



Gwasanaeth Ynni Energy Service

Cefnogi ymdrech Cymru i greu economi sero net llwyddiannus
Supporting Wales' drive to a successful net zero economy

Best Practice Note on Private Wires

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Lead Author	Jane Forshaw
Technical Review	Charlotte Norton
Peer Review	Paul Leeuwerke, Utility Consultancy and Engineering Ltd
Practitioner Review	Jo Wall

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Context

Within the Welsh Government Energy Service a number of public sector and community projects have either achieved or are exploring the possibilities of private wiring their renewable generation project to a **single** off taker (energy purchaser).

Whilst arrangements are possible that support more than one customer offtake these become increasingly complex technically and legally. This type of arrangement would require a private section of network which would need to be managed by a suitably qualified HV contractor who can undertake control, operation and maintenance of the network to ensure compliance with the Electricity at Work Regulations (1989). Arrangements for generation, distribution and supply of the electricity would need to be compliant with the Electricity Supply Licence regulations (or their exemptions). The scope and complexity of these arrangements will require individual assessment and is beyond the scope of this note.

The key benefit of a private wire Power Purchase Agreement (PPA) is that, for both the generator and off taker, there is the opportunity to share savings in avoiding grid charges and policy costs applied to electricity imported from the grid. The savings are shared between the generator and the end-user, so that the latter buys electricity below the retail cost of grid electricity while the former sells above the wholesale market price. As network charges and supplier levies have increased significantly in recent years, so interest in private wire supply has grown. It is possible, however, that these arrangements may be changed in the future which could reduce the level of these benefits.

Where a renewable energy generator is connected directly to its customer and the customer also owns the renewable energy generator then the carbon benefits of this arrangements are allowable under the Welsh Government guidance on carbon accounting

Private wire PPAs are driven by both generators and users seeking price certainty and for end users to strengthen their corporate social, financial and environmental responsibility credentials by buying electricity from a named local renewable source.

The viability of the business case (to both the offtaker and generator) is dependent on:

- being able to spread the costs of the private wire over a large scheme i.e. the larger the offtaker then the further it might be possible to economically route the private wire
- the time-scale covered by the power purchase agreement (a minimum term of 15 years is considered likely to be required)

In order to supply electricity to a third party, the generator organisation would either need to be a licenced electricity supplier or fall under one of the exemptions in Schedule 4 of the Electricity (Class Exemptions from the Requirement for a Licence) Order 2001. Without acquiring an electricity supply licence (which is expensive and onerous), the generator organisation should ensure that their legal team review the details of the exemptions rules and ensure they are satisfied with compliance, noting that this will apply to generation, distribution and supply exemptions. Ofgem provide further advice in this area, particularly with respect to more complex supply arrangements.

Agreements between supplier and off taker should be negotiated carefully to ensure that risk is apportioned appropriately to deliver a robust and deliverable deal, which is fair to both parties.

Generators will need to be clear about the volume of energy the renewable asset will produce and its variability, over the lifetime of the asset. Solar and wind farms are considered to be sufficiently predictable that the majority of them in the UK are now either owned or financed by institutional investors at very low rates of interest – reflecting the degree of certainty that the forecasted volumes will be produced.

There will be some variation from the forecasts produced at feasibility stage as these will be subsequently verified with an Energy Yield Assessment from a qualified engineer and warranted by an Engineering Procurement and Construction contractor. Of more concern can be the demand requirements of the off taker. The match (or mismatch) between supply and demand will determine the extent to which additional export capacity is required. If additional export capacity is not available at an affordable price then the scheme will need to be sized in line with the off taker's requirement. It would be normal for any PPA to have a 'take or pay' clause for a minimum amount of electricity ensuring that the generator is guaranteed a return on their investment.

The models that the Welsh Government Energy Service produce at feasibility stage are based around EU data on irradiance and MERRA-2 data on wind speed in specific locations. There will be some variations year on year, however irradiance is less variable than wind speed and the irradiance data used is highly accurate based on a large, long term EU funded database (known as PVGIS¹). Wind speed is far more variable on an interannual basis. To generate the wind speed data used in Welsh Government Energy Service feasibility assessments, 20 years' worth of data is downloaded and averaged from

¹ [PVGIS](#)

the online Renewables Ninja tool and MERRA-2 data, to provide a more robust wind speed estimate. In order to have greater confidence in the likely wind resource at a site Welsh Government Energy Service recommend that site specific models are built early on in the project development process.

