0.127 = 39,370 MWh of grid supplied electricity equivalent. Assuming the project is located in an area with an irradiance of 1,050 kwh/kwp.

For the requirement to be met by locally produced solar PV in 2030 the local authority would therefore need: 39,370 x 1,000 (conversion MWh to kWh) / 1050 = 37,495 kWp or the equivalent of around 38 MW solar.

An authority will only be able to offset emissions from electricity generation against its electricity consumption (i.e. Scope 2 emissions – see Section 6.5.2). In setting a target requirement consideration also needs to be given to the future consumption of electricity by the local authority as well as other planned interventions i.e will the authority's electricity demand diminishes over time. If the generation exceeds the authority's electricity consumption then it is not possible to 'offset further reduced emissions against those produced by directly burning fuels (gas, oil etc).

5.3 When Procurement rules might apply

Table 8 below sets out various scenarios and provides commentary on whether procurement rules (either the Public Contract Regulations 2015 (PCR) or the Concession Contract Regulations 2016 (CCR)) might apply. This is not legal advice and is provided for preliminary guidance only.

Note UK public procurement laws are due to change in summer 2023, following withdrawal from the EU.

Table 8 – When procurement rules might apply

Scenario	Comments
Scenario 1 - A local authority is approached by a third party wanting to **lease** its land for a solar farm or wind turbine AND the local authority does **not** want to end up owning the asset	Should be no procurement implications provided arrangements are structured as a pure land transaction and the following are **avoided**: • Option to purchase or buy back • Option to retain equipment at the end of the lease • Obligations on the developer to install and operate the equipment • Rents based on turnover or portion of earnings The local authority should exercise care in recording the basis for its decisions. Normal rules to ensure best value is obtained under s123 of the Local Government Act 1972 will apply.
Scenario 2 – A local authority is approached by a third party wanting to **lease** its land for a solar farm or wind turbine, BUT the local authority **wants** to end up owning the asset	This option is complex, and advice should be sought from the outset. The PCR would normally apply, the question being whether any specific exclusions may be available. It is likely to make little difference at what stage in the process the local authority seeks to acquire. Material considerations might include the developer having exclusive access to an affordable grid connection in the locality.
Scenario 3 – acquiring project rights when a site is ready for construction. In this instance the local authority would be acquiring as a minimum the following rights: - Option for lease or lease on the land where planning consent has been granted for the erection of the generating station	This is a site on land not owned or controlled by the local authority and rights over the site need to be acquired as part of the transaction. Advice should be sought in this instance. However, provided all project rights are in place at the time of the transaction and there is no option agreement prior to purchase then this should be a land acquisition, which would normally be outside the scope of the PCR.

- Wayleaves and other rights required along the cable route - Accepted grid export connection offer	
Scenario 4 – joint venture agreements – either to develop sites in local authority ownership or to develop sites on third party land	Assuming any potential partner does not come with project rights (eg grid export connection offer) it is highly likely that the PCR will apply and unlikely any exclusions will be available. Where a potential partner (or partners) come with critical project rights, there may be an argument that these constitute "exclusive rights" allowing for use of the negotiated procedure without prior publication under PCR regulation 32. Reliance on relevant PCR provisions should only ever be undertaken with extreme care and after taking legal advice.
Scenario 5 – acquisition of a constructed asset. This can be achieved either through the acquisition of the asset owner (possibly a Special Purpose Vehicle (SPV)) or through taking assignment of the lease and novation of the grid connection offer (whichever is easier)	Provided the local authority has (either now or historically) had no interests in the asset or its outputs then this would normally be outside the scope of the PCR. If any ongoing maintenance contract is acquired at the same time the local authority should take care to ensure that this falls below the relevant works/services threshold.

5.4 Purchasing Power from a third-party scheme (either on authority or third-party land)

In this instance it is highly likely the PCR would be engaged and there is unlikely to be an available exclusion.

It is also worth noting here that if a local authority owns a scheme and wants to sell the power produced to another public sector body, that public sector body will be obliged to undertake a suitable procurement. Being a public sector vendor imparts no favourable position over other suppliers.

Kent County Council – Public and private sector collaboration

In April 2022, Kent County Council used £14.4m from the Public Sector Decarbonisation Scheme to acquire a newly constructed 38-hectare solar farm from developer Ethical Power Limited. The Bowerhouse II Solar Farm in North Somerset consists of 39,312 solar panels and will produce 22,000 megawatt hours of electricity each year. The solar farm will reduce the authority's carbon footprint by 30% and contribute towards the authority's aspiration of achieving Net Zero status. The project will also make significant savings on the authority's electricity costs.

6 Financial case

6.1 Introduction

The Lamby Way case study demonstrates local authority investment in renewable energy can optimise existing assets, generate new income streams whilst also delivering on climate emergency targets. In this section of the guidance, we explore the financial rationale behind such investments and provide information on currently available subsidies and other income related information that is available to support local authority investment in renewables.

6.2 Investment rationale

6.2.1 Background for investment

Over recent years the main rationale, cited by local authorities, for investment in renewable energy is to provide an income stream to support service provision.

Increasingly authorities are also looking to renewable energy projects to support their decarbonisation agendas and therefore may be prepared to tolerate lower returns on investment. A local authority can buy the power the generating asset produces for their own use under a formal PPA agreement, this potentially lowers the authority's greenhouse gas emissions and speeds the journey to net zero emissions. This may also require a parallel "sleeving and balancing" contract from the authority's usual supplier to match time of day demand and supply.

Most local authorities are relatively large purchasers of electricity. Owning a large-scale renewable energy generator provides a natural hedge for councils against any ongoing rise in the price of wholesale electricity. This can be achieved either through a direct PPA, or simply by buying and selling into the same market.

West Suffolk Council own a 12.4 MW solar farm which has historically sold the power produced directly to the grid. The authority are now investigating a formal sleeving contract to purchase the power produced for their own use.

Case Study 2 – Solar Farm Ownership

West Suffolk Council – 12.4MW Toggam Solar Farm

In 2016 Forest Heath District Council (now West Suffolk Council) became one of the first local authorities in the UK to own a utility scale solar farm when it invested close to £14.5 million to acquire the 12.4MW solar farm at Toggam Farm in Lakenheath. The purchase was supported by independent legal, financial and technical advice and was backed unanimously by members of the Council. The purchase took around eighteen months from identification of the opportunity to completion of the contracts.

