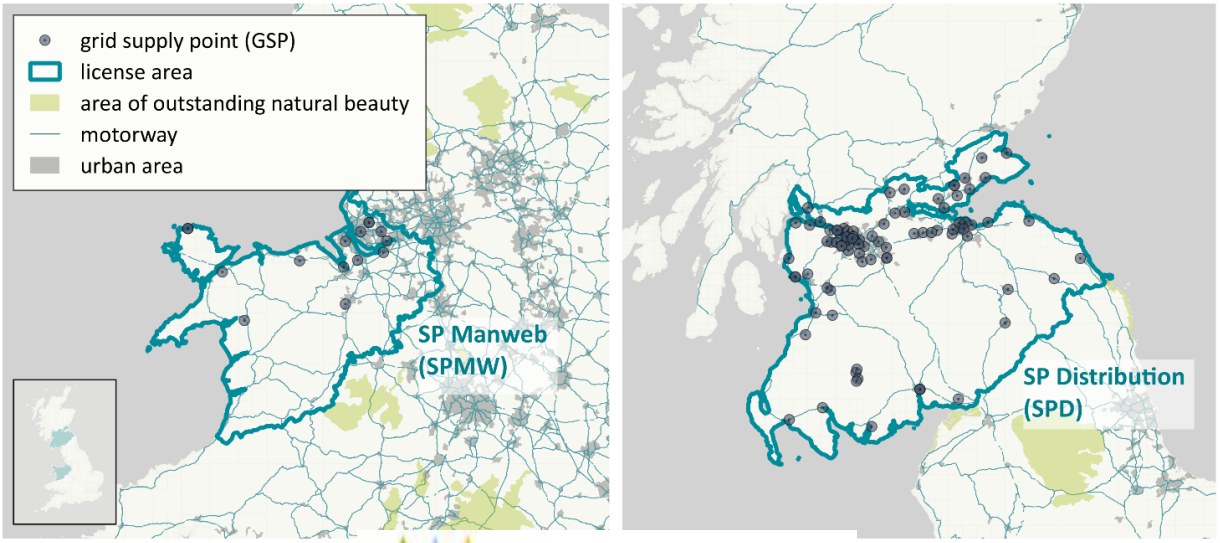
Policy Changes to Network Charging

A national methodology with big local impacts.



SP ENERGY NETWORKS

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Overview

- Network charges make up c. a third of customers' electricity bills, and they can significantly impact the viability, scale and choice of location for energy generation, storage and flexibility projects.
- The proposals in the Access and Forward Looking Charges Significant Code Review (SCR), combined with changes already in progress through the Targeted Charging Review (TCR), could fundamentally impact the operation and behaviour of new and existing customers on the distribution network.
- Ofgem has noted that through the SCR review they hope to encourage more efficient use and development of the distribution network within a net zero system. However, implicit in this is the assumption that the networks and Ofgem are able to **develop methodologies that can effectively influence customer behaviours and response.**
- Regen conducted analysis for SPEN looking at the impacts of the TCR and proposals from the SCR to understand the range of possible impacts on customers and associated impacts on Distribution Network Operators (DNOs).
- Uncertainty was a key theme from the stakeholders consulted. Ofgem's minded-to decision expected in Spring 2021 could entail quite radical changes for network charging, with important implications for customers, and for both the rate of deployment and location of new low carbon connections. However, could equally still see incremental changes which may simply tweak existing methodologies and have a lower impact.

Impact Assessment Methodology

The analysis conducted for this study involved:

1. Modelling of network charge changes. The modelling looked at existing and new structures for distribution, transmission and balancing charges for a variety of distribution customers. This produced an illustrative quantification of some of the changes and how the different changes might impact the network charges of various customer types.

2. Interviews with stakeholders and SPEN connections team. 18 interviews were conducted with a variety of stakeholders and with the connections team at SPEN across both their SPD and SPM licence areas. Stakeholder interviews included demand customers, a supplier, renewable energy developers and investors, community energy representative, storage developers and a trade body.

3. Results report. The results of the analysis were presented around four key themes from the charging reviews impacts which will have the most significant implications for both SPEN and network customers:

- Higher fixed charges for demand customers
- Locational charges and forward price signals
- Shallower distribution connection boundary
- Flexible access and connection options

The report explores the options still under consideration, and the uncertainty around their impact and implementation. These slides summarise the findings and analysis from the work and highlight the potential impacts most relevant to DNOs.

