Local Grid Charging

Exploring the incentivisation of local energy

Report by

Open Utility

Funded by

WESTERN POWER DISTRIBUTION INNOVATION

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Executive Summary

The UK's energy landscape is changing rapidly. Tumbling renewable energy prices and growing public and political will to decarbonise the system has made the rise of the clean energy sector all but unstoppable.

At the same time, technological innovations and the increasing prevalence of distributed energy resources (DERs) like solar PV, batteries and electric vehicles have opened the door to new – and largely unexplored - ways of energy trading and transfer.

Against this backdrop, peer-to-peer (P2P) trading has emerged as a promising way to support DERs whilst helping to take some of the strain off the grid's higher voltage levels, with significant cost savings implications. The system works by using sophisticated algorithms to match end-users' electricity demand with a nearby generator. Despite interest from a wide range of energy industry stakeholders, the growth potential of this local matching is being hindered by legacy network charging mechanisms that offers no financial incentives to either generators or end-users.

In response to this, Western Power Distribution (WPD) funded Open Utility and its project partners to explore different grid charging models that might encourage local matching – and to investigate the potential cost savings that could come from that matching.

Using a combination of expert interviews, desk-based research and economic modelling, the researchers considered four alternative pricing models intended to incentivise local matching:

- Network Replicating Private Wires (NRPW)
- Virtual Private Wires (VPW)
- Two versions of Locational Distribution Use of System (DUoS) charges

The research found NRPW, which is the only one of the four alternatives that already exists, provide strong signals for local matching. However, the model has significant barriers to entry, including upfront capital costs, contractual complexities and numerous logistical challenges, and is only a viable option for a very small number of end-users in the UK. And since Distribution Network Operators (DNOs) are largely blind to NRPW arrangements, they cannot plan and manage their networks around them.

By routing electricity over a DNO's network, VPW would provide similarly powerful signals as NRPW, whilst avoiding any unnecessary duplication, providing better transparency and generating revenue for DNOs through leasing charges. However, regulatory changes would be needed to

implement VPW, and these are unlikely to be agreed since participants in VPW arrangements would avoid paying certain policy costs which would then need to be borne by wider electricity customers.

The two Locational DUoS models are based on discounted rates for matched demand and supply, and would allow anyone to participate and benefit. Despite this obvious benefit, however, both models were found to provide far weaker price signals to encourage local matching than NRPW and VPW, meaning it would require significant scaling to deliver any notable system value. Furthermore, there would be significant complexities to implementing the models successfully, including how to share the value of matching fairly between demand and supply participants.

None of the models investigated in the research was found to provide the right mix of encouraging local matching between end-users and generators whilst also being fair to non-participants, highlighting the difficulty of developing a single mechanism to solve all problems. Despite this challenge, Open Utility believes there are ways of incorporating the best elements of both VPW and Locational DUoS into a single pricing model, and now wants to set up practical demonstrators and trials to continue its research.

Why We Did It

The UK is in the midst of an energy transformation the speed and scale of which has not been seen since the birth of the Industrial Revolution.

Our old and heavily polluting, fossil fuel-fed energy network is no longer fit for purpose, and there is now a real urgency among policy makers, business and the wider public to decarbonise the system.

This section considers P2P trading as an exciting new opportunity to emerge from this rapidly changing energy landscape, and looks at how current pricing models may be hindering its potential.

Why We Did It

Technological breakthroughs and the increasingly favourable economics of renewable energy have helped pave the way for clean tech and the inexorable rise of DERs such as solar PV, next-generation batteries and electric vehicles.

The prevalence of solar PV, for example, has increased exponentially in recent years to more than 937,000 installations across the UK, while the number of plug-in cars rose from 3,500 in 2013 to more than 130,000 by the end of 2017. During the same period, the price of offshore wind has dropped below that of nuclear and gas for the first time, and in January this year Government spelled out its plans to phase out coal by 2025.

The speed of change has confounded the expectations of most energy experts, and now the industry is playing catch up to what this means and how to make the most of it.

The Speed Of Change

937,000+

SOLAR PV INSTALLATIONS ACROSS UK

3,614%

PLUG-IN CARS INCREASED FROM 3,500 IN 2013 TO 130,00 IN 2017

New Opportunities

Just as technological innovations are crucial to upping the performance and lowering the costs of turbine rotors and PV panels, advances in intelligent metering are opening the door to new demand and supply models that carry the potential to fundamentally change the relationship between customers and their energy suppliers.

