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Towards the partial deregulation of Great Britain's electricity networks

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Abstract : Electricity network costs are an increasing proportion of consumer bills in Great Britain. At the same time and in common with other markets, lower distributed generation costs are enabling a degree of defection from the public network. This creates a risk that consumers not able to defect are left with higher fixed costs, counterbalanced with reduced network reinforcement requirements. This paper proposes that this be managed by policymakers by removing economic regulation from networks for certain consumer types and enabling price discovery.

Keywords : Electricity network regulation, grid defection, distributed generation, network tariff design, utility death spiral

JEL Classification : L94, Q48, H41

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Towards the partial deregulation of Great Britain's electricity networks

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1. Introduction

Considerable work has been undertaken on the potential for 'grid defection' by utility consumers as a function of declines in the cost of smaller scale generation assets. 'Grid defection' refers to a site operator or consumer disconnecting their electrical system from the wider the public network. This work has typically focused on geographies with greater solar irradiance (e.g. Sadat et al., 2024), reflecting the relatively lower cost of grid defection in those territories that can benefit from year-round solar.

Some studies (e.g. Khalilpour & Vasallo, 2015, Liu et al., 2019) consider at which point the relative cost advantage of distributed generation versus a utility connection may prompt consumers to disconnect from the utility. This is considered in the context of a 'utility death spiral', or where the fixed costs of a network are redistributed across a smaller pool of consumers, increasing relative costs and thus increasing incentives for further defections.

Managing this risk has been argued (Felder & Athawale, 2014) to be best achieved through changes to utility rate design, typically by increasing the share of fixed versus volumetric charges within the consumer bill in order to reduce the impact of distributed generation on utility returns and thus hold down bills overall. Others (Laws et al, 2017) have argued that contra to the above a higher proportion of volumetric charging reduces the risk of grid defection by rewarding distributed generation asset owners for staying connected to the network.

This paper considers these effects within the context of the non-domestic sector of Great Britain's electricity market. It sets out how they interact with the GB distribution network charging framework. This framework was developed following work by Profesor Goran Strbac and Dr Joseph Mutale (Strbac & Mutale, 2005) and was explicitly intended to facilitate distributed generation. It was subsequently updated through the GB regulator's Targeted Charging Review. The changes made by the regulator were aimed at reducing the ability of sites with distributed generation assets to avoid network charges.

The paper finds that the objective of these changes is in the process of being countermanded by market developments that have enabled demand consumers to avoid network charges through novel means. It establishes that this is a necessary function of network charges being unable to internalise both technological change and consumer loss of load preferences. This means that neither fixed or volumetric charges can fully manage defection risk.

The paper therefore proposes that regulators consider removing economic regulation from certain classes of end users, enabling electricity networks to enter into commercial relationships with specific sites based on specific costs to serve. This could have several impacts, including reducing the Regulatory Asset Base (RAB) possessed by network operators with potential impacts on financing costs, creating a novel technology risk challenge for network operators, and increasing consumer surplus in the GB electricity system.

2. Network charges in Great Britain

Non-domestic electricity consumers in GB are connected to the transmission (225kv+) or distribution networks, depending on their scale of demand. The overall volume of revenue in a given year these networks may recover from its entire consumer base is determined by GB's energy economic regulator, Ofgem. The intellectual framework that governs this process of economic regulation was originally instituted by Stephen Littlechild following privatisation of the networks in

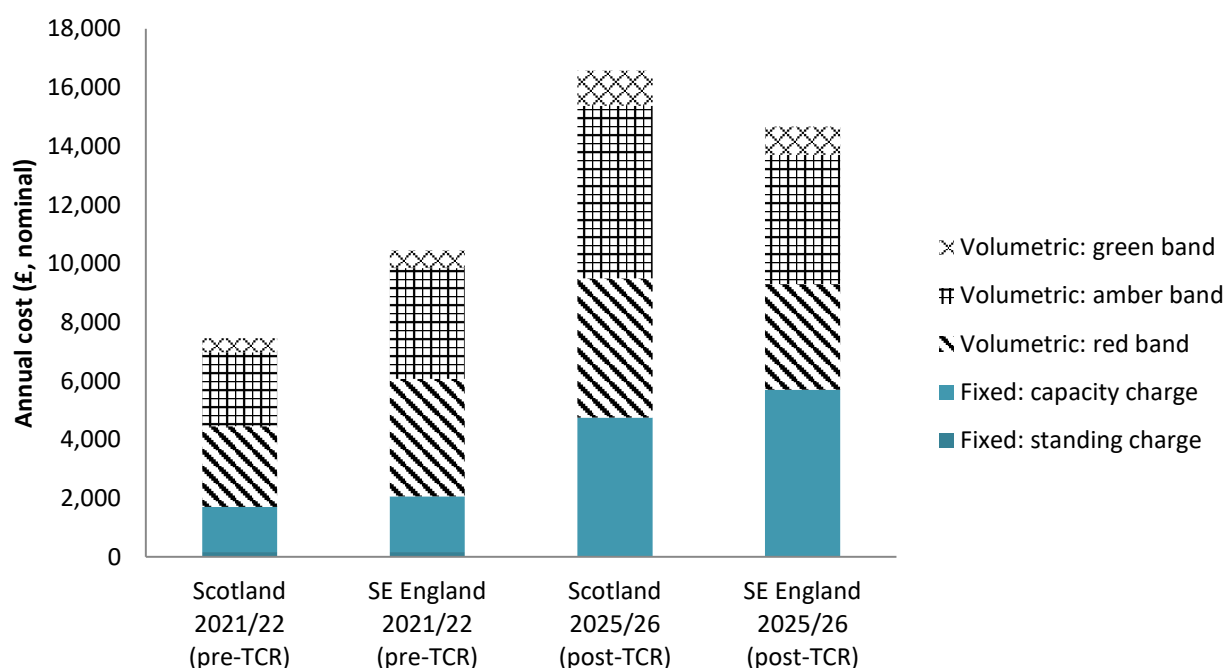
1989 (Littlechild, 2024). No data is available on incidences of non-domestic consumers disconnecting from this network, suggesting that instances of this are very low.