The solar farm was purchased post construction and electrical connection, but before the end of the two-year period to Final Acceptance. The council therefore took novation of both the EPC contract and a three-year O&M contract from the original owners.

Does Generation meet the forecast?

Toggam receives income under the ROC scheme as well as income from sales of electricity generated. As new schemes are unlikely to benefit from a similar subsidy it is important to look at the electrical production data for the first three years of operation. The table below sets out the predicted and actual generation for each of the last five years.

Year	Predicted Generation (MWh)	Actual Generation (MWh)	Variance on Forecast
2016/17*	6,942	7,482	+7.7%
2017/18	11,682	11,687	0%
2018/19	11,623	13,194	+13.5%
2019/20	11,565	11,974	+3.5%
2020/21	11,507	11,788	+2.4%
2021/22	11,564	11,441	-1.0%

*Part year only

The business case for investing in the solar farm was based on an independent assessment and data on how the asset was likely to perform. The advice from external specialists provided councillors, of all political persuasion, with the confidence to vote in favour of the investment. The table above demonstrates that their confidence was well placed.

The capital investment has provided an important revenue income to support service provision. The scheme is providing a net return of around five per cent after running costs and the repayment of capital. That money in turn will help towards funding everyday public services.

Selling the Electricity

The value of the electricity generated from the site in 2021/22 was worth £1.29 million for the year (2020/21 £1.30m). West Suffolk have previously used the E-Power auction to secure an annual power purchase agreement (PPA), the process of which is very transparent and easy to use. West Suffolk Council are looking at a sleeving contract which allows them to buy the power for their own use. Sleeving the power (i.e. selling it to themselves as green energy) would also reduce the authority's carbon footprint.

Does it take much resource to run?

The solar farm requires some monthly administration and management of the O&M contract. Re-procurement of the O&M contract has been cited as the busiest administrative time resource.

West Suffolk have not had a lot of technical issues, and most of these have been dealt with well by the O&M provider. Toggam Solar Farm has provided availability of around 98% during its first five years of operation.

Looking to the Future

Currently the project life is 25 years, but the authority can look to extend that nearer the time. The income generated comes from a mix of selling electricity into the NG and income guaranteed from the Government for a 20-year-period though Renewable Obligation Certificates.

What advice would West Suffolk offer to other local authorities?

"The main thing is getting a good design and build quality and then investing in a good O&M contract- it sounds obvious but keeping the grass cut is very important and staying on top of preventive maintenance. We are actively looking to build a new subsidy free solar farm."

6.3 Debt finance and the cost of borrowing

The LGA and Local Partnerships have produced a green finance guide (Financing Green Ambitions) to provide both practical guidance and examples of good practice to support councils in England to find the most appropriate and affordable ways to finance their green ambition. Below is a high-level summary of current borrowing available to councils.

6.3.1 PWLB

Since the introduction of the Prudential Code for Capital Finance in 2003, the PWLB has been a mainstay of local authority capital programmes. In October 2019, the Government announced a review of the PWLB: future lending terms aimed at finding proportionate and equitable ways of preventing councils from using PWLB loans to buy commercial assets primarily for yield. The review was followed in March 2020 with a consultation, the outcome of which was published on 26 November 2020, together with revised lending terms aimed at preventing investment purely for yield.

A key change introduced, as a response to the review, required councils looking to access PWLB to demonstrate that their borrowing directly supports service delivery, housing, regeneration or preventative action. The requirement to limit borrowing to investments directly relating to delivery of public services and the function of the local authority is now embedded in the updated Prudential Code. This means that borrowing must be primarily and directly for public services, relating to the function of the local authority, irrespective of whether the borrowing is sourced from the PWLB or any other provider of debt such as a bank, bond issue or investment fund.

The cost of local authority borrowing from the PWLB increased significantly over the last two years with rates for a 30 year fixed rate loan rising from around 2% in September to around 4.8% in January 2023. We recommend that local authorities developing renewable energy projects:

- Build in at least an interest rate buffer into project viability assessments. Interest rate risk sits with the council until funds are drawn down and the s151 officer should advise on a suitable rate.
- Undertake regular project viability assessments.
- Explore alternative sources of financing, as PWLB does not always offer the best rate.

6.3.2 Five Case Model

One of the main issues behind the need to update the Prudential Code was that local authorities were using their borrowing powers to buy capital assets purely for commercial return, and on occasion these capital assets were located far away from the local authority area. To support the development of a renewable energy business case (including the acquisition of appropriately sized generation asset), local authorities should seek to satisfy the detail required in the Green Book Five Case Model. The Five Case Model provides a clear decision-making framework to aid local authorities in their decisions around borrowing and investing. It takes into consideration the following dimensions:

- Strategic context.
- Socio-economic assessment of benefits.
- The commercial case.
- The financial case.
- The management case.

The Chartered Institute of Public Finance and Accountancy (CIPFA) encourage the use of the Treasury's business case best practice and the 2022 Green Book. According to business case best practice, organisations should explore a range of commercial models and finance approaches, while the risk should be placed with the party best able to manage it. CIPFA also recognise that establishing a business case is not linear or an exact science. Appendix 1 highlights points to consider when developing a business case for a renewable energy project.

6.3.3 UK Infrastructure Bank (UKIB)

UKIB was launched in June 2021 and has been lending to its first schemes since late 2021. The UKIB provides access to funding for both councils and private sector organisations. For local authorities, the funds accessed through this source will be cheaper than through PWLB but are only available for larger projects (>£ 5m) which are aligned to the UKIB's purpose of net zero and local economic growth. Tees Valley Combined Authority become the first authority to agree a loan with UKIB, securing a 50-year loan of £107m to fund its South Bank Quay project, which aims to transform part of a former steelworks into a 450-metre quay to service the offshore wind sector. For further information see the UKIB Strategic Plan 2022.

In December 2022, the UKIB established a partnership with BEIS to support local authority applicants to BEIS's £288 million Green Heat Network Fund (GHNF). The partnership means that local authorities seeking funding for new heat network projects through the GHNF can also apply for preferential rate lending from the UKIB through the same process.

6.3.4 UK Municipal Bond Agency (UKMBA)

The UKMBA is publicly owned, with its shareholders being the Local Government Association and 56 councils. Councils have the power to issue bonds but it is not currently a common activity due to the cost, time and fees involved relative to the cost and flexibility offered by the PWLB (bonds are a form of IOU that can be traded on financial markets). The UKMBA provides councils with a clear and effective route to market, either for a single or a pooled bond. Bonds can provide cheaper finance than PWLB and interest rates are outside the direct control of Government.