Summary impact on network customers

The key policy options in the SCR have been introduced to remove differences between how costs are calculated and recharged for the distribution network via the various charging methodologies CDCM for distribution, Extra High Voltage in the EDCM and CUSC at transmission. The changes will, therefore, lead to a shift of cost burden between customer groups, and in some cases between transmission and distribution connected customers. They will impact demand, generation, existing and new customers differently.

Charging key impact areas		Residual fixed charges for demand customers (TCR)			Locational DUoS and forward price signals				New connection options		
Cost of options developed or being considered		TNUoS residual fixed charge	DUoS residual fixed charge	BSUoS volumetric for domestic only	EHV Customers moving to long run marginal cost	Locational forward DUoS - demand area	Locational forward DUoS - generation area	Additional TNUoS on distributed generation	Fully shallow connection boundary	Shallower connection boundary	New flexible capped connections
Existing demand customers	Average domestic	→	→	↘		→	↗		↘	→	
	High usage domestic	↗	↗	↘		→	↗		↘	→	
	Commercial - low capacity factor	↓	↓	↘	?	→	↗		↘	→	
	Commercial - high capacity factor	↘	↘	↘	?	→	↗		↘	→	
Existing generation customers	Scottish generation				?	→	↘	↓	↘	→	
	Other generation				?	→	↘	?	↘	→	
	Behind the meter generation	↘	↘	↘		↗	→				
New customers	New renewable generation				→	→	↘	↘	↑	↗	↑
	Dispatchable & fossil generation				→	↗	↗	↗	↑	↗	↑
	New demand	→	→	↘		→	↗		↑	↗	

Figure 1: Summary of distribution customer cost impacts from the options developed or being considered.

Key themes for DNOs

- The locational forward-looking distribution-use-of-system charges (DUoS) as well as more flexible connections imply that **networks will need an increasingly granular understanding of network flows and costs now, and in the future.** Within this it will be important to understand and model both short term and longer term evolution in the location and electricity use profile of demand and generation customers on the distribution network. Networks will need to ensure their processes are able to capture and reflect these within distribution future energy scenarios (DFES) and network modelling to plan effectively for the impacts of TCR and SCR and any future changes or updates.

  In addition if the connection boundary becomes significantly more shallow, it will be important to be proactive and identify areas that are likely to be of high interest in a shallow/er regime (particularly for renewables) and take a coordinated approach to manage customer queries and process connections in these areas.

- All elements of the review are going to require **high quality communication with customers and for networks to take proactive approach to stakeholder engagement**. For the TCR changes this will include the allocation of commercial and industrial customers to capacity bandings and having processes in place to deal with queries and requests to reduce capacity when allowed. For the SCR, a key area will be communicating the network's methodology and outcomes for the new locational charges, some of which could have political implications.

- **Most of the changes will require the networks to invest more in physical assets, network monitoring as well as processes and capability.** The shift to higher fixed charging for demand will reduce risk by bringing in more revenue consistently over the year. The moves to have shallower and more flexible connections will mean DNOs

are expected to take on more constraint risk as well as potentially an increased cost to process connection enquiries. If there are a significant number of new connections, there will be an associated increase in expenditure on network investment and possibly on timescales to both respond to enquiries and to complete reinforcement work.

- Finally, it will be important to **build resource and capability for flexibility within the organisation**. Existing non-firm flexible connections largely pass the risk of constraint curtailment to the customer. If this customer risk is to be now capped or time limited, the implication is that networks will need to manage constraints by other means. Within this it will be important to coordinate different sources of distribution network flexibility including new DUoS locational charges, new flexible connections (and existing work on ANM) and procured flexibility via distribution system operators (DSO) and National Grid electricity system operator (ESO).

Higher costs for commercial and industrial customers?

The modelling indicated that some commercial and industrial customers may see higher network charges as a result of the TCR shift from variable to fixed costs, based on capacity bandings. However, the actual gross change will depend on the consumers relative utilisation of capacity, the extent to which they previously avoided Triad network charges and their ability to respond to new forward-looking signals.

Demand-only volumetric balancing-services-use-of-system charges (BSUoS) would double BSUoS costs for demand customers, even if they are not particularly impacted by the increase in fixed charges. In theory this would be matched by reduction in the price paid for wholesale electricity due to the reduction in transmission generation costs.