The charges that any given non-domestic consumer may incur for their use of the network are determined by industry codes¹, which specify a methodology through which the cost applicable to any given consumer may be calculated. The methodology that underpins distribution network charges was substantially overhauled (Ofgem, 2019a) in order to manage an increased volume of behind-the-meter generation.

Network charges in GB are split into a ‘forward looking’ component and a ‘residual’ component (Strbac and Mutale, 2005). The forward-looking component reflects the marginal cost that a user’s use of the network in a specific manner may impose on the network by prompting the need for reinforcement. This is determined by the maximum net load on the system at peak load and that user’s contribution to it. A reference model is used to examine a comparable system absent of the need to service that user, and the delta between the cost of that system and the outturn system is translated into a charge. Distributed generation, inasmuch as it reduces the maximum net load on the system where it is located at a demand node, therefore enjoys lower forward-looking charges.

Residual charges represent the remainder of the volume of charge permitted under Ofgem’s price control. The 2019 overhaul (the ‘Targeted Charging Review (TCR)’) amended ‘Residual’ charges for distribution networks. These volumetric charges were amended to be fixed. For non-domestic consumers these fixed charges are determined by the volt-ampere rating of that consumer’s connection. Figure 1 presents an illustrative example of how this has changed the composition of distribution network charges.

Figure 1: Comparison of distribution network charges pre and post TCR for illustrative sites in Scotland and SE England with annual consumptions of 500MWh and maximum import capacities of 200kVa



¹ The Connection and Use of System Code (NESO, 2026) relates to transmission charges, and the Distribution Connection and Use of System Agreement relates to distribution charges (DCUSA, 2026).

This was intended to reflect the ability of distributed generation to avoid volumetric residual charges as well as lower forward-looking charges. Inasmuch as a network operator has a statutory ability to recover their agreed volume of charge, any residual charges not recovered from network users with generation ‘behind the meter’ would be recovered from the remaining consumer base. This was judged to be distortive.

Ofgem consulted on this change. Some respondents provided feedback (Ofgem, 2019b) that this move may increase the risks of outright disconnection from the network, albeit alongside other changes to utility costs. Ofgem in its decision said:

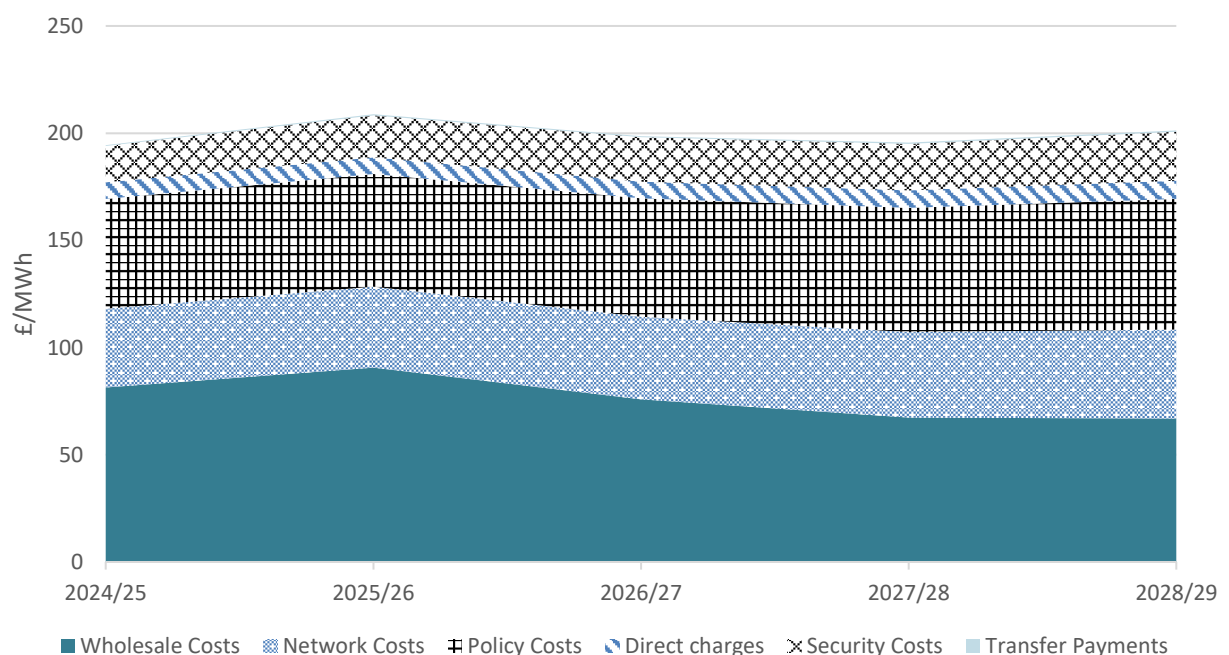
“We consider that the overall risk of disconnection is low as the value of being connected to the grid goes beyond providing a source of supply and the cost of replacing the utility achieved from a grid connection is often prohibitively high.”