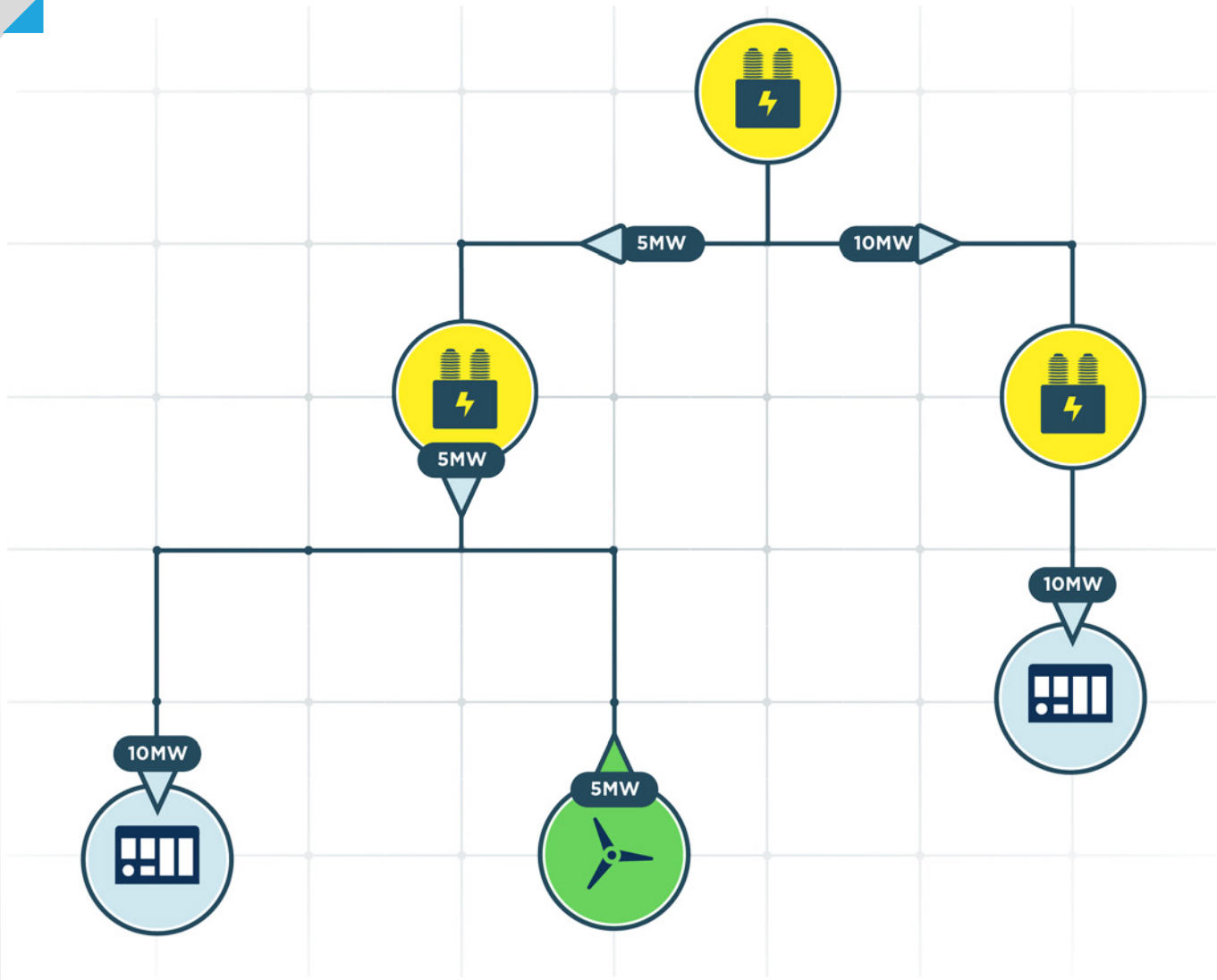
P2P trading is one such model catching the eye of a wide range of energy stakeholders as a way to maximise value from local networks and DERs, and works by drawing on the changing energy landscape and emerging digital capabilities to match customers with local energy generators (*see* **What is Piclo?**).

The primary benefit of local matching (*see* **Local Matching Explained**) like this is that it minimises the distances the power has to travel, and so reduces power flows at higher voltage levels of the grid, thus potentially removing the need for costly future improvements to create additional network capacity to meet increased peak demand flows.

In the case of WPD, which has put the cost of upgrading its own network at £224.5 million over eight years, initiatives like local matching that reduce or delay peak flow growth offer large financial savings - in WPD's case, up to £28 million a year.

Further savings can be made from reduced system losses due to reduced peak time flows through network assets. Preliminary research completed for this report indicates that if just 10% of demand from low and high voltage half-hourly metered end-users in the WPD area was matched with local generation, these customers could make combined annual savings of £1 million on avoided generation through reduced losses, plus a further £0.2million in avoided carbon costs.

Preliminary findings show that if 10% of end-users used local matching these customers could make combined annual savings of £1 million on avoided generation through reduced losses.



Local Matching Explained

For the purpose of this research, local matching is defined as the netting off of demand and generation between one or more end-users and a generator that are served by the same part of the distribution network and within the same settlement period. With the correct incentives this can be encouraged, leading to changes in behaviour and processes of end-users and generators that increase local matching, and even potentially affecting the choice of location for new assets.

SUBSTATION GENERATOR DEMAND 10MW IMPORT VOL. 10MW EXPORT VOL.

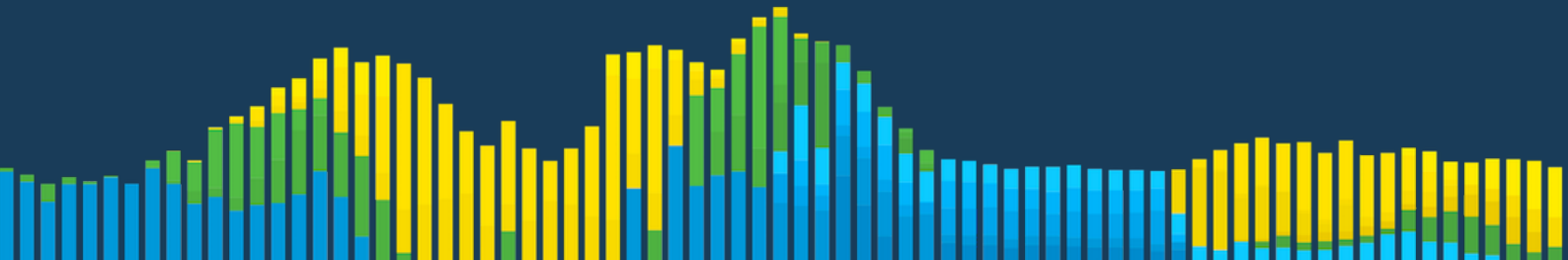
piclo®

What Is Piclo?

Developed by Open Utility, Piclo is the UK's leading software platform for decentralised energy markets. The first Piclo application, Piclo Match, was launched in October 2016, offering a peer-to-peer energy matching service that uses smart meter data to to provide a more granular way of debiting and crediting electricity being put on and taken off the grid.

This allows registered customers to choose the generators they want to match with based on a range of criteria, including location, technology type, ownership and cost. The platform's powerful algorithms then match as much energy as possible with the highest priority generators. Electricity retailers pay Open Utility to license the platform and in return they can offer customers a tangible renewable supply—an increasingly valuable differentiator in competitive markets.