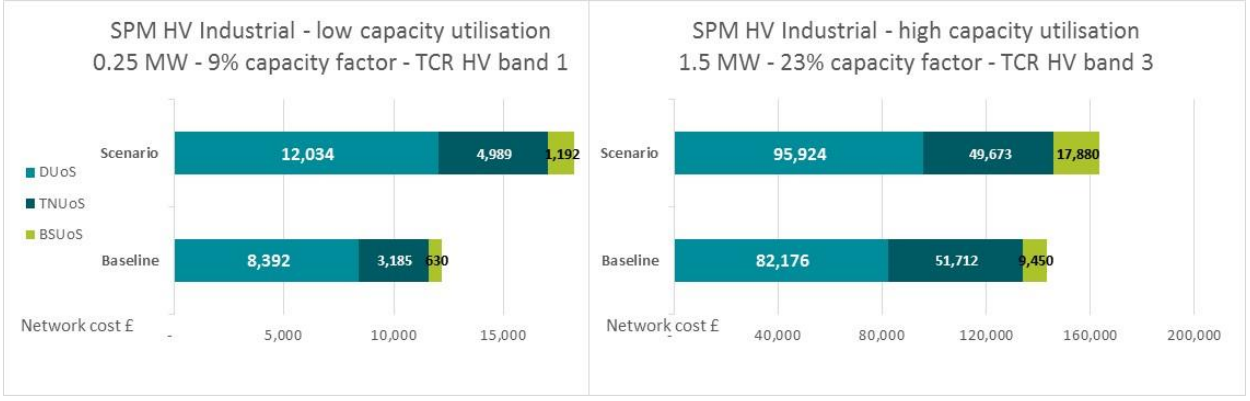

Figure 2: Estimated increase or decrease in total network charges for different users in SPM from scenario. This includes fixed TNUOS, DUOS and demand only volumetric BSUOS