3. Changes in UK non-domestic electricity bills

In the period since Ofgem amended network charges, the composition of UK utility bills for non-domestic consumers has changed. Acha et al (2022) developed a model of non-domestic electricity costs using a bottom-up approach, taking into account the development of individual tariff components. In both the case studies cited, commodity costs as a fraction of the overall bill fell by at least 3% between the period FY 2017/18 to FY 2023/24. This is driven in large part by higher environmental obligations, including legacy support schemes for renewables as well as higher costs for balancing the system.

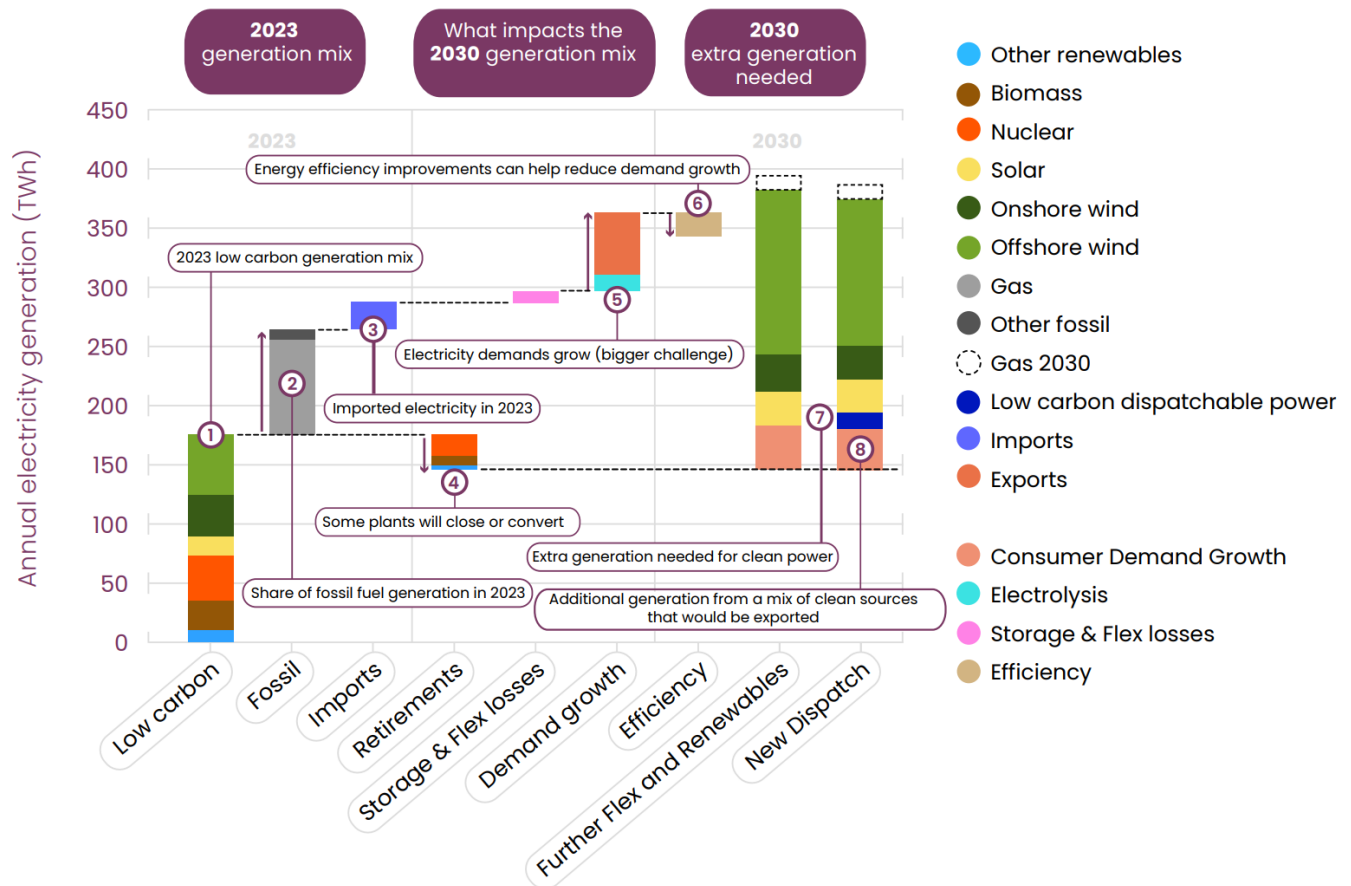
Following the decision by Ofgem (2025a) to approve a significant increase in investment in electricity transmission networks as part of its third price control undertaken on its RIIO model, a number of estimates for the impact of both the above trends and this new cost pressure on non-domestic bills have been produced by energy consultancy firms. Figure 2 below shows the projection made by Brownlow Utilities (2025).