With recent funding from Government's Department for Business, Energy and Industrial Strategy (BEIS), Open Utility has started work on its second Piclo application, Piclo Flex - a service which lowers barriers for customers with flexible assets, such as batteries and electric vehicles, to participate in their local smart grid.



The Missing Incentive

Despite the proven capabilities for local matching and the vast potential savings it affords, P2P trading in local energy markets remains a niche sector.

The reason for this is that, while logic might dictate that there should be cost savings for using energy close to where it is produced, there are currently no financial incentives for all but the biggest businesses to locally match their electricity supplies. And this is because the current approach to pricing assumes the grid is still a centralised, fossil fuel-fed energy system, making it more and more unsuitable in today's changing energy scene.

This means existing P2P energy customers are signing up primarily as a demonstration to their increasingly environmentally conscious consumers of their support for local, low carbon energy producers.
To take the P2P trading model to scale, it is vital to make the traditional, money-driven business case.

To add to the research in this field, WPD funded Open Utility and its partners to carry out research into different grid charging options that might encourage DERs local matching in the future.

What We Did And What We Found

The continuing rise of DERs has laid the foundations for a new type of business model in the UK energy system in which end-users buy their energy directly from local generators.
But as seen already, this local matching of demand and supply will never achieve its full potential unless the economic case is made to incentivise wide-scale involvement.

This section sheds light on the limitations of the existing pricing system in the face of DER, and explores a number of alternatives designed to encourage more local matching.

The Current Local Grid Charging Method

DUoS charges (*see* **DUoS charges explained**) for most UK electricity users and generators are set based on the Common Distribution Charging Methodology (CDCM). Using this method, a DNO's costs are allocated to each network level (e.g. low voltage (LV), high voltage (HV), extra-high voltage (EHV)). Demand users are then charged an amount based on their assumed use of different network levels and their estimated contribution to the maximum load on the network as a whole.

Correspondingly, the CDCM uses the same cost allocation method for demand to calculate DUoS credits for generators who export electricity to the distribution network.

In doing so, the methodology assumes that distributed generation always offsets demand at higher network levels, where in reality, these generators increasingly provide surplus supply (due to being in generator-heavy locations or because they are generating electricity outside of peak demand hours).

During the times that this happens, end-users could end up funding credits even though the generators are providing no benefit to the network, or in the worst case actually adding to its operational costs. Furthermore, there is no incentive to encourage more generation in high-demand areas and vice-versa.

Implications for local matching

- While CDCM makes it easy to manage costs and charging for a whole network region, the method lacks the necessary flexibility to provide financial incentives – or price signals (*see* **Price Signals Explained**) – that would encourage local participants to shift their demand or generation patterns to maximise local matching.
- Even when local matching does take place, participants receive no remuneration for the savings on network reinforcement costs that matching has incurred.

Price Signals Explained

Price signals are financial incentives that influence the behaviour of generators and end users. So, in the context of local matching, a successful price signal would be one that provided a commercial benefit to either or both parties that was large enough to cover their costs of providing that matching.

DUoS Charges Explained

In Great Britain there are six DNOs responsible for developing, operating and maintaining the distribution networks that carry electricity from the high voltage transmission grid to homes and businesses.

DUoS charges are made by DNOs to recover their maintenance and asset reinforcement costs from energy suppliers and smaller, independent distribution network operators that use part of their network. Charges are then passed on by energy suppliers to their customers - the end-users - and are based on actual use. Rates vary depending on region and also time of day to encourage end-users to reduce their demand at peak time, and are represented on a red/amber/green scale.

DNOs also issue credits to any generator that exports electricity to the local grid. These are calculated on the assumption that the electricity generated is all used by end-users locally and therefore is providing a saving to the grid; and it is this estimated grid saving that goes into the calculation of the value of the credits. However, in reality, not all generation may be locally matched.

The DNO's chargeable costs are met through this complex web of charges and credits. So, in the short term it is a zero sum game: if DUoS charges are restructured to encourage local matching and a customer makes a saving because of that restructure, then there must be a corresponding negative impact elsewhere. However, in the long run better local matching would save grid costs and therefore lead to lower costs for all.

Price Incentive Models

Local matching has the capacity to reduce the strain on higher voltage level power lines, while advancing the development of clean energy generation.

To support its growth, financial incentives could be introduced to encourage increased matching that could work in two ways:

1

By encouraging end-users and/or generators to shift their energy use/generation to different times of the day so that they are more closely aligned with each other, and therefore maximising the matching opportunity;

2

By encouraging end-users or generators to connect to parts of the network currently dominated by the other, thereby increasing the scope for additional local matching.

As seen above, however, the CDCM fails to provide any financial incentives to encourage consumers and generators to get involved. The purpose of the research, therefore, was to investigate alternative pricing models to spur interest in local matching, one of which already exists:

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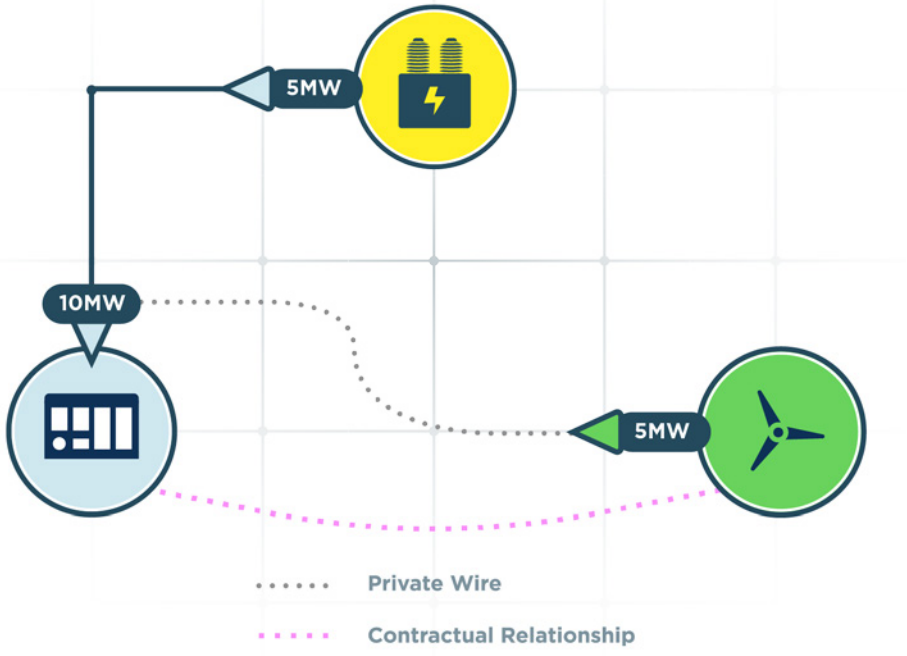
Network Replicating Private Wires (NRPWs)