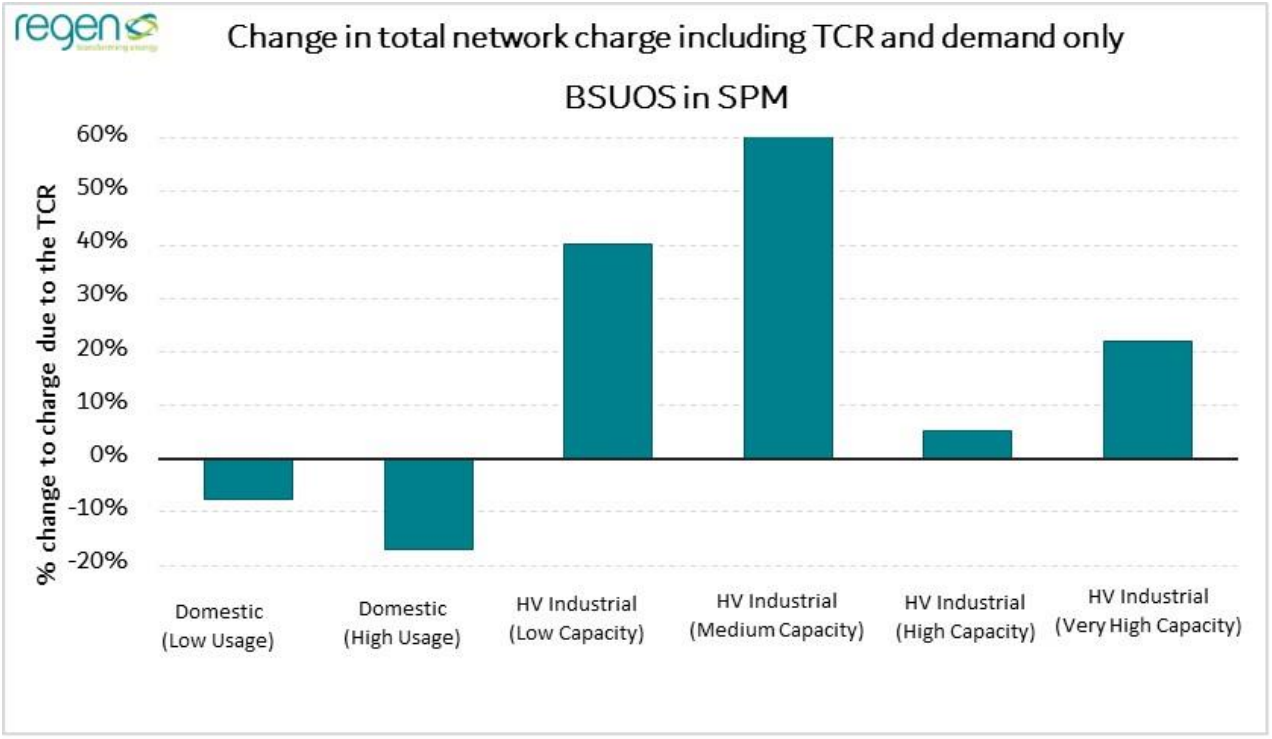

Figure 3: Estimated increase or decrease in total network charges for different users in SPM from scenario 1, includes fixed TNUOS, DUOS and demand only volumetric BSUOS

Implications for DNOs

- The TCR changes are likely to lead to **an increase in the highest winter peaks from 2022/3** as Triad avoidance reduces or disappears. With the level of Triad avoidance being relatively unclear, SPEN will need to put in place additional systems to manage a resurgent peak on their network and manage the uncertainty in winter 2022/3 of how high the new peaks might be.
- There is also likely to be an **associated impact on the availability of flexibility** such as diesel generators, gas reciprocating engines and battery storage. This may result in less contracted flexibility being available to provide flexibility services, increasing the price of procured flexibility.
- Although Ofgem has ruled out customer capacity banding changes ahead of the new TCR charges except in 'exceptional circumstances', it is **likely that some existing commercial customers will seek to reduce connection capacity** to avoid high fixed charges once allowed to do so. Some users with high capacity and low utilisation (e.g. emergency pumping stations) will be particularly impacted. DNO's will need to put in place processes to manage disputes and connection capacity enquiries and be ready to respond ahead of further price control periods when customers may look to change bandings.

Locational charges and impact on generation customers in Scotland

The existing low voltage (LV) and high voltage (HV) distribution network tariffs are currently set at licence area level and therefore provide little, or no, sub-licence area locational price signals. Ofgem has strongly indicated that the remaining variable, or forward-looking, DUoS tariffs should be more cost reflective based on location and demand or generation are driving network costs. By implication, generators in 'generation dominated' areas may face higher network charges. The level of granularity and zonal methodology to be applied has not been confirmed, but both the SPD and SPM licence areas have areas that are strongly generation dominated.

The impact of higher locational network charges is likely to have a greater impact for onshore wind generators, since solar and gas peaking plants can more easily target demand dominated areas.

An additional area of impact for SPD generator customers in Scotland is the proposal to levy a wider transmission-network-use-of-system (TNUoS) tariff on generators from 1 MW – 100 MW, who currently do not pay this charge. The zones and tariff structure for wider TNUoS chargers are being reviewed and could change. However, based on the current tariff structure, the application of wider TNUoS charges would entail an additional charge in Scotland (for generators elsewhere TNUoS can be a credit) which could see SPD generation customers paying significant new costs. While transmission connected customers in the same area could pay less than at present.