Figure 2: Non-domestic electricity price projection (all-in)



The above projection shows the commodity cost fraction of the non-domestic bill declining from 42% to 33%. This transition reflects the shift in the UK generation mix from assets with significant variable costs to assets with high fixed costs. The UK Government has committed to accelerate this transition further, illustrated in advice by the GB System Operator (Figure 3).

Figure 3: National Energy System Operator [NESO] (2024) estimate of generation increase necessary to achieve UK Government decarbonisation trajectory



Not all non-commodity charges are fixed. Environmental obligations are levied volumetrically, as are payments for maintaining system frequency. Residual network charges, previously volumetric, are now fixed as discussed above. Charges for the GB Capacity Market are recovered based on peak demand. The recovery of other charges, such as supplier operating costs, are at the discretion of market participants.

Network charges are projected by Brownlow to increase from 18.8% to 20.6% of the non-domestic bill over the period to FY2028/29, while Capacity Market charges are projected to increase from 1.4% to 1.7%.

4. Impact on value proposition of electricity networks

This shift to fixed rather than variable costs as a function of the diminishing role of thermal generation in the power system materially changes the value of networks to the system. The efficiency of thermal generation is improved through demand smoothing, which in the absence of an efficient power storage system can be achieved through widening that generation's customer base. The purpose of the GB national grid at its outset was to achieve that wider customer base (Hannah, 1975). This led to better fuel economy and higher use of fixed assets, which lowered costs.

However, as discussed above, the cost of storage is now very low. This means that a thermal generator that serves a single site can achieve efficiencies and utilisation rates comparable to a generator connected to the public network. Fixed cost generation assets including wind and solar have cost profiles that are determined in part by economies of scale but in more significant part by cost of capital. The value proposition of electricity networks is therefore now given by:

- a) The contribution of that network to security of supply at that site, and;
- b) Lower cost supply from larger fixed cost generators that are able to leverage economies of scale and cheaper finance.

However, (b) is a function of when in the business cycle such generators are procured. The cost of supply from technologies such as offshore wind is substantially determined by the cost of finance and the cost of capital components (Arup, 2024). If fixed cost generation is purchased during periods of high inflation and high interest rates the relative cost advantage of bulk supply is eroded. The UK Government recently committed to buy 8.5 gigawatts of offshore wind at an average price in excess of £(2024)90/MWh (Department for Energy Security & Net Zero [DESNZ], 2026a). This is higher than the average GB wholesale price of power over the period January 2023 to February 26 of £82.50 (Office for National Statistics [ONS], 2026a). Sites that are able to access self-supply more cheaply than the long-run cost of bulk supply through purchase at a varying point in the business cycle may therefore be able to avoid these costs.

5. Ability to avoid network charges

Non-domestic consumers may opt to reduce their exposure to fixed costs by applying to their distribution network operator to reduce their 'Maximum Import Capacity' (MIC), the fixed value in kilovolt-amperes (kVA) against which network charges are calculated. They can achieve a sustained reduction in their MIC through:

- Temporal shifting of their electrical load;
- Electrical efficiency measures, and;
- The use of behind the meter generation to reduce their peak demand.

In the event that their actual use exceeds their MIC value, they are charged the same fixed rate per excess kVA (DCUSA, 2026)².

No data on the extent of the use of this facility is currently available. A network company approached for the purpose of seeking this data has indicated that it may not share data on this topic under GDPR rules³, and further indicated that any data it may hold is unclear inasmuch as the same site may have applied for a MIC reduction directly or via an energy broker. We have identified at least six non-domestic energy brokers or suppliers offering advice on this (Business Energy Deals, 2026; D-Energi, 2022; SMS Energy, 2024; Connected Energy, 2023; Aquaswitch, 2026; Smartest Energy, 2023). This indicates that there is a market for this service sufficient to support multiple competing businesses.