Key considerations

Grid connection

It will be necessary to determine where the scheme will connect to the grid. It is unusual for there to be more than one connection point, in the rare circumstances where the DNO allows two connection points there are significant additional costs associated with high voltage protection infrastructure.

The most normal arrangement is for the grid connection to be at the customer site. This allows the off taker to have a separate supply for the balance of its electricity needs with billing and supply arrangements remaining separate. If the connection is at the generating station it is not unusual for the DNO to require this to become the point of supply for the customer. This in effect makes the generator the supplier to the customer for all their electricity and brings with it additional risk of failure to supply.

Moving the point of supply connection to the customer site brings with it the risk that the connection may not always be available to the generator. If for example the customer ceases trading or the PPA agreement comes to an end the generator may not be able to obtain an alternative affordable connection. This is one of the primary reasons that the PPAs need to be of a longer term nature. Some PPAs provide for long term grid access to the generator in the event of the customer no longer occupying the site, but this will be for the parties to negotiate.

The off taker will need back-up grid supply, because of the intermittent nature of renewable supply, also to hedge against the risk of the supplier not meeting demand at peak times, and to ensure that they can still get power during shut downs or service failure or loss of the DNO network.

It might also be possible to export excess generation through the offtaker's grid connection, depending on what grid capacity is available. Any connection will require a grid connection offer from the DNO, (to operate the generation in parallel with the DNO network) regardless of whether or not it is intended to export power. There may be costs associated with this,

regardless of whether there is export capacity or not and it would be the generator who would be expected to pay these costs. The question of who applies for the grid export connection and in whose names the connection agreement is held is one for negotiation through the PPA process.

The project will need a high voltage electrical contractor to design and build the cable and associated high voltage infrastructure. Most companies who specialise in this type of work also do work on DNO infrastructure and are known as Independent Connection Providers (or ICPs). To work on DNO infrastructure (or infrastructure that will be adopted by a DNO) an ICP must be on the Lloyds National Electricity Registration Scheme (NERS) accreditation scheme. Technically, as private wire works are not part of the DNO infrastructure a non-accredited supplier could be used, however in order to ensure quality and safety it is strongly recommended that only accredited suppliers are used. Most HV contractors are now Lloyds Registered – however it is worth noting that contractors associated with manufacturers may not be.

It is recommended that the NERS accreditation is checked at the outset and you should obtain proof of the registration. The accreditation means that the company has the correct quality standards, levels of insurance, and the experience and capability to work on the grid infrastructure and will therefore have the competency to design and install a suitable private wire connection. Their staff will be suitably qualified people who know how connections work.

Any private wire which is either new or will export to the electricity grid will need a suitable meter installing (which is capable of measuring export) or adaptation of the customer's existing meter to accommodate export, prior to connection and commissioning. The process for ordering and installing meters is relatively complex and close attention should be paid to the responsibilities of each party. This is not an activity that a client can pass off in its entirety to the contractor. It is worth noting that the generation meter will not necessarily come via a meter operator.

In order for a meter to be installed a suitable location will need to be provided. This might be inside an existing building or it might be in a separate purpose made meter enclosure. The responsibility for preparing this area should be with the contractor installing the high voltage works and needs to form part of their specification, however the size of this may depend on the size of the meter to be fitted and that information may not be available at the design stage. Meter location may need to be by negotiation with the private wire customer as it may be on their land.



Figure 1 - Swansea Bay University Health Board solar farm at Brynwhillach farm (top left) providing power to Morriston Hospital (image courtesy of Vital Energi)

The meter itself is installed by a meter operator (or MOP). The MOP will be instructed by the power purchaser (i.e., for any grid supplied electricity NOT the private wire customer) under their PPA. As the customer you will need to have this PPA in place well in advance of your proposed connection date to ensure there is time for information on the requirements for the meter housing to be processed by your installation contractor, the housing to be installed and the MOP to be scheduled to undertake the fitting.

It should be borne in mind that the generation site will also need a small import capacity to manage electrical needs for the onsite infrastructure (such as CCTV which has to run regardless of whether power is being generated). This will need its own grid connection offer (which may be part of the same offer as any export) or could be taken from an existing supply. This will be a low voltage supply, as opposed to exported power which is more likely to be medium voltage. This grid connection should be applied for an accepted concurrently with the main export connection. Be aware that this will need its own PPA for power consumed and the constraints regarding meter installation apply to this installation in addition to the export metering.