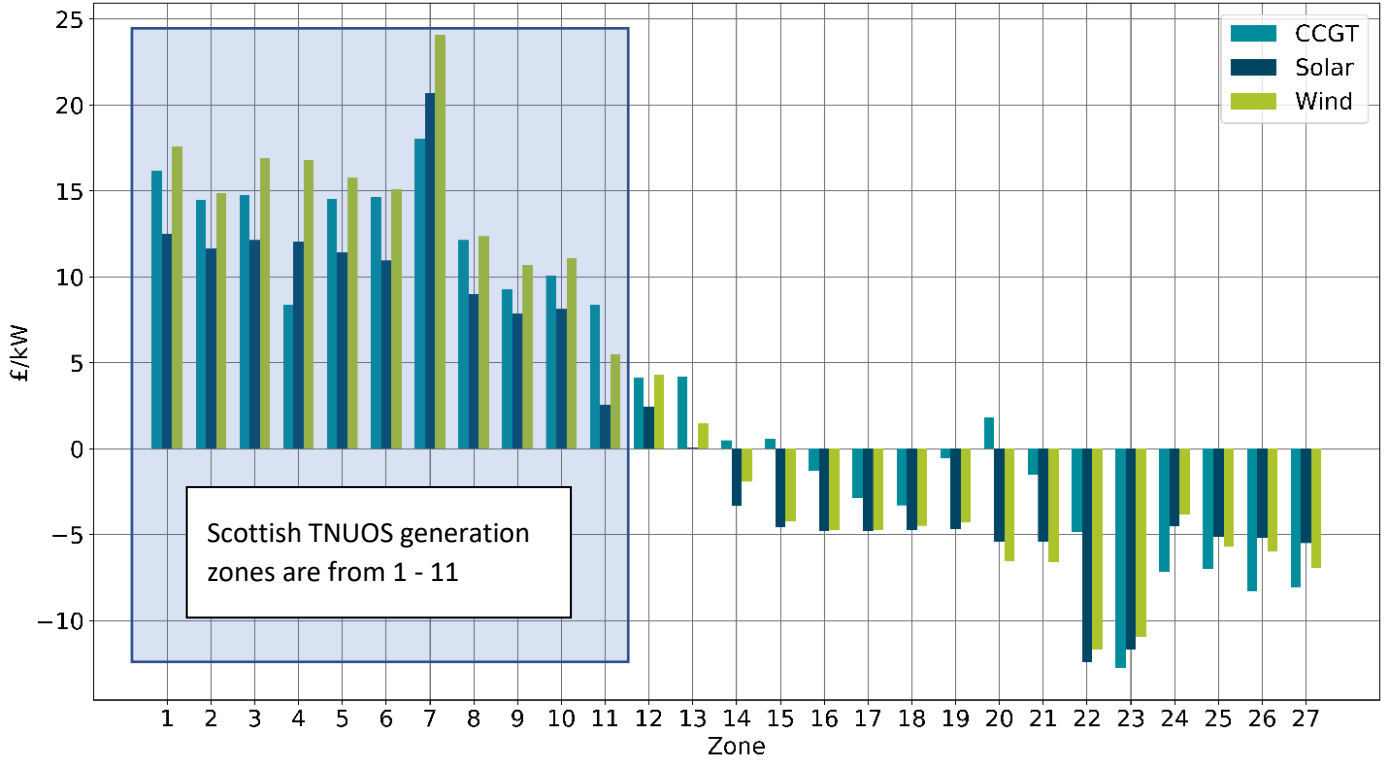

*Figure 4: Current **2020/1** wider locational TNUoS charges for different generation technologies and GB Zones*

Shallow or shallower connection boundary

A critical change that is expected within the SCR is that the connection boundary on the distribution network may become shallower. This means **that new connections might be expected to pay less, or possibly none,** of the network reinforcement costs associated with their connection. The level of shallowness is uncertain.

- The first implication is that, faced with lower costs, **more new connections would be expected in constrained areas** of the network. This could have significant impacts in areas good renewable resource. However:
    - Customers in constrained areas could see stronger price signals within the DUoS locational charge.
    - It is likely that the High Cost Cap will be retained.
    - Research shows that the reinforcement cost varies greatly as a proportion of the total connection cost, the impact of any change would therefore be highly project dependent.

- A reduction in connection cost could be more significant for smaller generation projects connecting at LV and HV. SPEN connection teams suggested that EHV projects are more able to absorb current reinforcement costs.

- As a further implication, faced with lower connection costs, generation customers may be less interested in accepting a non-firm or flexible connection agreement. Existing 'non-firm' customers may also wish to move to a firm connection under a shallower system.

- New demand connections may see more benefit than generation as housing and commercial project developers may be less concerned by higher future locational charges. Demand sites are also more likely to be located near existing network and have lower sole use asset costs.

