

Proposed Solutions

Option 1 – Invoice only the boundary Supplier

Under this approach, the Distributor would continue to invoice UoS charges only to the Supplier registered to the boundary MPAN in Settlement. In order to invoice all units, this solution requires the Distributor to either receive or be in a position to calculate gross units at the boundary, whereas Settlements will only show net units (i.e. with units used by embedded customers having been differenced from the boundary MPAN).

Scenario	Pros	Cons
Overall		<ul style="list-style-type: none"> Can only be applied where there is a boundary MPAN with an appointed Supplier.
All HH Site Specific Settled with difference metering	<ul style="list-style-type: none"> All charges (including capacity and reactive power) can be levied accurately based on boundary metering data. Provided an agreement is in place between the Meter Operator/Data Collector and boundary Supplier, the boundary Supplier will receive the same boundary metering data as the Distributor so can validate invoices. By invoicing based on actual boundary metering data (rather than e.g. the sum of embedded customer metering data) the Distributor will always invoice for the units which it has delivered, avoiding any issues with losses within the private network and the risk of inaccuracy when 're-aggregating' embedded customer metering data to determine boundary data. Private network is treated as a single customer – so the Distributor's charges 	<ul style="list-style-type: none"> Needs a mechanism by which the Distributor receives gross boundary metering data (which will not be received through Settlement). Needs a mechanism by which the Distributor applies zero rates to data received through Settlement for the PNO (both embedded customers and difference boundary data). Full charges will be applied to the supplier of the boundary point MPAN based on the gross boundary point metering data. For the avoidance of doubt appropriate loss adjustment factors need to be applied in a manner in accordance with BSCP128. <p>The boundary Supplier is invoiced by the Distributor in respect of units which it has not supplied (i.e. the units used by embedded customers for which another Supplier is responsible). There will need</p>

	will always be exactly equal to the charges which would have been levied had a single customer been connected at the ownership boundary between the Distributor and the PNO and the Distributor is only invoicing in respect of its own assets	to be additional processes in place to recover these costs from the other Suppliers of embedded customers, which may be between PNO and supplier or supplier and supplier.
All HH Site Specific Settled with full settlement metering		<ul style="list-style-type: none"> • Solution relies on a boundary MPAN with an appointed Supplier – hence does not cater for these scenarios.
All NHH or HH Aggregate Settled with full settlement metering		
Combination of HH and NHH Settled with full settlement metering		

Consumer Impacts

If the Distributor is billing at the boundary, the boundary Supplier is receiving all of the Distributor's charges which are likely to be passed on to the boundary customer (i.e. the PNO). Allocation of the Distributor's charges between the PNO and its customers (including those with competition in supply) would then rely on appropriate commercial arrangements between the PNO customers and the suppliers involved.

Option 2 – Invoice all Suppliers based on the tariff which the Distributor would apply if the end user were connected at the ownership boundary between the Distributor and the PNO with a correction to fixed charges and some form of capacity allocation

Under this approach, the Distributor would invoice based on units received through Settlement, using the tariff which the Distributor would apply if the customers were connected at the ownership boundary between the Distributor and the PNO UoS charges to:

- both the boundary Supplier and the Supplier of embedded customers (under the difference metering approach); or
- the Suppliers of all embedded customers (under the full Settlement or shared metering approach).

A solution would be needed to the issues raised at the end of the 'Why Change' section (paragraph 1.8). This could be achieved for fixed charges by applying a proportion of the fixed charge to each supplier which would ensure that the total of fixed charges applied for all customers connected to the private network is equivalent to the fixed charge which would have been applied had there only been a single boundary MPAN. For capacity charging, some means of capacity allocation would be required to split the agreed capacity at the ownership boundary between the Distributor and the PNO between the connected customers.

Scenario	Pros	Cons
Overall	<ul style="list-style-type: none"> • Distributors and Suppliers already receive (almost) all information required to facilitate this approach through existing settlement arrangements. • Each Supplier pays UoS charges only for units which it has supplied. • Distributor would assign the tariff which would be assigned to a single customer connected at the ownership boundary between the Distributor and the PNO – so Distributor is only invoicing in respect of its own assets. • All units are charged based on the tariff which the Distributor would apply at the boundary – so assuming the sum of units charges is equivalent to the sum of units through the boundary, the total units charges levied will be the same as 	<ul style="list-style-type: none"> • Distributors and Suppliers would need additional information identifying private network MPANs in order to appropriately assign tariffs. • The need for additional (likely manual) processes for Suppliers will increase the cost to serve of embedded customers, potentially reducing Supplier engagement and the extent to which embedded customers benefit from competition.

	those which would be levied if a single customer were connected at the ownership boundary between the Distributor and the PNO.	
All HH Site Specific Settled with difference metering		<ul style="list-style-type: none"> • Capacity and reactive power charging will be inaccurate compared to option 1. • The connection agreement will be between the Distributor and PNO for capacity at the boundary, which is being monitored by boundary metering – the Distributor would be (arbitrarily) dividing this capacity between PNO customers. • Option 1 results in charges which are exactly equal to that which would have been levied had a single customer been connected at the ownership boundary between the Distributor and the PNO – this option will create a similar but not identical charge because the excess capacity charging issue and reactive power charging issues identified in the ‘why change’ section (paragraph 1.8) cannot be resolved under this mechanism.
All HH Site Specific Settled with full settlement metering	<ul style="list-style-type: none"> • Fixed charges can effectively be split between the number of embedded customers to ensure the equivalent of one fixed charge is levied in aggregate. 	<ul style="list-style-type: none"> • Capacity charging will rely on the Distributor ‘assigning’ some of the boundary capacity to each embedded customer. The Distributor has no basis for doing so, and risks indicating that each embedded customer has that agreed capacity – the only agreed capacity which is relevant to the