Both outright grid defection and MIC reduction reduce the fixed charges for which an individual non-domestic site may be liable. The costs accrued to develop the infrastructure previously used to

² Some sites may be exposed to higher charges in the event they have a lower customer contribution value, which reflects a lower share of connection charge paid by the customer.

³ GDPR does not cover aggregate data, except where such data may enable the identification of individuals or individual businesses.

supply that site at a higher voltage level may not have been fully recovered. These costs will accordingly be recovered from other consumers.

This effect indicates that the efforts undertaken by the regulator to minimise avoidance of residual charges through a move to a fixed charge were only partly successful. The cost to a customer of avoiding fixed charges is higher than the cost of avoiding volumetric charges, but the incentive and capability to avoid residual charges remains. This incentive is increased by relatively higher non-commodity costs outlined above, which can also be avoided through 'behind the meter' generation.

6. Challenges for the current network charging framework

The approach that GB takes to defining network charging was in large part determined by the landmark work of Strbac & Mutale, which sought to determine an efficient basis for network charging through an elegant analysis of the underpinning factors that determine the cost of network provision. Charges should be as reflective of the real costs of supplying network services as possible, based on the maximum flow of a given circuit or circuits and the incremental cost of upgrading that circuit as determined by a reference model. Strbac and Mutale recognised that in practice recovering of agreed revenue may oblige additional charges, inasmuch as no reference model would reflect perfect information. This has transpired, with residual revenues ranging from 50% of overall charges to a payback of -20% in some years⁴.

This theoretical framework for the most efficient network tariff is described in recent literature as the 'consensus' (Turk et al, 2025). Implicit in this framework is the assumption that economic efficiency means that price equals cost of provision. This meant that the other half of a more typical trade – i.e. the amount a consumer would be *willing to pay* for a service – is not captured in network charges. What we can take from the discussion of MIC reduction above as well as the TCR itself is that the price consumers are willing to pay per kVA of grid services is, for a class of consumer with access to capital sufficient to reduce their exposure, lower than the network charge. For that class of consumer, who as a function of technological change may now access alternative provision of electricity supply services, the public network is no longer a monopoly. Network charges, inasmuch as they contain no price discovery component, are therefore inherently subject to demand risk.

7. Incentives applicable to non-monopoly network users

'Willingness to pay' can be linear for a fixed charge per kVA, but has a discontinuity at a value of kVA per site that represents a consumer's likely maximum load post any self-generation and thus the value at which a higher loss of load risk is introduced. The precise value at which a higher loss of load represents an unacceptable cost to that site will vary, but will be based on activities undertaken at that site. A site where the principle use of electricity is heat for buildings and where the thermal mass of a building may retain heat during any loss of load may have a higher loss of load tolerance than an industrial facility that requires a constant volume of production to protect sensitive equipment. For the purposes of this paper this should be understood as a site's *internal* value of lost load, set against the network-wide value determined by industry codes⁵.

There will be a class of sites such that their internal value of lost load is sufficiently low that a connection to the public network is not necessary at all. This will be driven by both network charges, additional final consumption levies on the power bill, and the cost of onsite generation that can provide electricity services appropriate to that site's reliability requirements.

⁴ See e.g. Ofgem, 2024. Ofgem assumed a 50/50 share during the TCR.

⁵ For the GB market VoLL is defined by the Balancing & Settlement Code (Elexon, 2026).

The relative cost of smaller-scale generation has changed since Ofgem's TCR decision in 2019, when the regulator's above statement about grid defection was made. The cost of storage via lithium-ion cells has declined by 40% (BloombergNEF, 2024). Solar has fallen by 37% (IRENA, 2025). Sadat & Pearce (2024) considered the scope for grid defection across the US in the context of these falls in price. They examined how rate design and solar irradiance impacted incentives to disconnect from the public network. They utilised a modelled solar/battery/diesel hybrid system to provide an equivalent service. The authors found that incentives to disconnect were highest in territories with the highest solar irradiance and the highest utility costs. The mainland USA sites it found to have clear economic cases for grid defection enjoyed average solar irradiance of 220W/m². Average solar irradiance in the UK is 101W/m² (Burnett et al., 2014).

Nonetheless, the relatively high costs of GB electricity identified above have meant that incentives to defect are now significant. Estimates of upsides vary by site, but for sites with a loss of load tolerance equivalent to a value of £6,000/MWh or below and who are not eligible for participation in the UK Government's various business electricity cost support schemes (Department for Business and Trade [DBT], 2025a) could see internal rates of return of over 20%⁶.

8. Potential scale of impact

For businesses not eligible for government support, which is only applicable to the 7000 most energy-intensive businesses in the UK, the above indicates that investing in off-grid solutions may be low regret. This will be contingent upon land availability for asset installation, local permitting requirements, and the ability of the business to borrow relatively cheaply.