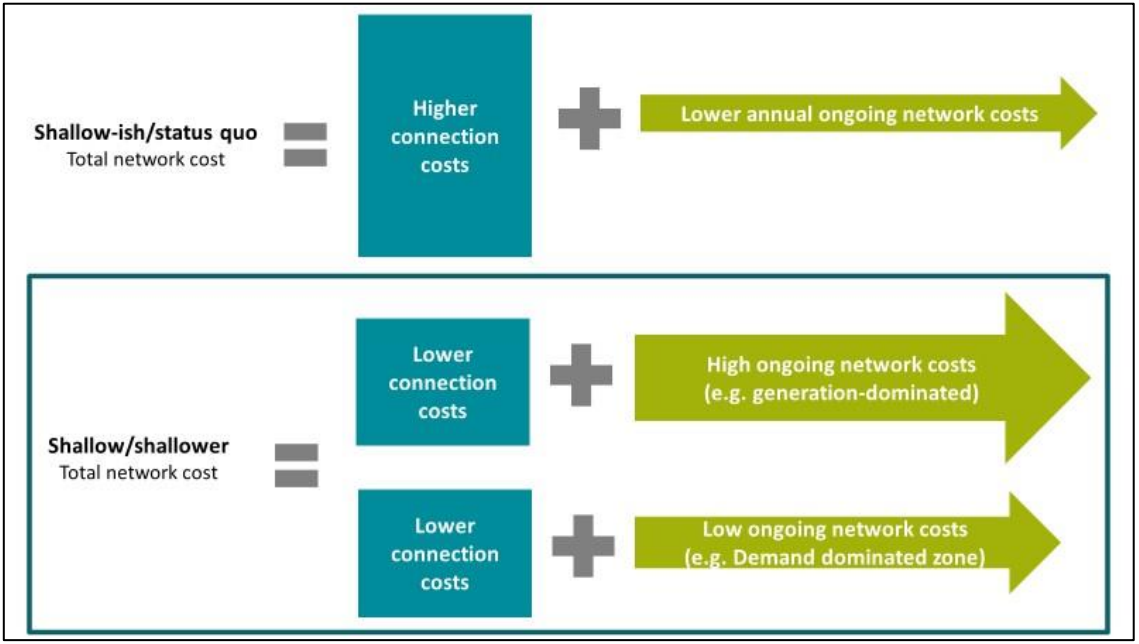

Figure 5: The theoretical trade-off between up-front and ongoing costs for a new connection

Implications for DNOs

- The combination of stronger locational price signals and lower up-front connection charges could have a **significant impact on where customers chose to connect and may increase connections in more constrained areas**, it may also influence decisions whether to connect to the distribution or transmission network.
- **This is likely to lead to higher connection costs paid through customer DUoS**. However, the full impact will depend on a final SCR policy design including the degree of shallowness, granularity and methodology for zoning, locational tariff design and the cost economics of individual projects.
- DNOs will need to **provide additional customer information and heat maps.** Updating of network heat maps to reflect new information (shallowness) and expanded to indicate locational charge zones.
- Although lower connection costs may be partially offset by higher ongoing charges, depending on the new charging methodology, there may not be a neat correlation between network constraints and locational charges.
- There is uncertainty about the position of existing network customers, who may have already paid “deeper” connection charges or accepted non-firm flexible contracts or an Active Network Managed (ANM) connection. **DNO’s will require a system to identify and refund or reduce charges for customers that have paid deeper charges.** Many of these customers are unlikely to be the current owners of the demand or generation sites.

Offering more flexible connections

The final key part of the access SCR is the proposal by Ofgem that DNOs should offer more customers the option of flexible connections to the network. This in theory would allow cheaper connections to customers by setting conditions that avoid the requirement for upgrades and reinforcement.

Assuming that flexible connections are offered in all locations with constraints, then more new connections would be expected across all areas of the network. If flexibility is well managed this would better utilise the distribution network, leading to higher capacity usage and network revenues.

Those being considered are individually or combinations of the below:

- Flexible connection contracts with a ceiling placed on the level of constraint that can be imposed by the DNO. For example, a generator might be constrained only 5% or 10% of export or similar.
- Time profiled access options where a contract will specify access only in summer, winter, or off-peak time. This could be for all or part of a connection agreement. For example, a connection agreement for an EV charger means it can only be used during off-peak periods.
- Shared access where complementary generators, demand, or storage in the same network location (exact level tbc), coordinate access and pay for a connection only on net usage.

Flexibility and interaction with shallow charges

A key question for both the review and DNOs is the relationship between a shallower charge and flexible connections. With a fully shallow charge, it is possible that a firm connection might be a lower cost than a flexible connection, which is likely to include a contribution from the customer to network monitoring costs.

As a result, there is potential that the flexible connections will compete with a firm shallower charge and undermine take up of flexible contracts. However, a number of areas may differentiate these contracts in practice.

- A flexible connection could offer a cheaper point of connection cost if a closer connection could be made with agreed flexibility and constraints.
- Flexible connections may also be expected to be done more quickly and therefore a timeframe for connection may be sooner (and therefore lower cost for the project).