Bonds are raised against the covenant strength of the local authority and for single bonds (i.e. one local authority) a credit rating will be required. For pooled bonds the UKMBA will undertake financial due diligence on the councils which will not result in a published credit rating. The UKMBA is able to issue certified Environmental, Social and Governance (ESG) bonds for compliant projects and has a published certified framework for these (Sustainable Finance). ESG bonds attract a lower interest rate than standard bonds and provide finance which is potentially cheaper than PWLB.

The reporting requirements are relatively light touch and seek to rely on criteria the local authority have already developed to support their project reporting.

Bonds require a minimum size of £250m borrowing which can be either from a single local authority or a pool of councils. The UKMBA will broker any pooled arrangements. Projects can be refinanced through this route and a local authority is able to include both projects which have been completed within the last three years and projects which are being delivered over the next two years.

Bonds have the advantage of being able to forward fix an interest rate for up to two years, without the need to draw the funds immediately. This can provide significantly more funding cost certainty than PWLB.

Lending terms can be flexible between 10 and 45 years and whilst the UKMBA does not provide financial advice it will help councils decide which is the best option for their requirements.

6.3.5 Community Municipal Bonds (CMB)

Crowdfunding is a process by which people provide money to projects, companies or organisations via a website or platform. Depending on the nature of the financial arrangement, people receive a return that is either financial (investment-based) or non-financial (donation-based).

A CMB structure is a new model of public sector crowdfunding, which offers the potential of providing low-cost capital for councils while also delivering socially and environmentally positive outcomes. This structuring provides councils with the ability to raise money more locally for green projects and provides a direct connection between their communities and new green infrastructure. Increasingly the rates and terms for community lending are close to those offered by PWLB.

West Berkshire Council was the first local authority in England to launch a Community Municipal Investment (CMI) bond. More recently, in August 2020, Warrington Borough Council launched a CMI bond to raise £1m to help finance the construction of a solar farm near Cirencester and its co-located battery storage facility (a 24MW hybrid project). The CMB has a five-year term and will pay investors 1.2% per year, on a twice-yearly basis. The minimum investment was just £5. Warrington Borough Council is one of only a few UK councils to have a credit rating from Moody's international rating agency. The CMB fund raise closed after reaching its £1m target, attracting over 500 investors from across the UK, with an average investment of almost £2,000 each.

Both the West Berkshire Council and Warrington Borough Council CMIs were issued by the council corporate body and administered by Abundance Investment, with local resident and general public investors purchasing the bonds.

Abundance Investment is particularly active in this sector and has indicated through research that CMIs have the potential to unlock a multi-billion market of retail investment money that could be directed into local authority funding via the Community Municipal Bond approach. Furthermore, the research outlined that investment-based crowdfunding had the potential to provide capital on terms which are similar to or better than the PWLB and through a process that emulates the ease of use of PWLB, while also offering the potential to deliver significant wider benefits to local communities.

6.3.6 Conclusions

Local authorities are well placed to access debt finance (cheaper than the private sector), both through PWLB, the UKIB, the UKBMA and through the emerging CMB market. Financial terms for PWLB and CMBs are likely to be similar going forward, with CMBs providing the opportunity to connect local people to projects in their area but are unlikely to raise all the funding necessary for larger projects. CMBs and PWLB can be blended to support projects where both local connection and larger funding packages are required. The cheapest source of potential funding will be either through the UKMBA or the UKIB, but this is only for larger projects needing to borrow £5 million or more.

In addition to being able to borrow at favourable rates, some local authorities hold significant reserves so they can invest directly in projects and blend funds from a variety of sources. The example below shows how Bedford Borough Council brought together three different funding sources to deliver Elstow Solar Farm. There is also growing, proven potential for innovative sources of financing, such as bond or share offers to the local community.

These financial arrangements combined with an ability to take long project time horizons, relatively easy access to council-owned land, and secure markets to consume the power generated all mean that local authorities can structure attractive renewable energy generation projects, in a fashion that cannot be replicated by most commercial investors.

Bedford Borough Council's Elstow Solar Farm

This solar farm was opened in 2022 and is now exporting low-carbon electricity to the grid, saving around 900 tCO2e. The project is made up of over 8,000 solar panels, is capable of generating up to 4.2MW of electricity which is enough to power approximately 1,000 homes.

"The project has cost £4.15m – with Bedford Borough Council investing over £2.2milion and the project being awarded more than £1.8million from the South East Midlands Enterprise Partnership (SEMLEP) toward the project. Additional support was received the "Getting Building Fund" which is designed to deliver jobs, skills and infrastructure across the country.

The site for the solar farm is a former landfill, which was closed around 28 years ago. The terrain is undulating and has presented some challenges to construction which have required engineering solutions to overcome. Part of the solution included importing more topsoil to increase the depth of the cap and avoid damage to the cells beneath. This approach is time consuming but has allowed the mounting structure to be piled as opposed to ballasted, reducing some costs in construction.

6.4 Risk management

Whether a local authority is considering a renewable energy asset, to offset carbon or a financial investment, it is vital that they fully appreciate the pros and cons of their proposal and the capacity required to bring it forward. It is key that this is understood to determine whether a project represents a viable and deliverable proposition. Good quality external advice should be sought to avoid any tendency towards optimism bias.

Managing risks during development, construction and operation is covered in section 3. In this section we consider the financial risks. Project finances are a combination of capital costs from either development and construction or acquisition and project revenues. Project revenues depend on the amount of electricity generated (production risks) and the price achieved for selling that electricity. Production risks are covered in section 3.5.1. Price forecasting is a complex business, and it is strongly recommended that local authorities consider several indices before deciding on a suitable electricity price scenario.

In the paragraphs below we provide some general comments on the main costs that a local authority considering a renewable energy investment should capture in the financial model for the project.

6.4.1 Capital Expenditure Assumptions

Table 9 below sets out the assumptions for both procurement and financial modelling in relation to capital.