Business that fall into this category are likely to be in the overwhelming minority. Only 4% of businesses have electricity demand in excess of 0.2 GWh (Ofgem, 2022). However, 74% of large businesses fall into this category, and these businesses represent nearly half of both total commercial employment and turnover (DBT, 2025b). There are over 8,000 'large businesses', meaning that the majority of these businesses will be eligible for the UK Government's electricity discount scheme. Businesses within the scheme are likely to benefit from investments that permit MIC reductions, while businesses outside of the scheme with available capital and located on a single site may benefit from developing their own microgrids.

Non-domestic electricity demand in 2024 was 190TWh (DESNZ, 2025a)⁷ of which 20TWh was from the public sector (DESNZ, 2025b). This is final demand post any existing autogeneration on industrial sites. Smaller businesses represent 50% of business turnover (ONS, 2023). Although smaller businesses are less likely to consume as much energy per unit of turnover, we can conservatively assume that half of non-domestic demand and a quarter of public sector demand corresponding to hospitals and other large sites may benefit from grid defection in whole or in part.

This corresponds to 80-90TWh of electricity demand – over 25% of the UK total. In the event that these businesses opt to defect from the public electricity network in whole or in part, the fixed costs that they otherwise would have paid will be reallocated to other consumers. This will push the upside for defection further, implying that smaller businesses may also start to benefit from defection. However, this effect will be initially limited by the ability of smaller sites to install sufficient infrastructure to achieve a reasonable value of lost load or MIC avoidance. Over the medium term, given the value on offer, it is possible that energy service providers will create bespoke defection

⁶ The average figure for a number of sites supplied to the author under conditions of commercial confidence.

⁷ 'Non domestic demand' in this case refers to industrial, commercial, public sector and oil and gas use.

packages for smaller sites, much as we found such providers already offer for MIC reduction. Businesses on industrial parks may also seek action from the landowner.

9. Implications for network charging

Considering the incentives outlined above, the efficient level of defection is driven by sites where:

$$\text{Forward Looking Charge (FLC)} > \text{Cost of self generation} + \text{Value of Lost Load (VoLL)} \text{ at a kVA threshold}$$

In other words, those sites where the marginal cost of a network connection expressed as the internal cost to the network provider is higher than the cost of self-generation minus a reliability penalty should defect. Efficient use of the network is optimised by connecting only those sites where the FLC is less than the cost of grid defection. For clarity, this may refer to partial defection via MIC reduction as well as outright defection, taking discontinuities in VoLL into account. This would ensure that limited public network capacity is available to those users who most require it.

However, the actual incentive to defect in part is given by:

$$\text{FLC} + \text{residual charges} > \text{Cost of self generation} + \text{VoLL at a kVA threshold}$$

The incentive to defect in entirety is given by:

$$\text{FLC} + \text{residual charges} + \text{final consumption levies} > \text{Cost of self generation} + \text{VoLL}$$

Inasmuch as residual charges are normally positive, the incentive to defect from the network will always be higher than an 'efficient' level. This may be tolerable when the cost of self generation is high, but as discussed above, this is no longer the case.

The residual charge is reflective of the real-world information constraints facing the regulator when developing the reference model used to develop a forward-looking charge. Final consumption levies are used by governments for public policy purposes where those purposes are not served through funding via taxation. Both are a fixed sum that must be recovered. For that set of consumers who are not able to defect, they are exposed to ratcheting costs in excess of the costs that would be efficient if grid defection was set at an efficient level. This may create significant equity issues over time.

10. Ability of the regulator to determine efficient charges

Ofgem's intent in undertaking the Targeted Charging Review was to avoid this issue, but as demonstrated above it has instead delayed it. It has several options within the existing framework it could pursue.

1) Exit charges

This may take the form of a charge for MIC reduction or for outright defection set in proportion to residual charges that may have been recovered over a period. Domestic customers who disconnect from the gas network are subject to a charge that would be analogous to this (Ofgem 2025b). It follows work undertaken on utility deregulation in the US (Berry, 2000).

However, this does not eliminate the incentive to defect, it simply reduces it, and in addition would apply to those sites where efficient use of the network would mean their defection.

2) Floating residual charge reduction

This would take the form of an addition to the network charging methodology that reduced residual charges for certain users by an amount proportionate to their defection risk. The intent of this would be to amplify the forward-looking charge signal and thus achieve an optimum level of defection. The amount of this reduction could 'float' alongside an appropriate index for self-generation costs.

However, this relies upon the ability of the regulator to identify defection risk appropriately, a task that requires considerable private information from potentially tens of thousands of network users. It would also represent a 'free' option for particular sites that would increase the value of land suitable for self-generation without imposing the actual cost of self-generation on its purchasers.

3) Novel connection agreements

Ofgem is already undertaking work to enable non-firm connection agreements for new demand connections to the public network (Ofgem, 2025b). This could enable new connections to opt for a more flexible agreement that, in exchange for a lower network charge, allowed sites to accept a risk of disconnection during periods of network stress. For sites with on-site generation, any loss of service could then be avoided.