It is possible that a flexible connection could be used by DNOs as a ‘stepping-stone’ to a firm connection as the network evolves or is reinforced.

Connection types	Point of connection cost	Network costs to customer	Network monitoring costs	Flexibility markets	Forward-Looking DUOS
Shallow-ish	As required to achieve a firm connection	Paying for a level of reinforcement	None	Limited additional need	Dependent on location
Shallower	As required to achieve a firm connection	Paying lower reinforcement costs	None	Some additional need to avoid added reinforcement	Dependent on location
Shallow	As required to achieve a firm connection	None	None (assuming connection is post reinforcement)	Increased need to avoid added reinforcement	Dependent on location
Active Network Management	Potentially lower due to closer connection point	Paying for monitoring and system costs	Yes – to automatically monitor and constrain	Limited additional need	DUOS signals reinforce constrained time periods
Flexible – Max constraint	Potentially lower due to closer connection point	Paying for monitoring and system costs	Yes – to automatically monitor and constrain	Increased need to avoid exceeding constraint levels	DUOS signals reinforce constrained time periods
Flexible – Time of use	Potentially lower due to closer connection point	Paying for monitoring and system costs (maybe lower)	Yes – at customer site mainly	Limited additional need	TOU periods expected to be reinforced by DUOS
Flexible – Shared access	As required to achieve a firm connection	TBC – could be both reinforcement and monitoring costs	Yes – at customer sites to monitor net access	Limited additional need	Dependent on location

Figure 6: Comparison of the different connection types under discussion along with costs and implications for flexibility.

Implications for DNOs

- **Significant amounts of additional monitoring and data would be required for all areas of the network** in order to develop flexibility options for new connectees (this is assuming all areas will be offered flexible contracts).
- As with shallower boundary, **DNOs could be dealing with increased number of connection enquiries** (particularly renewable generation) in areas of constraints and good resource. Each connection enquiry would need to be provided with a 'menu' of quotes depending on the options they identify. This will lead to a potentially more lengthy and costly quotation process for the DNO which may impact the existing offer timescales.
- There would be an ongoing cost of monitoring and management of flexibility contracts. There is uncertainty about how the cost of the flexibility system is recovered from new connections.
- It is possible that DNOs would need to upgrade existing ANM contracts to a 'capped constraint' as well as changing the ANM systems to replace the 'first in last off' approach.
- The additional risk from ceilings on flexibility or time of use contracts **will need additional risk management from DNOs** to ensure they are able to stay within contractual obligations. They are likely to need to procure additional flexibility or pay compensation.
- Higher utilisation of the distribution network is likely to lead to a subsequent impact on the utilisation of the transmission network.

Summary: Impact on decarbonisation

Will the changes support decarbonisation and achieving net zero?		
Higher fixed charges for demand customers	• Enhances uptake of low carbon technology by reducing the marginal cost of higher electricity usage, for example the adoption of EVs and heat pumps and electrification of processes.	
	• Reduces cost of electricity unit but also reduces energy efficiency signal.	
	• Reduces the business case for behind-the-meter generation, however most impact on plants that run at peak which is likely to be diesel and fossil fuel.	
	• Reduces the peak winter network cost business case for battery storage but may encourage storage to be used to reduce capacity of connection in the longer term.	
Locational charges and price signals	• Potential political consequences of the different zones may conflict with delivery of local net zero plans.	
	• Locational charges in generation dominated areas may dissuade new renewable generators from connecting in areas with good wind and solar resources.	

	• Could encourage local matching of demand and generation, reducing losses.	
	• Fossil generators likely to find it easier to capture locational DUoS benefits than renewable generators.	
Shallower distribution connection boundary	• May allow an increase in renewable generation in areas of good resource and reduces the customer costs of electrification of heat, transport and processes.	
	• Potentially, if DSO are allowed and incentivised, facilitates more strategic investment in key areas of the network.	
	• Potential reduction of incentive for new developments to be energy efficient but also means fewer barriers to electrification (or heat and transport) in new demand sites.	
Flexible access and connection options	• Increase the utilisation of the existing electricity network and allowing more connections at a lower cost.	
	• Could support the development of network monitoring and flexibility markets.	
	• Could support greater electrification and renewable generation at lower network cost if DSOs are allowed more scope to optimise network investment.	