NRPWs are a subset of private wires (*see* **Private wires explained**) that replicate existing assets owned and maintained by the local DNOs, and are located in areas with spare network capacity. The arrangement involves a single generator supplying electricity under contract to at least one independent customer (i.e. it is not self-supply) using wires that are owned and maintained by one or both parties and are not part of the regional DNO's network.



Benefits

The main beneficiaries are the participants. By using NRPW the generator profits from a supply licence exemption, and the generator and/or end-user(s) benefit(s) from a distribution license exemption, as applicable. This provides reduced costs to the end-user and extra revenue to the generator.

Challenges & Limitations

Contractual complexities, hefty up-front costs and logistical challenges to installing NRPW all provide barriers to entry, while the sheer size of the multi-year contract means there are only a small number of viable end-users in the UK able to accommodate that level of risk.

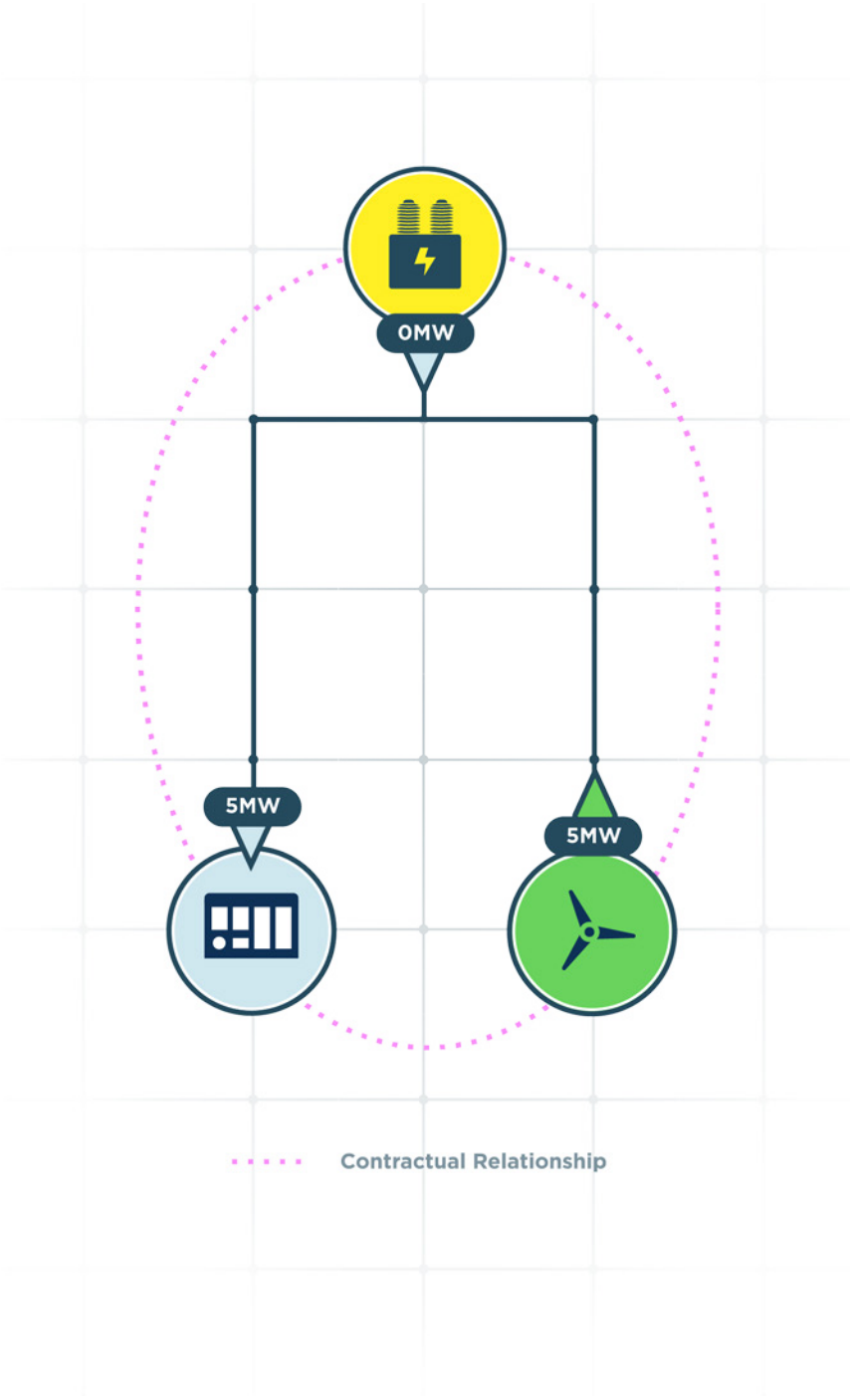
Private Wires Explained

In a standard private wire arrangement, a generator supplies electricity directly to the consumer via a privately owned wire. Participants are then exempt from paying certain environmental, supply and network charges, such as Climate Change levy and DUoS, on – and only on - the electricity supplied under the arrangement.