Table 9 – Capital Expenditure Assumptions

Capital Expenditure	Comment
Solar panels/Turbines	Solar panels or turbine costs are likely to be the most significant element of capital expenditure. Solar EPC contractors buy significantly more volume than any individual project and without the leverage of a pipeline of projects it is likely that best value for money on solar equipment will be achieved through the EPC contractor. With turbines in order to increase the level of certainty surrounding capital expenditure we would recommend binding offer price quotes are obtained from suppliers.
Balance of Plant/Civils	These costs are very much project specific and typically cover the following works: Site clearance, site and health and safety management, access works, tracks, hardstanding, turbine foundations (design and construction), civil and electrical infrastructure, solar panel mounting system (design and construction), fencing and security.
Grid	One of the main challenges wind and solar development faces generally is the cost of procuring access to local grid infrastructure. The cost will depend on the complexities of connection to the grid e.g. at what cost, what distance from the site and the need for any third-party wayleaves etc.
Development costs	Development costs including planning consultants and specialist reports, topographical surveys, outline designs, land agents, and lawyers' fees and the cost of the planning application itself. Solar PV applications are generally cheaper and quicker than wind applications to the point of planning submission, however the planning application fees for solar PV are considerably higher than for equivalent wind generation capacity.
Project management	These costs are very much project specific and largely driven by the complexity of the development process and the length of the project construction programme. Typical costs include site management, owners engineer and principal designer costs.
Pre-construction costs	Pre- construction costs typically cover the following costs: Local authority acquisition/development costs, insurance during construction, miscellaneous property costs, planning obligation fulfilment costs, due diligence costs and legal costs.
Contingency	A contingency allowance will give the project more protection from risks such as adverse foreign exchange rate movements. Wind turbine and solar panels are typically purchased from the Euro zone for example. In setting contingency, it is important to have a view on current pricing for components and whether they are rising or falling.

6.4.2 Operating Cost Assumptions

Table 10 below sets out the assumptions for both procurement and financial modelling in relation to capital.

Table 10– Revenue Expenditure Assumptions

Operating Cost	Comment
Lease and access lease costs (where the local authority is not the landowner)	Solar leases are generally relatively straightforward with payments either based on the number of acres occupied index linked to CPI or RPI, or a % of gross turnover. Landowner lease payments typically follow a stepped approach with a reduced percentage payable in the first ten years, with a higher percentage payable thereafter. Percentages, however can vary significantly and are often driven by a combination of landowner demands and affordability. The concept of stepped percentages has its origins in bank funded projects where high debt costs in the early years meant reduced cash flow for funding operating costs. Should it be the case that private land must be trafficked in order to reach the site, an access lease will be required, and an annual cost incurred. Access lease costs vary significantly between sites and are often driven by landowner demands and the location of the site.
Turbine O&M maintenance	Specific rates will be provided by the turbine supplier. A maintenance cost profile typically increases at five-year intervals.
Civil and electrical maintenance	Allowance should be made for costs associated with maintaining the site roads, foundations and site generally.
Solar PV O&M	Solar PV O&M contracts generally wrap all associated maintenance and monitoring work with the customer being responsible for the additional costs of equipment replacement (e.g. inverters). The O&M costs are flat, and the cyclical replacement can be dealt with through the development of a sinking fund if necessary.
Grid charges	Following receipt of a grid connection offer it will be possible to determine charges associated with using the NG network. Balancing Services Use of System (BSUoS) or Transmission Network Use of System (TNUoS) charges will apply depending whether the grid connection is at distribution or at transmission level, with rates varying by location. Allowance should also be made for importing power, metering, wayleaves and other associated grid connection costs.
Business Rates	For wind an allowance for business rates will be required, with rates varying by location. An early indication of business rates can be obtained through liaising with the local business rates valuation office. Solar PV rateable values are as set out in a Memorandum of Agreement between the Solar Trade Association and the Valuation as described in section 3.6.4 of the report.
Operating Cost	**Comment**
Communication systems	Allowance should be made for costs associated with communicating with or monitoring the performance of the renewable energy asset which falls outside of the O&M contract scope. An example will be the provision of broadband.

Other operating costs	Allowance should be made for other applicable operating costs such as: habitat enhancement, community fund payments, insurance, tax and accounting, local authority asset management costs and decommissioning provision costs.
Contingency	An operating cost contingency (or a sinking fund) is recommended to cover unexpected outages and cyclical equipment replacement.

6.4.3 Sensitivities

Local Partnerships recommends that any local authority looking to invest in renewable energy carries out a range of sensitivity analysis at both Outline Business Case (OBC) and Full Business Case (FBC) stages to show the potential upside/downside scenarios around the proposed project on the project cash flow projections.

Changes to the inflation assumption is likely to result in the largest deviation from the base case. Whilst a higher level of inflation impacts on the operating costs for the project, project cash flows will also increase due to the impact on electricity revenue.

Typical sensitivity analysis would include:

1. Inflation
2. Electricity price
3. Year on year production (i.e. variance from base case) as a result of both weather conditions and plant availability
4. Exchange rate impact on build cost
5. Delay costs (during the development phase)
6. Interest rates

Tax treatment for schemes is important and authorities will need to take specialist advice in relation to all forms of taxation. This advice may influence the ownership model the authority chooses to pursue.

6.5 Income from electricity sales

6.5.1 PPA

All schemes will require some form of PPA to sell the electricity produced. It is unlikely that any scheme will secure a PPA at the outset for the life of the project. Different arrangements may apply during the lifespan of the project. This is particularly true under a private wire arrangement when you need to consider when designing the infrastructure how you will export power to the grid if the arrangement subsequently changes.

Grid export PPAs come in two main forms, either relatively short-term arrangements generally with the major energy suppliers, or longer-term arrangements with a single (or small group) customer. Shorter term arrangements often offer a better spot price than the longer-term ones – but there is more exposure to general price volatility.

Longer term PPA agreements are generally with commercial third parties and seek to fix prices over a set period which helps protect those entering into the PPA (both buyer and seller) from market

volatility. Large corporates, such as The City of London Corporation, HSBC and Vodafone have recently used corporate PPAs for their energy needs. Increasingly large companies are making a commitment to go 100% renewable and are taking actions such as entering into corporate PPA's.

Where power is sold as renewable energy the Renewable Energy Guarantees of Origin certificates (REGOs) will be sold with the electricity and therefore any greenhouse gas emissions savings will normally benefit the purchaser of the power rather than the owner of the renewable energy generator. REGOs demonstrate that electricity has been produced from a renewable source. Each megawatt hour (MWh) of renewable energy generated will receive one REGO and it is the only mechanism for demonstrating that electricity consumed is renewable. REGO certificates are used by suppliers to meet the fuel mix disclosure in their supply licences. REGOs are an important market mechanism to enable value to be created by more desirable sources of electricity, which are backed up with certification.