Whether this is an appealing offer for such sites will depend on the price. A non-firm connection coupled with on-site generation to compensate reduces the relative security of supply of the site from $n-2$ to $n-1$ (i.e. the number of simultaneous failures necessary to prompt a loss of supply). Conversely, a MIC reduction post-connection construction retains the same level of security inasmuch as in the event of generation failure the site may still draw from the public network, albeit at a cost.

The price for a non-firm connection would therefore need to be a function of that site's VOLL to be competitive with a firm connection, assuming that a site spends a similar amount on generation under both options⁸. Inasmuch as Ofgem's reforms are intended to accelerate connections to the network rather than manage the price of existing connections, it is therefore likely that any charging regime applicable to non-firm connections would be subject to the critique above.

11. Taxation as a framework for cost recovery

We now wish to explore alternative frameworks for cost recovery that sit outside of the options currently available to the regulator. Strbac and Mutale put forward the principle that cost recovery should relate to the efficient costs of network provision, but if:

- a) networks are no longer a monopoly on the provision of electrical services, and;
- b) no version of network charging is able to internalise consumer willingness-to-pay;

then efficient costs of networks *alone* are an insufficient basis for cost recovery because they will necessarily apply incorrect incentives to grid defection.

Network charges are not a price determined by a supply and demand curve but rather a charge determined by a government. This is equivalent to a tax. In this section we therefore consider the literature on efficient taxation, beginning with Ramsey (1927).

Ramsey's famous analysis starts from the principle that efficient taxation is non-distortive, inasmuch as it leaves consumer utility maximisation expressed as patterns of consumption unchanged. This

⁸ In reality a site faced with managing an $n-1$ loss of supply risk would likely need to spend more on e.g. gas engines than a site with $n-2$ risk, assuming VOLL is constant.

means that for a given volume of government revenue recovered through commodity taxation greater costs should be applied to those commodities for which demand is less price sensitive, or inelastic.

In our case, this means shifting network charges onto consumers with lower propensity to defect – i.e. those with inelastic demand for electrical services. This would largely be domestic and smaller commercial consumers. This is the *de facto* position of various European governments that actively transfer network charges from industry to other consumers (International Energy Agency [IEA], 2020). The UK Government offers a 60% discount for particular heavy industries, shortly to rise to 90% (DBT, 2025c).

Mirlees and Diamond (1971) expands Ramsey's analysis to the impact of commodity taxes on aggregate production efficiency. This work takes pains to demonstrate that maximising public welfare will typically include maximising aggregate production efficiency. This means that public welfare is maximised when an economy is capable of producing the maximum level of outputs from a given set of inputs, given technology and other constraints. Mirlees accordingly finds that taxation of intermediate goods is inherently inefficient. Producers, faced with higher input costs for one commodity, will switch their inputs to a commodity that may be lower cost but results in lower production. This means that the economy is producing less than it otherwise would be capable of, and thus public welfare is not maximised.

For our purposes, we need to determine the status of electricity networks within the economy. There is a rich literature on this question. For producers it is reasonable to interpret utilities as an input cost for the purposes of production. For households we follow Becker (1965) in interpreting individual households as 'production units'. This means that households utilise electricity networks to produce services such as heat and light for the purposes of consumption, but do not consume networks directly.

It therefore follows that if we take Mirlees' conclusions as read then the efficient level of taxation – and thus network charges – is zero. This highlights a tension between public welfare economics and the economics of utility regulation. For the purposes of public welfare economics, private regulated utilities issue a good that is purchased by governments on behalf of the consumer and the cost of that good is subsequently recovered by taxation. But it should be clear that reducing network charges to zero and recovering network costs through taxation is also not efficient: what we have done is reduce the price of a commodity for private producers below its cost of production and therefore created an incentive to over-index on that input good compared to more efficient inputs.

Utility regulation is intended to resolve this tension by developing a tax that best reflects the cost of production of that commodity. As discussed in section 9, for electricity networks this activity is inherently not able to fully reflect the actual price of that commodity in a market where there is competition to provide an equivalent service. It is therefore a distortion of input prices that reduces the aggregate efficiency of production.

12. A 'club goods' framework

An alternative to taxation is a 'club goods' framework (Anderson et al, 2004). This comprises a useful analysis of a class of quasi-public goods. These are goods which are a function of collective action, but unlike classic public goods are 'congestible' – i.e. consumption of these goods reduces the amount available for other consumers. Adding consumers to a 'club good' therefore imposes a cost on other consumers. A clear example of this is a gym, whereby there is a fixed capacity expressed in terms of weight-lifting and other equipment and where adding members will reduce the

ability of existing members to access that capacity at a time of their choosing. Pricing for participation must therefore reflect this congestion.