It is also suggested that the Electrical Engineer for the project has a job description which defines their role up to the point of energisation not just construction.

Construction

It is possible that a project will have a contractor developing the renewable asset, another contractor delivering the private wire and then also the off taker. Unless the contract paperwork is clear for all parties, then there is a danger that no obligation is created to require the parties to work together. It is good practice to have a lead contractor manage and coordinate the process and ensure joint working across all the contractors.

It is worth noting that the number of contractors and sub-contractors working across a private wire is likely to be substantial and in many circumstances they will not necessarily all be contracted to the same client. Potential participants, depending on the complexity of the project, could include:

- Solar Farm Client
- Solar farm Contractor (D&B and O&M)
- Solar Farm sub-contractors both for physical installation and programming/software controls
- Private wire civils designer
- Private wire HV designer
- Private wire construction contractor
- DNO representatives (for G99/G100 and other wider network safety issues)
- Offtaker client
- Offtaker consultancy team
- Contractor/s responsible for physical connection of installed wires and final testing arrangements (whether this is the generation or offtake side might depend on the complexity of the offtake site)

H&S oversight of all of the above is also crucial as is final certification and signoff of the installation, connection and data requirements.



Figure 2 - Ducts installed at Launch Drill Location, Lamby Way, Cardiff City Council

If the public sector body does not have its own in-house electrical engineer it is recommended that a specialist electrical engineer is appointed at an early stage in the process, rather than necessarily prioritising the civil engineering. It is also important to budget for this advice. This suggestion is being made because very often the public sector does not have the necessary experience to ask the right questions of the renewables and private wire contractor, so ideally you need an electrical engineer sat client side helping to ask the difficult questions. The electrical engineering is a specialist area that will require careful procurement. WGES has developed some example specifications for this technical engineering role.

You will also need to have experience in the team to manage the construction of the project. Most energy managers are well qualified in their fields but have not necessarily had experience of managing a complex high voltage civil engineering project. Private wire projects also typically include issues with planning and land rights which may be beyond the experience of some energy managers.

It is essential to have a project team with the right skill sets and levels of experience to behave as a competent client.

It is suggested that the renewables asset and the private wire construction are commissioned at the same time. In practice it may be that the private wire takes longer than the renewables asset to construct. Ideally the procurement would utilise either an Engineering, Procurement and Construction contract or Energy Performance Contract, both of which provide some level of performance guarantee. If possible, the project would have a single contractor construct the renewable asset and the private wire. A New Engineering Contract (NEC) contract is considered to be less appropriate for covering the renewable asset and private wire as it does not provide an energy performance guarantee, but it may be more appropriate if the private wire works are undertaken separately to the renewable asset as a standalone contract. It is recommended that an independent NERS-accredited high-voltage engineer is appointed to assess and provide the information required to inform the technical specification of the private wire works.

It is important that the route for the private wire is assessed for land ownership and any wayleaves or easements are negotiated well in advance of construction. It might be worth considering a longer route to avoid a difficult or costly negotiation. It is also important to understand what utility assets might be buried in the ground. For instance, some of the asset registers held by the utilities will not always be precisely accurate with locational information. It is also worth checking if you need any licences for where you are hoping to drill, e.g., under an estuary requires a Marine licence, which has its own lead in time.



Figure 3 - Directional Drilling Plant – entry site on the River Rhymney estuary connecting Lamby Way solar farm to Welsh Water

Underground cables installed by the DNO are usually done so using their statutory powers, these do not apply to private cables and you will therefore also need planning consent for your cable installation.

Arrangements to consider prior to the scheme becoming operational

In terms of ongoing responsibility for the cable the body organising the private wire would need to arrange a COMA (Control Operation and Maintenance) agreement with a HV contractor. The COMA contractor would be responsible for ensuring that the cable is working correctly and is properly maintained and would also be on call for any issues in relation to failure (with agreed Service Level Agreements in their contract). There is no need for an IDNO as the cable is private.

Underground cables are usually shown in searches, such as “Linesearch before you Dig” (www.lsbud.co.uk), which is a free service that enables those building and developing around them to know that they are there. This happens because searches are issued to the statutory undertakers who own the majority of this infrastructure, however private cables are not covered by these arrangements. Cable strikes are potentially serious events that can lead to injury or death. As the owner of a private cable it is incumbent on you to take reasonable steps to ensure that the cable is discoverable in land searches and there are independent organisations you can pay to hold this information and issue it when searches are requested.