PPA's also have a lot to offer local authorities and other public bodes taking action on reducing their direct and indirect climate impacts. Key benefits gained from public bodies entering into a PPA with a third-party generator (or their own arm- length generator) are as follows:

Secure energy price - as part of any prudent risk management approach, entering into PPAs provides some insulation against volatile wholesale power markets;

Long term hedge – utilising a PPA gives access to longer date prices;

Additionality/provenance – purchasing directly from a new incremental green generator demonstrates commitment to reducing demand on carbon emitting fuel;

Support UK climate change policy – the UK has made a legal commitment to net zero emissions by 2050. The Government's EES published in April 2022 sets out the ambition that by 2030, 95% of British electricity will be produced by low-carbon means, and by 2035 the Government aims to have a fully decarbonised electricity system. Many local councils have declared climate emergencies and have set targets to achieve carbon neutrality as early as 2030.

6.5.2 PPA structures

Whilst PPA structures continue to evolve there are typically three contract structures:

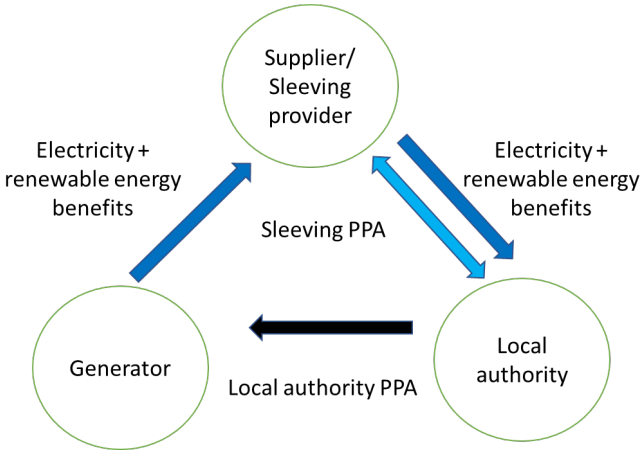
- Physical (also referred to as a 'sleeving' arrangement)
- Synthetic (or virtual)
- Private Wire

Physical PPA

A Physical PPA is between a customer and a generator who are remote from one another. The public electricity network provides the connection and network charges apply. This form of contract provides a direct and verifiable connection between the electricity produced and the electricity consumed.

An overview of the contractual arrangement is shown in Figure 9 below:

Figure 9 – contractual arrangements for a physical PPA with local authority as the off-taker



- Under this structure, the off-taker enters into a long term PPA with a renewable energy generator to take some or all of the energy generated by its plant (or portfolio of plants) with a defined amount of power sold at a fixed price per MWh. Typically, the PPA will contain provisions for the sale and purchase of electricity and the allocation of any applicable renewable energy benefits, and the provisions governing that sale and purchase.

- The PPA will also include obligations to provide or procure certain metering and regulatory activities that can only be undertaken by licensed electricity suppliers (such as npower, Centrica etc). As such, the off-taker will need to enter into a back-to-back agreement with its licensed supplier under which, the licensed supplier commits to undertake these obligations.

- In parallel to this arrangement, the off-taker will have an electricity supply agreement with its licensed supplier, under which electricity may be supplied to meet the off-taker's energy demands from time to time. The terms of supply, under this supply agreement, will consider the electricity purchased under the PPA and passed through to the licensed supplier, under the licensed supplier agreement. This ensures that the off-taker has the benefit of fixed pricing for renewable energy under the PPA but the reliability of a supply agreement with a licensed electricity supplier to meet its day-to-day energy demands.

- There is generally a charge for the sleeving PPA with the sleeving provider which amounts to around 5% of the value of the wholesale electricity traded.

Both wind and solar developers have built up extensive pipelines of renewable energy projects which can give off-takers flexibility around choosing a PPA start date and the ability to dovetail into their long-term energy buying/risk management strategies. Options also exist for individual public bodies to aggregate smaller volumes to benefit from pricing.

Synthetic PPA

In a synthetic PPA structure no power is physically traded. Instead, it is a purely financial structure where the off-taker and generator agree a defined 'strike price' to fix the cost of power between themselves for the power generated, by a renewable energy facility. Each party will then enter into separate agreements with their electricity/licenced supplier to sell/acquire electricity at the spot price.

A synthetic PPA works as a financial hedge, in that if the spot price in a settlement period exceeds the PPA defined strike price, the generator pays the excess amount to the off-taker for power generated in that period. Where the market price for power is less than the strike price in a settlement period, then the off-taker pays the shortfall amount to the generator for power generated in that period.

A synthetic PPA is relatively simple to enact and provides price certainty to both parties. It can be harder to demonstrate a direct connection, but this should still constitute a valid carbon reduction for an authority participating as an off-taker, provided the contracts also secure the associated renewable energy accreditations.

Private Wire PPA

Private wire PPAs are concerned with the sale of electricity from a generator to an off-taker. Under this PPA agreement, power will normally be sold directly from the generator's facility to the off-taker, rather than being notionally passed through a national power grid. Typically, the generating facility only supplies power to the off-taker and will be located at, or close to the off-takers assets. Private wire PPAs are often utilised in conditions where the off-taker wishes to secure its own source of power. In the case of a local authority for example, an energy intensive depot or industrial estate owned by the local authority. Cardiff Council will be entering into a private wire PPA as part of their arrangements for Lamby Way (see case study 1).

Electricity supplier green PPAs

Securing a 'green' tariff from your existing supplier or another major energy company may, on the face of it, appear to be an attractive option. However there are significant hurdles to this approach, in that PPAs with major suppliers are hard to justify in terms of additionality. Most of the schemes listed would have entered into a PPA with a large electricity supplier, regardless of the specific demand from one customer. There is also the risk of perceived 'green washing' where in allocating renewable energy generation to a specific customer, the supplier is potentially increasing the carbon intensity factor for electricity supplied to its other customers, who are not on a specifically 100% renewable energy tariff.

The only potential exception to this is a supply contract with one of the cap exempt energy suppliers, however commercial tariffs are not always available and the potential exposure to significantly higher costs. Ofgem has categorised three suppliers as having cap exempt tariffs these are Good Energy, Green Energy UK and Ecotricity. Cap exempt supplies can be expensive and are not subject to Government intervention.