Strbac & Mutale above can be seen as a framework for achieving this pricing, inasmuch as it is focused on the marginal system cost of any given user. However, classically club goods achieve prices close to cost as a function of any individual club member's ability to vote with their feet; that is, acquire the same goods from another club with more reasonable pricing.

In the absence of competing utilities, what we have explored in this paper is the capacity of certain sites to vote with their feet by forming what is essentially a club of one. This activity helps to reveal the real cost of providing electrical services in way that utility regulation cannot.

An enduring regime for network charging under this framework is therefore given by an equilibrium between the *cost* of providing the network service and the *value* of that service to the consumer. Given the discussion in section 7 on where that equilibrium – the efficient level of defection – may sit, it is therefore clear that we should utilise sites considering defection as a route to discovering the real prices of network services.

13. A value discovery framework

Our core objective must be to minimise the cost of electrical services for all consumers, modified by the cost of carbon. This means that the framework must engender an efficient level of network defection. If we assume that the value of a service cannot be determined centrally then it must be discovered through dialogue between the proxy agent of the state – the network – and the user of that network. Such a dialogue cannot happen *ex nihilo* but rather in the context of existing relationships between a network, its users, and its existing framework of economic regulation. We therefore assume that the following principles apply:

- Technological risk – the risk that further technology change degrades the value of a network connection for consumers – should be allocated in line with the ability to manage that risk;
- Bulk supply cost risk should be allocated in line with the ability to manage that risk;
- Networks should have the opportunity to recover their efficient costs, where those costs were accrued to provide network services of a given value, and;
- All participants in any dialogue must be subject to incentives appropriate to our objective of minimising the cost of electrical services.

Technological risk is a function of the cost of the network versus the cost of alternative services provision. Network users are not able to manage the cost of the network as a whole, only their individual exposure to those costs. Technology risk, inasmuch as it reflects an inability to recover certain network costs, must therefore sit with networks to manage.

Bulk supply cost risk can be managed by network users through efficient trading to an extent, but as illustrated above an increasing share of that cost is driven by Government policy. For the GB market, the Government must therefore be responsible for managing the majority of this risk.

Cost recovery in the context of site-specific VOLL implies that the central determination of those costs is not tenable inasmuch as they no longer relate to value. For those sites at risk of defection networks must be given the ability to seek to recover costs through a negotiated settlement with that site. This has implications for network financing, where many network companies have benefited from debt issued at close to risk-free rates for large portions of their revenue.

Incentives should be a function of the best view of the efficient cost of the network. This implies a role for forward-looking charges in providing structure for cost recovery.

If we combine the above principles, then we can set out the parameters of a value discovery framework:

- Network operators should be enabled to negotiate with site operators to determine a contract for networks that includes a price and period. By locking in revenues for a set period network operators can manage technological risk.
- This would be applicable only to sites of an appropriate size, likely connecting at 33kv ("Extra High Voltage") and above which already have forward-looking charges specified to a higher degree of granularity than other consumers.
- To ensure that network operators do in fact seek the best price, a haircut to the Regulatory Asset Base of these sites should be applied in proportion with the marginal cost of connection of these sites as determined by forward-looking charges.

This creates an incentive on network operators to maximise revenue from these sites up to a threshold of forward-looking charges plus their internal costs. This price can then be evaluated by the site operator to determine the efficient level of generation and storage assets to install on their site.

The framework covers a subset of the sites at risk of defection inasmuch as Extra High Voltage sites number in the low thousands rather than the higher number specified above. We assume that sites with a larger connection are more likely to have the capability to consider their electricity costs in detail, ensuring that they can act as a counterparty.

Expansion of competition

The GB electricity retail market was deregulated in phases over the 1990s, with highest demand users (1MW+) being subject to competition from 1990, while lower demand users followed in sequence (Department for Business, Energy & Industrial Strategy [BEIS], 2016). While this trajectory may not be appropriate for network competition, we have presented arguments in this paper in support of larger sites being subjected to competitive processes for determining network charges. However, we would expect that any volt-ampere threshold for competitive network charges would rapidly become subject to consumers organising themselves around that threshold. Navon et al. (2023) finds that under appropriate conditions for grid defection it may become optimal for consumers to self-organise into larger demand units to maximise the upside of distributed generation. This would imply that any particular threshold may become quickly outdated depending on the cost trajectory of grid-equivalent services.

Conclusion

In 2007, the House of Lords Select Committee on Regulators, summarising the work of Professor Littlechild on regulation, said⁹:

"Regulation is essentially a means of preventing the worst excesses of monopoly; it is not a substitute for competition. It is a means of "holding the fort" until the competition arrives."

⁹ [House of Lords - Regulators - First Report](#)

For electricity networks, competition has arrived, albeit in a relatively narrow and specific manner across a particular set of consumers. In this paper we have presented reasons to believe that deregulating network commercial activities for a particular section of that consumer base may be optimal for reducing the cost of the network for all consumers. This would be a significant change for network regulation, however, we believe it requires serious consideration.

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