In the event of a cable strike there would be a need to mend the cable as quickly as possible – but on the basis that the point of damage would already be known, this should take no more than a couple of working days as a repair should be quite a straightforward thing to do) – so not a huge amount of export would be impacted. There should not be a minimum supply constraint in renewables PPAs and this type of outage should be covered by standard contract conditions.

If the off taker has to fall back on grid in case of failure to supply there should not be a penalty from grid electricity unless there are specific penalties in the grid contract for failure to consume specific volumes. The grid supplied electricity contract therefore needs sufficient flexibility to deal with the variations associated with intermittent generation but that should not be a problem unless you are connecting a really significant proportion of the offtaker's supply.

Offtake and minimum supply requirements

You will obviously need to bear in mind any curtailment conditions which have been applied to your grid offer from the DNO.

Assuming the generator has paid all the costs in relation to the development and connection of the renewable energy generation asset and the private wire it would be undesirable for there to be a minimum supply requirement as renewable energy generation is intermittent and cannot be guaranteed. There may be a maximum supply requirement set by the off taker.

The offtaker will generally need to accept a take or pay clause ensuring that the generator has certainty of income.

Given the recent volatility in energy prices it is recommended that a significant degree of flexibility is in-built into any PPA to ensure that the most financially beneficial distribution between private wire and grid distribution can be achieved easily and whenever necessary through the contract term.

Additional costs

When assessing the merits of a private wire, additional costs associated with the installation and maintenance of the private wire infrastructure should be factored in, for example responsibility for the physical interface between the generator's plant and the offtaker's facility, and for insuring the private wire against damage.

The asset needs registering with a third party land registration service such as the line search before you dig website, to allow any other ground work contractors to see there is an underground cable present.

It is also worth bearing in mind that the depth of cable laying will trigger a different specification for the cable due to the heating effect at depth.

You will need to consider insurance against issues like an outage from a cable strike.

Private wires are rarely as straightforward as initially envisaged, with potential engineering obstacles being concealed and land rights not always being clear at the outset. Any organisation considering developing a private wire must be prepared for significant additional costs during the development phase as these difficulties are discovered and assessed.

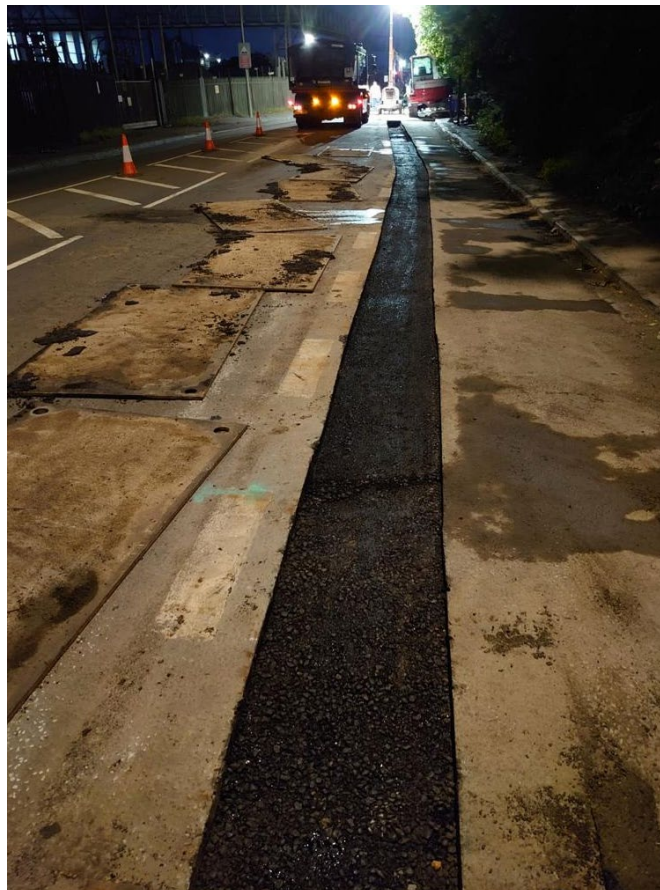


Figure 4 - Night Working for Traffic Management, Lamby Way, Cardiff City Council

Some items, such as railway lines and some rivers may prove almost impossible to overcome. These items need to be identified at the outset and either an alternative route

found or a solution thoroughly investigated and agreed. For example, a railway crossing may be possible if one of the following are present:

- A highway crossing the railway either via an underpass or a bridge with a duct in it where the cable can be accommodated in the highway
- An overhead span of line is possible

Key negotiation points

Pricing

A PPA is a contract between an electricity generator and the party who is purchasing the power (the off taker) which incorporates the commercial terms for the sale and purchase of electricity for a project. Where the purchase is not a licenced supplier of electricity, it is typically referred to as a 'private wire' PPA. For any scheme with both a private wire customer and some grid export you will need both a private wire PPA and a PPA with a licenced supplier.