Direct PPAs with generating stations

It is possible to procure electricity directly from a generating station, through either a sleeved or a synthetic PPA. Either of these arrangements is compliant in terms of carbon accounting. For example, The City of London Corporation procured a long term sleeved PPA with a solar farm in Dorset in 2021. In terms of carbon accounting, this option is much stronger than a PPA with a major energy company because it is easier to demonstrate both permanence and additionality and has improved future cost certainty when compared with a PPA with a cap exempt supplier.

Carbon accounting practice

A local authority will be able to account for the electricity produced from renewable energy generation against its Scope 2 emissions. These are the emission produced by the consumption of grid supplied electricity. It is not possible to use renewable energy generation to offset against Scope 1 emissions in the UK.

Recommended practice in the UK is for organisations to undertake dual accounting for the use or generation of renewable energy. Under this methodology the initial assessment is undertaken using grid supplied electricity and then an adjustment is shown 'below the line' for the renewable energy. In this way it is possible to retain visibility over both total consumption of electricity (and the success or otherwise of energy efficiency measures) and the use of carbon. In order for renewable energy to be reliably used in carbon accounting it is necessary to consider three things:

1. **Additionality** or whether the use of renewable energy directly contributes to additional renewable energy resource in the UK. Any scheme which would have gone ahead regardless of the arrangement should not be included in carbon accounting measures. A local authority should be wary of supplies which are part of much wider arrangements where the allocation of a project to a particular customer would lead to the general supply for customers not on a 'green' tariff having a higher carbon intensity.

2. **Permanence** of the arrangement – any initiative which can easily be reversed e.g. if budget cuts are required these should not be included in carbon accounting measures.

3. **Traceability** - this means the extent to which it is possible to be certain that the electricity purchased has been generated at the point specified. This is governed in the UK by REGO certificates (see Section 6.5.1). Note REGO certificates alone are not necessarily proof of renewable electricity as these can be traded separately from the electricity produced.

6.6 Income from subsidies

Subsidy income is highly prized for its certainty, albeit that guaranteed levels of payment may be lower than those in the prevailing market. This is potentially less critical for a public sector owner than a private sector one, as interest rates and debt service cover ratios in the private sector are significantly improved for assets with a certain income as opposed to those relying on merchant income streams. A local authority on the other hand is also a major purchaser of electricity and is therefore able to hedge the income stream against its liabilities.

6.6.1 Contract for Difference (CfD)

The CfD scheme is the government's main mechanism for supporting new, low carbon electricity generation projects in the UK.

Explainer

CfD is a price guarantee mechanism, providing the generator with a guaranteed price for a fixed period. The guaranteed price is secured via an auction process with generators offering their best (cheapest) price for the electricity supplied. The scheme accepts schemes (cheapest first) until a pre-set cap on capacity is reached. Once the cap is reached the highest price accepted by any of the successful bidders becomes the "strike price" which is then paid to all bidders.

Under CfDs generators pay money back when wholesale electricity prices are higher than the strike price and are provided with a top up to the strike price when the wholesale electricity prices are lower.

In February 2022, the Government announced a change to the frequency of auctions for funding through the CfD scheme. The auctions will now take place every year rather than every 2 years. The change will take effect from March 2023 when the next CfD round (AR5) opens (documents and further information can be found at Guidance related to the Contracts for Difference fifth allocation round (AR5)). Applicants seeking a CfD contract are required to submit the necessary application forms within a set application window. Applications are then assessed against the eligibility criteria set for the allocation framework. The use of eligibility requirements are designed to mitigate against speculative projects being awarded contracts, reserving budget without bringing forward capacity. Table 11 below summarises the key solar PV and onshore wind eligibility requirements (planning consent and a valid grid connection) for Allocation Round 5. For AR5 the Administrative Strike Price for solar PV (>5 MW) is £47/MWh and £53/MWh for Onshore wind (>5 MW) in 2012 prices (for further information follow the link to Contracts for Difference (CfD): Core Parameters for the fifth allocation round, 2023 (publishing.service.gov.uk)).

On 7 July 2022 the results of the CfD Allocation Round 4 (AR4) were announced, which awarded contracts to 10.8 GW of new-build low-carbon capacity, representing the largest volume of capacity

procured in all CfD auction rounds held to date. (All prices below are in 2012 values). The key insights of the AR4 auction include:

a. Pot 1 (Established technologies): Established technologies were eligible to participate in the allocation round for the first time since AR1 was held in 2015. 0.9 GW of onshore wind capacity secured contracts at a strike price of £42.47/MWh and 2.2 GW of solar PV capacity secured contracts at a strike price of £45.99/MWh. For onshore wind the most cost-effective projects in the auction were those located in Scotland.

b. Pot 2 (Emerging technologies): 0.6 GW of remote island wind capacity secured contracts at a strike price of £46.39/MWh (16% increase from AR3). The auction also featured the first procurement of floating offshore wind (32 MW) and tidal stream (41 MW) at a strike price of £87.3/MWh and £178.5/MWh respectively.

c. Pot 3 (Offshore wind): A record 7 GW of offshore wind capacity secured contracts at a record low price of £37.35/MWh (8% lower than AR3). The addition of AR4 capacity brings GB's total contracted offshore wind capacity to 27 GW by 2026/27, leaving a remainder of 23 GW to be secured in future allocation rounds in order to reach the Government's ambition of 50 GW by 2030.

Price competition between solar and wind in the auction, as well those for other technologies was highly competitive. The most competitive projects in the auction benefited from using the latest, most powerful, technology as well as having a good energy resource and a low-cost grid connection. Technological advances (see Section 4.5.3), coupled with significantly larger size of new developments is having a positive impact on the economics of subsidy free solar PV. For example, of the 66 solar PV projects that secured a CfD in AR4, 29 (44%) were projects ≥40MW in capacity. All of the 10 onshore wind projects that secured a CfD in AR4 were ≥50MW in capacity.

Scotland is the windiest country in Europe and based on Q1 2023 data from the Department for Energy Security and Net Zero's Renewable Energy Planning Database: quarterly extract there were 41 onshore wind planning applications submitted in Scotland during the course of 2022 (totalling 2.32GW). In Comparison just 5 onshore wind applications were submitted in England over the same period (totalling 6.8MW) representing less than 0.5% of the capacity proposed in Scotland.

Between 2016 and 2021 just 14 planning applications for new onshore wind farms were approved in England, comprising a total of 31 turbines with a combined maximum installed capacity of 46.4 MW.