The concept of private wires covers a wide range of practical arrangements, including self-supply and same-site installations, and is the only existing pricing model that provides a price incentive for local matching.

Virtual Private Wires (VPWs)

VPWs are a theoretical alternative pricing option to CDCM that would work similarly to NRPWs, but instead of requiring the use of new wires would route an allocation of the DNO's spare capacity over existing, licensed distribution network assets through some kind of private leasing arrangement.



Benefits

The primary benefit to both participants in the VPW model would be the exemption from supply and distribution licenses and the associated revenue opportunities. (Perhaps not surprisingly, the research revealed there would be significant levels of interest in the VPW model from both customers and generators.)

Challenges & Limitations

Several legal and regulatory hurdles would need to be overcome before VPWs could be deployed, including the need for a bespoke distribution exemption to release the DNO from aspects of their license.

Exploring Fairness In The UK

The pricing models investigated in the research deliver varying financial outcomes for different stakeholders across the UK energy network.

In the case of VPWs, for example, local generators would stand to save considerably through licence exemptions, leaving the wider customer having to pick up the tab for policy costs. This disparity between different parties raises important questions about fairness and the ethical implications of the models.

It's also a topical issue, after Ofgem launched a targeted charging review back in August 2017 to address the regulator's concerns that existing residual charging arrangements were unfair to consumers.

The trouble for Ofgem, or anyone else try to make the energy system fairer for all, is that they're taking on what is effectively an impossible challenge, since the very nature of a progressive energy system means there will inevitably be winners and losers. This is because subsidies and financial incentives are necessary if it is to deliver on overall system objectives, such as building capacity and the climate change agenda.

Of course, in the long run everyone would ultimately benefit from the UK having a more efficient, greener and cheaper energy system which isn't contributing to climate change and where the lights are kept on.

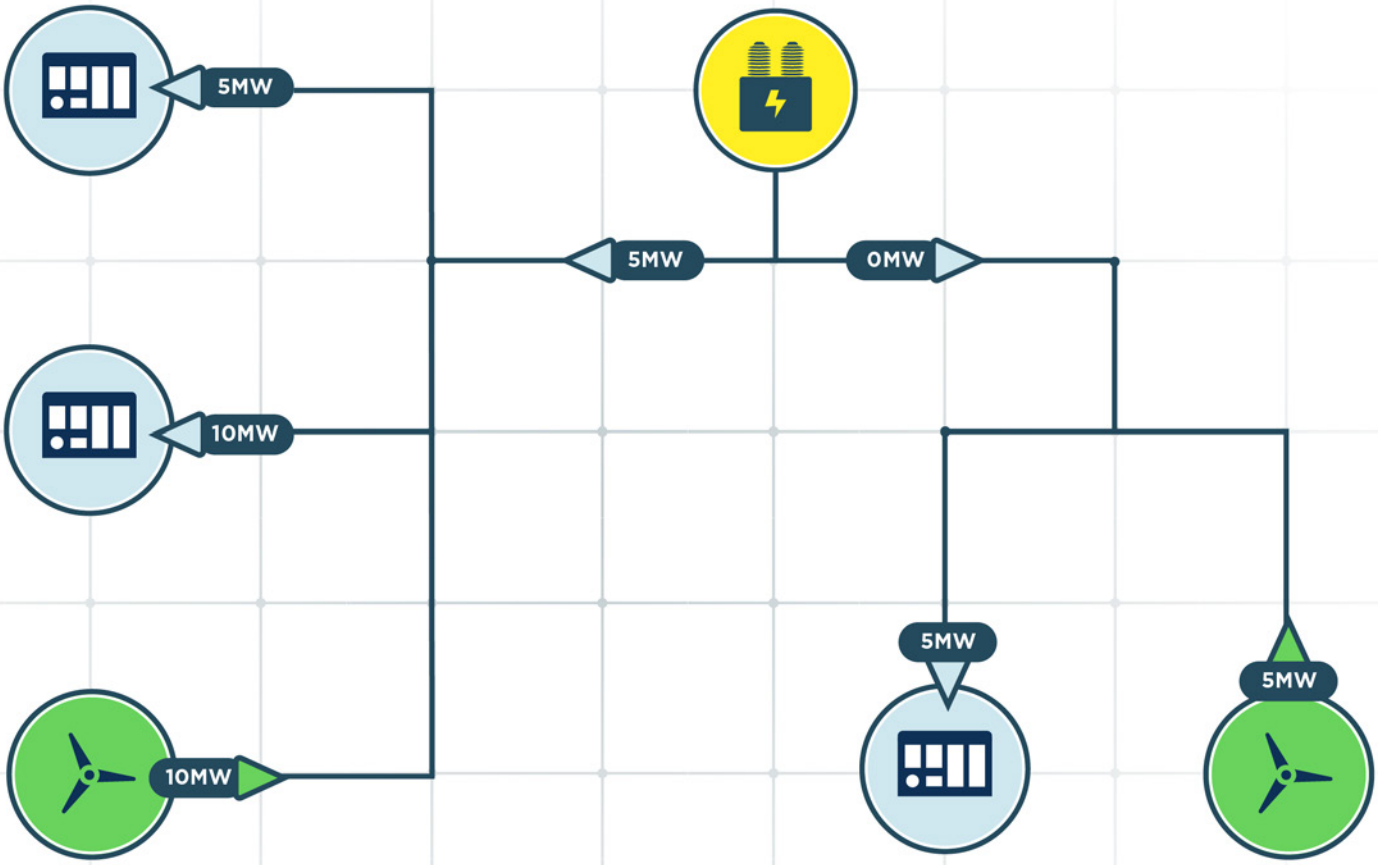
But in the here and now it's a very different story. Consider, for example, a family living in a block of flats in inner-city London which doesn't have the option of installing PV panels, or the small business start-up that cannot afford the upfront costs of entering a private wire arrangement with a local generator. Under the existing pricing model and some of the models laid out in the report, they are having to pay more in charges simply because others have been able to invest in renewables.