For generators, the private wire PPA model provides an attractive route to market with long term enhanced revenues. Issues can arise from the covenant strength of the counterparty. Whilst the economics of a scheme may be enhanced by a private wire the terms of any debt finance will be directly related to the strength of the PPA and the covenant strength of the off taker.

Private wire PPAs present an opportunity for both suppliers and off takers to hedge against volatility of energy prices. A cap and floor mechanism allows corporate buyers protection against the cost of purchasing electricity from a licenced supplier and rising power prices, while ensuring they don't miss out on decreasing power prices.

In either case energy prices are usually inflation linked. The index selected will be part of the negotiation and will be directly linked to the starting price. RPI would favour the supplier as it is higher than CPI.

Careful consideration should therefore be given by both parties to the pricing mechanism to ensure maximum benefit is obtained from this alternative energy sale and purchase arrangement, e.g., fixed price or a cap and floor mechanism. Where surplus energy is exported to the grid, the parties will also have to agree who benefits from the sale of the power.

The additional complexity and risks associated with the legal and contractual arrangements underpinning the private wire supply deal will also need careful consideration. WGES have a draft MoU available for use solely by public sector parties, with the kind permission of Welsh Water.

Termination

Parties should consider carefully the consequences of the PPA's termination, either at its expiry, due to breach or due to commercial preference of either of the parties. The generator may require the ability to continue operating and exporting to the grid post-termination, and/or flexibility to negotiate a replacement private wire deal following termination of the original agreement, or they may require compensation for loss of income or incomplete cost recovery. The off taker will want flexibility to obtain energy elsewhere post-termination, either from another PPA or from the grid if the generator falls away. If connection is via the off taker's infrastructure then clear provisions will need to be negotiated in relation to any ongoing access to that infrastructure for the generator.

Possible future regulation

A boom in private wires may be tempered by incoming regulatory change, writes [Ali Lloyd](#), senior principal consultant at Pöyry. There are some regulatory clouds on the horizon which need to be considered by developers and end users contemplating such schemes.

Ofgem is currently reviewing network charging rules, with the likely outcome that there will be a shift toward recovering more costs through fixed or capacity-based charges, and less from variable unit charges. This reduces the cost which can be avoided by a private wire arrangement, assuming a back-up connection to the grid is still required.

It is also possible that the government may seek to limit avoidance of supplier levies by private wire generation, if there is concern about the growing volume of demand avoiding these levies.

So while private wire supply may look economically attractive in the near term it will be important to address potential regulatory changes when developing the business case and negotiating a PPA.

Risk Register

The resources available for managing risk are finite so one should aim to achieve the optimum risk response, prioritised in accordance with an evaluation of the risks.

Risk is defined as “uncertainty of outcome”, whether positive opportunity or negative threat of actions and event.

As a minimum all the issues raised in this briefing note should be items considered for a risk register.

Examples from the Welsh Government Energy Service

Lamby Way, Cardiff City Council

- [40-acre Cardiff solar farm gets the green light - BBC News](#)
- [Current Projects - Cardiff Smart City \(smartcardiff.co.uk\)](#)

Morrison Hospital Solar Farm at Brynwhillach

- [Morrison the first hospital in Wales to develop its own solar farm - Swansea Bay University Health Board \(nhs.wales\)](#)
- [This Welsh hospital is being powered by a solar farm \(wales247.co.uk\)](#)
- [Welsh solar farm exceeds expectations in powering Swansea hospital | Wales | The Guardian](#)

Appendix A. Bibliography

- Sheppard Ben, Walker Morris, Private Wire PPAs in brief 17th January 2018
- Woolsey, Laura, “Network and policy reforms affecting private wire arrangements”, Cornwall Insight website <<https://www.cornwall-insight.com/press/network-and-policy-reforms-affecting-private-wire-arrangements/>>, last accessed 04.03.2022.



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