Turbine sized have increased significantly in the last eight years, from the norm of around 125m in 2015 to around twice that height in 2023. Larger turbines are more efficient and provide better financial returns. If planning in England were to be relaxed it is likely that viability challenges would remain unless turbine heights were to increase significantly.

The CfD auction process does not address the difficult planning environment for onshore wind in England, which could mean proposals favour onshore wind in Scotland and Wales. 220m tip height turbines have already been consented in Scotland, with projects at 240m+ also in the planning system. In comparison, historic planning consents in England have been at 125m which will prevent the use of the latest, most cost-effective turbines and so hindering projects' ability to compete in auctions.

Table 11 – Allocation Round 5 Eligibility Criteria

Eligibility Criteria	Allocation Round 5 Requirement	Documentary Evidence Required to be submitted through the EMR Delivery Body Portal
Applicable planning consents	The applicant must demonstrate that either planning consents do not apply, or that: • the obtained planning consents enable the proposed CfD unit to be established or altered • and the electricity generated is to be supplied to the national Transmission System, the Distribution System, or a Private Network. Location details of the proposed CfD unit (e.g., post code, geographic coordinates, ordinance survey grid reference) Capacity (in MW) if the planning consent is equal to or more than the Initial Installed Capacity Estimate of the CfD Unit.	A copy of planning consents, including: • a signed and dated planning decision notice • Evidence of granted extensions if planning consents have already expired • Clarification evidence if the planning consent specifies a different technology to the proposed CfD unit • A map
Connection Agreements	The applicant must explain in its application whether: • A Direct Connection applies where the connection is either to the transmission or distribution system. The Connection Agreement entered into must then permit (via either firm or non-firm capacity agreement) Transmission/Distribution Entry Capacity of at least equal to 75% of the Initial Installed Capacity Estimate • A Partial Connection applies, or no other Connection Agreement applies • A Private Network Use Agreement applies. This agreement must then state the exporting capacity to that private network and the capacity in the private network that is accessible under the agreement Location details (post code, geographic coordinates, ordinance survey grid reference) in the Connection Agreement must match the proposed CfD unit application. The Target Commissioning Date in the application is on or after the connection	• A copy of the connection agreement or Private Network Use Agreement which allows for the relevant connection. • Evidence of clarification if the planning consent specifies different technology to the one in application • A map

	date specified in the Connection Agreement	

The application process and calculating the value to bid in the auction are complex and therefore specialist advice should be sought before CfD income is considered in any business case.

6.6.2 Smart Export Guarantee Scheme (SEG)

On 1st January 2020, the Government introduced the SEG scheme, which will enable anaerobic digestion, hydro, micro-combined heat and power (with an electrical capacity of 50kW or less), onshore wind, and solar photovoltaic exporters with up to 5MW capacity to receive payment for exported electricity. The SEG scheme replaces the FiT scheme that closed in Q1 2019.

Under the SEG scheme, all licenced energy suppliers with 150,000 or more customers must provide at least one Smart Export Guarantee tariff. There are currently 16 companies which are licenced to offer SEG rates (SEG Supplier List).The Government has set out that in order to provide space for the small-scale export market to develop, there will not be any specified minimum tariff rate, other than that a supplier must provide payment greater than zero at all times of export. The SEG licensees therefore decide how they want their SEG export tariff to work in terms of its rate, type and length. Storage is also eligible to receive export payments, although suppliers will be able to exclude 'brown' electricity from those payments and require the generator to put metering in place that isolates 'green' exports. You can find further information on the currently available highest SEG export tariffs in the following link Compare Smart Export Guarantee Tariffs | Solar Guide.

Under the scheme, exported power must be metered, with a meter capable of reporting exports on a half-hourly basis, and meters must also be registered for settlement – though the SEG design is flexible and does not necessarily require half-hourly readings.

For PV, wind and micro-CHP installations up to 50kW, generators will be asked to demonstrate that their installation and installer are suitably certified. OFGEM have indicated that an installation certificate such as a Microgeneration Certification Scheme (MCS) certificate (or equivalent) is sufficient to demonstrate this. For all other installations, generators will be asked to demonstrate that the installation is suitably certified. The government does not plan to require a central register of SEG installations.

Full details of the OFGEM SEG guidance can be found at Smart Export Guarantee: Guidance for generators | Ofgem.

7 Conclusions

Several local authorities have successfully invested in renewable energy generating assets and there are likely to be opportunities for other local authorities to follow suit. The Government's ESS published in April 2022 sets out the ambition that by 2030, 95% of British electricity will be produced by low-carbon means, and by 2035 the Government aims to have a fully decarbonised electricity system. Local authorities are significant consumers of electricity and by investing in generation to meet their own needs, can make a significant contribution to the delivery of that renewable energy ambition.

Whether it is better to seek to develop an asset, or buy one from a commercial developer, will depend on the opportunities available and how each local authority responds to individual challenges.

Local authorities should not assume that it will be more cost effective to develop their own schemes. Solar PV and wind developers have worked hard to drive down costs in recent years and bring considerable leverage and expertise to the market. An example of this is the recent (April 2022) Kent County Council purchase of the Bowerhouse II Solar Farm built by Ethical Power Ltd. Some of these schemes are likely to offer better value for money, and at less effort, than development of schemes from scratch.

Grid connection risk is a key challenge for the in bringing forward large-scale projects. Ofgem changes coupled with the Government's ESS is likely to generate a high number of new applications and subsequently further increase the competition for connections and offers now can often not connect before 2028.

The schemes most likely to be successful are commercial scale solar PV, either smaller schemes with a direct private wire to a customer, or larger schemes of 10 MW or more. With the recent difficulties in obtaining reasonable connection dates, the emphasis on small schemes with a good private wire off take, is likely to increase. Opportunities to develop new wind turbines in England appear to be limited at the present time. At the time of publication there is an ongoing Government technical consultation to explore how local authorities demonstrate local support and respond to views of their communities when considering onshore wind development in England.

When considering where to sell the power the local authority will need to balance financial returns with their potential to offset the authorities' carbon emissions. With private wire options there may be no alternative than a direct sale of the power and the accompanying REGO certificates.

Those authorities who have developed or purchased assets advise that good quality external advice will be needed, which ever route you are taking.

The LGA and Local Partnerships have produced a green finance guide (Financing Green Ambitions) to provide both practical guidance and examples of good practice to support councils in England to find the most appropriate and affordable ways to finance their green ambition.