The long-term future may look brighter for all, but today those additional charges make the unfairness of the system clear to see. This family and small business might even prefer to have a less efficient, less green grid, but one that ensures those unable to harness renewable energy streams are not financially penalised – and who can blame them?

Clearly this is a highly complex and politically charged area, for which there are unfortunately no silver bullets. Improving fairness is an essential objective for today's changing energy system, and Ofgem's review is a welcomed start. While there may be no perfect answer to the challenge, reducing the number of losers and finding ways to protect those that do miss out is certainly within our grasp and must be the regulator's focus.

Locational DUoS Charging Models

The research explores how two variations of the DUoS charging mechanism that explicitly recognise the value of local matching could be used to provide financial incentives. Both models would involve modifying the CDCM to acknowledge that locally matched electricity does not use network levels higher than the level at which matching takes place. This would then makes it possible to charge customers costs attributable only to the network levels they were using, rather than all the other higher network levels they would be charged for under the existing CDCM.



Model 1

In this version, generators would no longer receive DUoS credits for exporting electricity to the local grid, where currently all generators receive credit on the assumption that it is likely to have local matching benefit (*see* **DUoS Charges Explained**). Instead, end-users that matched their demand with local generation would be charged a lower "matching DUoS" rate, paid using the credits that would otherwise have gone to the generators. So in effect the total amount to be recovered through the DUoS charging would not change, but simply be reallocated. Of course, for this model to work some method for sharing the savings through discounted rate between end-users and the local generators would be required.

Model 2

In this model, some of the savings made from the reduced need to reinforce the network and from diminished losses would be "reinvested" to increase the discount allocated to local matching. So generators would still receive their generation credit for matched generation, but end-users would also receive a lower matching DUoS rate.

Benefits

The primary benefit of these two methods would be their enormous potential for being scaled, since they would be accessible to all network users.

Challenges & Limitations

Comparatively low price signals would provide less financial incentive to generators and end-users to match locally, while the administrative aspect of both methods could be is potentially highly complex.

Impact

To get a better sense of the overall impact of the alternative pricing models investigated in the research, it is necessary to consider not only their influence on encouraging local matching and their potential for being rolled out at scale, but also the effect each one will have on different actors within the energy system.

Impact

To get a better sense of the overall impact of the alternative pricing models investigated in the research, it's necessary to consider not only their overall influence on **encouraging local matching** and their potential for **being rolled out at scale**, but also the effect each one will have on different actors within the energy system.

In the table below, the actors are broken into three groups:

- **DNOs** - distribution network operators
- **Participants** - end-users and generators directly involved in local matching initiatives
- **Wider distribution customer** - all other end-users and generators

Impact on:	DNOs	Participants	Wider Distribution Customer	Encouraging Local Matching	Scalability
BASELINE (STANDARD CDCM)	🟡	🟡	🟡	🔴	🟢
NRPW	🟡	🟢	🔴	🟢	🔴
VPW	🟢	🟢	🟡	🟢	🟡
LOCATIONAL DUoS CHARGING	🟢	🟡	🟢	🟡	🟢

🟢 POSITIVE IMPACT 🟡 SOME IMPACT/ NEUTRAL 🔴 NO IMPACT/ NET NEGATIVE

The impact on each actor is compared against a baseline – the existing CDCM - for each of the alternative pricing models. Green represents a positive financial outcome, amber means no net change, red reflects a financial loss.

The sections below provide an overview of these impacts by pricing model, and draw on projected costs and savings calculated during the research to provide a better sense of proportion of those impacts.

Impact On: DNOs

Two key challenges caused by NRPWs for DNOs are the lack of visibility of the generation and the duplication of assets, potentially leading to the network being used less efficiently.

However, it does encourage local matching behaviour, which benefits the DNO due to decreased power flows through higher levels of the network, thereby reducing the need for costly reinforcement.

The VPW price mechanism resolves the two issues above, since the participants are using DNO-owned assets, whilst also encouraging local matching and providing additional revenue to the DNO through the lease charge it receives.

Conversely, the standard CDCM model does not allow for pricing to recognise the system savings of local matching, and therefore does not encourage the most cost-efficient behaviour. The Locational DUoS charging models overcome this drawback by encouraging electricity to be routed through lower voltage levels locally, thereby alleviating the strain on higher levels and reducing the need for expensive network upgrades, as in the case of NRPWs and VPWs.

BASELINE
(STANDARD CDCM)

NRPW

VPW

LOCATIONAL DUoS CHARGING

Impact On: Participants

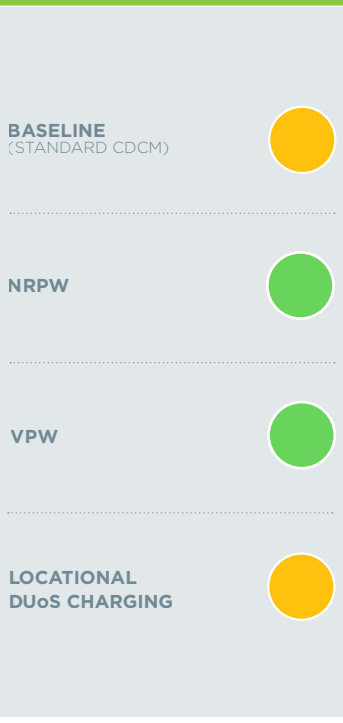
Before considering the financial implications of each model on participants, it's worth remembering that local matching isn't all about the money.
For businesses and other organisations that can demonstrate they buy their energy from local, renewable generators, there is a lot to be gained in terms of goodwill and positive public relations with today's increasingly environmentally conscious consumers.

The costs of setting up NRPW are high and the contracts long, which leads to greater risks. While these factors are enough to prevent most organisations from pursuing this alternative, those that can stand to make considerable financial gains. Based on the research findings, it's estimated that just from grid-cost savings generators can see income rises of about 20%, and end-users can expect 3% cost reductions for every 10% of their electricity needs covered through an NRPW.

The research projected very similar financial benefits under the VPW model since the same policy costs and DUoS charges would be avoided. And although participants wouldn't have to meet the upfront capital costs of installing new wires, the annual leasing costs involved in VPW would likely be close to that of the capital costs spread over a number of years. So, overall the financial implications of both models are similarly favourable.

There are significant financial risks associated with NRPW that make them a less compelling option than VPW, however. By investing in costly replicated distribution assets and signing up to long-term contracts - typically 25 years or more - participants are effectively putting all of their eggs in one basket; if something goes seriously wrong with the assets or the end-user pulls out of the deal early, the counterparty is left extremely vulnerable. Participants in VPW arrangements by contrast would have peace of mind that the DNO is ultimately responsible for the upkeep of the distribution assets, and that if the end-user did break the contract then the physical infrastructure would already be in place to supply other local end-users on the network.
The financial benefit to participants in the Locational DUoS models on the other hand would be negligible or non-existent by comparison.

In the case of Model 1, the total amount of money to be recovered through DUoS charging and credits wouldn't change, but would



simply be allocated differently, as explained previously. An end-user participating in local matching might therefore expect to pay in the region of 2% less for their electricity overall through discounted rates; however, generators would lose a similar amount due to the removal of generation DUoS credits. Hence the need for a method for sharing the savings between users and the local generators.

In Model 2, the savings on demand DUoS charges would be marginally lower compared with Model 1. However, because the generation DUoS credits wouldn't be removed in this model, the research projected a combined annual saving for demand and generation in the region of 1-2%, where in Model 1 the combined costs and income across the end-user and generator would stay the same. Like Model 1, a method for sharing the savings would be needed to incentivise the use of the model.

Impact On:
Wider Distribution Customers

In the NRPW model, participants are exempt from certain supply license charges, meaning residual policy costs are having to be borne by fewer customers. The participants also pay lower grid charges since the local matching all takes place off the distribution grid via replicated assets; however, the DNO assets still exist and still need to be paid for, which again falls to the wider distribution customers.

VPWs have cost implications for wider distribution customers since participants would be exempt from certain supply license charges, meaning residual policy costs would have to be borne by fewer customers. However, leasing arrangements between participants and DNOs could serve to benefit the wider distribution customer if that additional revenue is used to offset any price hike. So, the overall impact to wider customers would be lower than that of NRPW.

The Locational DUoS models represent the best outcomes for the wider distribution customer since they provide a price incentive - albeit a small one - for people and companies to make the most cost-efficient use of the distribution network that is accessible to all.

BASELINE
(STANDARD CDCM)

NRPW

VPW

LOCATIONAL DUoS CHARGING

Impact On:
Encouraging Local Matching

The existing CDCM provides no price signals to encourage either end-users or generators to match their demand and supply locally, thereby effectively straight-jacketing the potential for wide-scale local matching and the benefits to the system that come from that. Equally, CDCM does not incentivise new generators to locate in areas needing increased capacity, or end-users to establish premises in places liable to surplus supply.

NRPWs, on the other hand, do provide the strong price signals necessary to encourage local matching, made possible due to significant license exemptions. VPWs carry similar price signal benefits as NRPWs for local matching, but unlike NRPWs they also maximise the efficiency of the system, since leasing arrangements under the model only allow for the supply of a DNO's spare capacity. The two Locational DUoS models offer very weak price signals compared with both NRPWs and VPWs. While they might be enough to encourage some local end-users to match their demand with local supply, and vice versa, they are very unlikely to incentivise end-users to locate to areas specifically for their local matching potential.

BASELINE
(STANDARD CDCM)

NRPW

VPW

LOCATIONAL DUoS CHARGING

Impact On: Scalability

The CDCM was designed to enable nationwide rollout, and the two methods for Locational DUoS charging considered in the research represent modifications to that model. Although the price signals for local matching would be far weaker for these models than for NRPW and VPW, the difference in their profile means anyone would be able to participate and benefit from them. So, while the financial incentive would be lower, the universal accessibility of the models would offer the potential for wide-scale uptake and volume-based impact.

The strong price signals provided by VPW to encourage local matching would make the model an attractive alternative for some types of end-users and generators. However, this would be counterbalanced by the fact that participants in VPW arrangements would be exempt from certain charges, meaning the overall policy costs would then have to be borne by the wider network customers, thereby making regulatory approval for VPW - and the prospect of the model truly scaling - unlikely.