8 Appendix 1 – Points to consider when developing a renewable energy business case

Five Case Model Dimension	Points to consider
Strategic content	• A local authority's main driver is carbon reduction, rather than the purchase of an income stream. This can include area wide decarbonisation as well as the authority's own scope 2 emissions. • The Climate Change Act 2008 • The Ten Point Plan for a Green Industrial Revolution (November 2020) • Net Zero Strategy: Build Back Greener (October 2021) • British Energy Security Strategy (April 2022) • Mission Zero (an independent review of the Government's approach to delivering its net zero target) (January 2023) • Local authority specific policy context (e.g sustainability strategy key aims and goals). Without a project of this nature does the local authority not have a realistic opportunity of realising its net zero emissions targets? • Grid context (e.g background to any grid capacity/reinforcement issues). • Benefits, risks, constraints, and dependencies • Critical success factors • Existing service delivery arrangements

Socio-economic assessment of benefits	• Public investment should bring socio-economic benefit to the local community, whilst carefully balancing costs and risks. It is not for local authorities to act as, or compete with, commercial investors. • Tangible demonstration of leadership of the local authority in tackling the climate emergency. • Forward purchase of the local authority's own energy requirements - insulate the local authority from a volatile energy market and provide stable and affordable pricing for electricity. • Provide additional economic activity in the construction, maintenance, and asset management of the project. • Enables the local authority to deliver public services in its area. For example will the project deliver a long-term revenue stream that will contribute towards easing pressure on finances and enable more effective delivery of front-line services. • Finding assets to purchase can be relatively difficult as demand generally exceeds supply, which restricts choice of location significantly. This potentially makes the socio-economic case harder to make as the economic activity would likely happen without the local authority's intervention. Need to consider other socio-economic benefits that result. • Grid connection scarcity - majority of available grid connections are closer to demand where there is low availability of suitable land for renewable projects. Securing a suitable grid connection for the export of electricity can be very difficult and for some local authority's would not be possible due to network constraints in their area. For these reasons, some local authorities may look to acquire solar farms which are not within their boundaries, or on their land. • Community fund consideration. • Upskilling of authority staff. • Use of local asset manager • Contribute to the diversity and security of the UK's energy supply.
The commercial case	• Is the project appropriately sized? • Consideration of commercial models and financing approaches. • Need for risk mitigation (identification and apportionment) in key areas such as: - Ownership - EPC price risk - EPC procurement - O&M - Asset management - Finance - Term - PPA - Profit and dividends • Finance e.g can better value for money can be achieved by using private or alternative financing to the PWLB. • Procurement considerations

Financial case	• A local authority should not assume that it will be more cost effective to develop or procure its own schemes. Solar PV developers have worked hard to drive down costs in recent years and bring considerable leverage and expertise to the market. Some of these schemes are likely to offer better value for money, and at less effort, than development of schemes from scratch. • Market engagement to establish project cost base for business case development. • Price forecast data • Options appraisal – "Do Nothing", Option 1, Option 2 etc. • NPV/IRR analysis • Affordability analysis
Management case	• Recognise that investment is renewables is not risk free. There are examples of projects which have not gone well. • Need to mitigate risk: - Establish key areas of risk - Draw on external expertise. - Undertaking due diligence - Establish a governance structure • Outline plan and timescales • Stakeholder engagement and communication • What are the anticipated outcomes of the project? • Budget for ongoing specialist support

Glossary of Terms

Any engagement with the renewables industry will involve a degree of technical language and common terms. It is not necessary to have a detailed technical vocabulary, however an understanding of some of the basic terms and concepts will aid understanding in the preceding sections of this document.

ANOB	Area of Outstanding Natural Beauty
BEIS	Department for Business, Energy and Industrial Strategy (subsequenty replaced by the Department for Energy Security and Net Zero)
Brown electricity	Grid supplied electricity which will be derived (at least in part) from the burning of fossil fuels
CCC	Committee on Climate Change
CCR	Concession Contract Regulations 2016
CfD	Contract for Difference – current large-scale subsidy regime
CIC	Competition in Connections (for grid offers)
DECC	Department of Energy and Climate Change (fore runner to BEIS as the ministry for energy)
DNO	Distribution Network Operator. These have mostly become DSOs, however the term DNO is still in use
DSO	Distribution System Operator. These organisations run the local electricity distribution networks. There are seven of them across the UK (only one in any location) e.g. UKPN, Western Power Distribution, Scottish and Southern
EIA	Environmental Impact Assessment
EPC	Engineering, procurement, construction contractors
EUR	Euro (European currency)
FBC	Full Business Case
FES	Future Energy Scenarios – produced annually by the National Grid to forecast future energy needs
FiT	Feed in Tariff – previous subsidy regime
GBP	Pounds sterling (UK currency)
Green electricity	Electricity derived purely from traceable renewable energy generation sources
GW/ GWh	Gigawatt or Gigawatt hour. Measurement of electricity equivalent to 1,000 MW or MWh
HELGA	Heat Networks and Electricity Generation Framework – owned by Crown Commercial Services
HV	High voltage
ICP	Independent Connection Provider
KW/KWh	Kilowatt or kilowatt hour. Standard measurement of electricity (used on electricity bills)
MCS	Microgeneration Certification Scheme
MOA	Memorandum of Agreement

MW/MWh	Megawatt or megawatt hour. Measurement of electricity equivalent to 1,000 kW or kWh
NFFO	Non-Fossil Fuel Obligation – previous subsidy regime
NG	National Grid – operator of the transmission system for electricity
O & M	Operation and maintenance
OBC	Outline Business Case
OFGEM	Electricity industry regulator
PCR	Public Contract Regulations 2015
PPA	Power Purchase Agreement – contract for the buying and selling of electricity
PV	Photovoltaic i.e. turning light energy into electricity
RE100	Global scheme for companies to declare their intention to use only 100% renewable electricity
ReFit	National Energy Performance Contract framework – owned by Local Partnerships and the GLA
REGO	Renewable Energy Guarantees of Origin – scheme administered by OFGEM to provide transparency to customer about the source of their electricity
RO	Renewable Obligation – previous subsidy regime
ROC	Renewable Obligations Certificates issued under the RO
SEG	Smart Export Guarantee Scheme
SPV	Special Purpose Vehicle – term for a company set up to own a specific asset – largely to define its boundaries of operation and make it easier to trade.

Contact details

Jo Wall, Strategic Director – Climate Response, Local Partnerships

Email: jo.wall@localpartnerships.gov.uk

Tel: 07985 476697