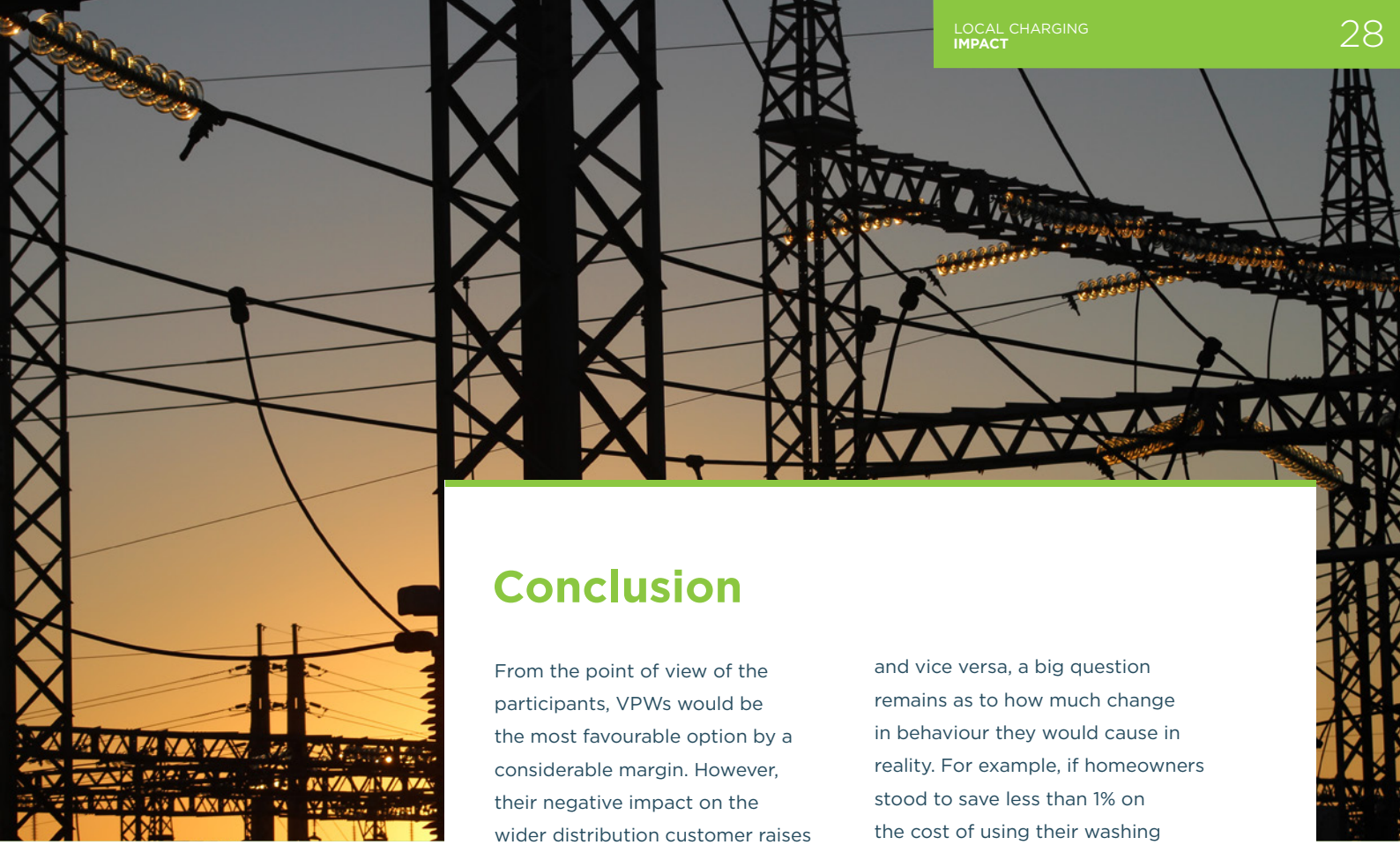
NRPW are extremely rare and are only a viable option for a small number of very large companies and organisations, making their widespread rollout effectively impossible.

BASELINE
(STANDARD CDCM)

NRPW

VPW

LOCATIONAL DUoS CHARGING



Conclusion

From the point of view of the participants, VPWs would be the most favourable option by a considerable margin. However, their negative impact on the wider distribution customer raises important questions about fairness and makes the likelihood of getting regulator approval unlikely. NRPWs are deemed so expensive and difficult to set up, and their negative impact on the wider distribution customer so high, that their likely benefit to the UK's future energy system is severely restricted.

The Locational DUoS charging models are the fairest and, in principle, the most scalable of the alternatives. However, given their very low price signals to incentivise people and businesses to match their demand with local supply, and vice versa, a big question remains as to how much change in behaviour they would cause in reality. For example, if homeowners stood to save less than 1% on the cost of using their washing machine by deliberately using it when local supply was high, how many people would actually make that conscious effort?

Key learnings and next steps

Through the research, a number of key themes became apparent that need to be considered for any solution to significantly increase the prevalence of local matching.

Most crucially is the tension between strength of price signals and fairness. On the one hand, it's important for the financial incentives to be strong enough to influence behaviour, as demonstrated by NRPW and VPW. On the other, however, the mechanism must have low barriers to entry to allow a wide variety of grid customers to participate, as demonstrated by Locational DUoS.

Although all of of the models considered in the research have their downsides; Open Utility believes there are ways of incorporating the best elements of both VPW and Locational DUoS. In particular, it's felt there is scope for exploring models which involve a more dynamic price component. As a next step, Open Utility wants to start testing these and other models by setting up practical demonstrators and trials.

About The Whitepaper

This white paper is an overview of the technical report, **Next Generation Networks: Comparison of price incentive models for locally matched electricity networks**, developed by Open Utility with support from Reckon, Regen and Lux Nova Partners.

Using a combination of expert interviews, desk-based research and economic modelling, the report explores opportunities presented by the increase in distributed energy resources in the UK to lower energy system costs through local matching of generation and demand.

It highlights the potential cost savings to the grid - and by extension end-users - that could come from local matching, and investigates the prevalence of - and potential for - different grid charging models that could encourage that matching.

Open Utility is an innovative energy technology company building digital services for a decentralised energy future. The company is shaping the future of energy with its expertise in energy innovation, real-time systems and user-experience design.

Reckon is an economics consultancy with expertise in data analysis, economic regulation and competition law. Reckon assist DNOs, IDNOs, customers and industry governance organisations with the development, implementation and maintenance of distribution use of system charging methodologies in England, Wales and Scotland.

Western Power Distribution is the largest Distribution Network Operator in the UK, responsible for delivering a safe and reliable network to over 7.8 million customers across the Midlands, South Wales and the South West.

Regen is an independent not-for-profit that uses its expertise to work with industry, communities and the public sector to revolutionise the way we generate, supply and use energy. Regen has over a decade's worth of experience pioneering new ideas and business models to support growth in the sustainable energy sector.

Lux Nova Partners are a boutique clean-energy law firm, specialising in low carbon energy projects, structuring, contracts, financing and regulation. Lux |Nova lawyers have provided vital legal input into many of the key innovations in the clean-energy and local energy supply space.

Words From Our Funder

With increased stakeholder interest in the area of local energy, we commissioned this report to investigate and clarify the potential for virtual private wires and innovative charging mechanisms to incentivise local matching and provide benefits to our customers. This fits into our wider portfolio of technical and commercial innovation aimed at identifying and implementing new technologies and processes to continue to deliver a costs effective network.

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