		<p>embedded customers is that with the PNO.</p> <ul style="list-style-type: none"> • If the Distributor splits capacity between embedded customers, it may also levy excess capacity charges for individual embedded customers, when each customer may well have operated within their agreed capacity with the PNO and in aggregate (because of diversity between embedded customers) remained below the agreed capacity for the private network, but exceeded their 'portion' of the boundary capacity. • Reactive power flows through each embedded customer's metering will not sum to the reactive power flows at the boundary, so reactive power charging will be inaccurate. • In order to accurately split fixed charges, the Distributor will need to know how many customers are connected to the private network, including when this changes over time. The Distributor will then need to amend the fraction of the fixed charge which is applied in respect of each embedded customer – which could be a cumbersome process.
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All NHH or HH Aggregate Settled with full settlement metering		If the tariff which the distributor would apply at the boundary is a HH metered tariff (which is likely given the boundary has potentially relatively high load) then this option would not be feasible with these scenarios as the distributor will receive aggregated data through Settlement to which it will not be in a position to apply a site-specific tariff (which would include variable unit rates, capacity and reactive charges).
Combination of HH and NHH Settled with full settlement metering		

Consumer Impacts

Each customer will be charged by their Supplier rather than the PNO for the use of the upstream distribution network (either explicitly via 'pass-through' arrangements or through inclusion in the supplier's tariff), the same as they do if they were connected to the Distributor's network. However PNO network costs will still need to be recovered, either through agreement with customer(s) or by PNO UoS charges to Supplier(s) of embedded customer(s).

Option 3 – Invoice all Suppliers as if the customer were connected to the Distributor's network, with the private network operator able to 'claim' some use of system revenue back from the Distributor in respect of private network assets

Under this approach, the Distributor would invoice the Supplier of both the embedded customers and the boundary Supplier UoS charges as if those end customers were connected direct to its network. As a result, the Distributor would have recovered some UoS charges in respect of assets on the private network, to which the PNO should be entitled, and so the PNO would be eligible to claim back a portion of UoS revenue from the Distributor.

Scenario	Pros	Cons
Overall	<ul style="list-style-type: none"> Suppliers face identical processes and charges for embedded customers as for 	<ul style="list-style-type: none"> If the Distributor treats credits to the PNO as a cost, it will not fully recover its

	<p>equivalent Distributor connected customers. This will potentially facilitate engagement by Suppliers and so increase the extent to which embedded customers benefit from competition.</p> <ul style="list-style-type: none"> • A single contractual agreement with the Distributor would be required by the PNO to recover UoS charges. This is more efficient than maintaining multiple contractual agreements with (changing) Suppliers. 	<p>revenue allowances. Would either require a licence change to allow such PNO credits to be treated as pass-through costs or for the costs to be treated as negative regulated revenue.</p> <ul style="list-style-type: none"> • Need for either a contractual agreement with Distributor and PNO to agree what value can be claimed or for the mechanism by which this value is determined to be defined in DCUSA.
All HH Site Specific Settled with difference metering	<ul style="list-style-type: none"> • If the amount which the PNO is eligible to claim is set relative to the boundary metering data, the net charge for the private network will be the same as under option 1. 	<ul style="list-style-type: none"> • Creates a complex mechanism by which the end result of option 1 is achieved.
All HH Site Specific Settled with full settlement metering	<ul style="list-style-type: none"> • The issue over capacity under this option falls away due to reconciliation process between the Distributor and PNO. 	<ul style="list-style-type: none"> • Issues with reactive power charging identified under option 2 remain under this scenario.
All NHH or HH Aggregate Settled with full settlement metering	<ul style="list-style-type: none"> • NHH Distributor tariffs are calculated specifically for each given end user group (e.g. domestic customers) – this approach enables existing tariffs to be used without needing to define tariffs for such customers with different boundary voltages. 	<ul style="list-style-type: none"> • Would require meter reads for private network customers to be disaggregated from meter reads for other customers to enable the credit to the PNO to be calculated.
Combination of HH and NHH Settled with full	<ul style="list-style-type: none"> • NHH Distributor tariffs are calculated specifically for each given end user group (e.g. domestic customers) – this approach enables existing tariffs to be 	<ul style="list-style-type: none"> • Would require meter reads for NHH and HH aggregate Settled private network customers to be disaggregated from meter reads for other customers to

settlement metering	used without needing to define tariffs for such customers with different boundary voltages.	enable the credit to the PNO to be calculated.
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Consumer Impacts

None identified.

Other Considerations

The Working Group discussed the impact this option could have on IDNOs, and whether this option would discriminate against IDNOs in a situation where a private network is connected to an IDNO network. In this situation, the IDNO would invoice the Suppliers of the embedded customers (typically using the tariff which the host DNO would apply to those end customers if those end customers were connected to the host DNOs network). The PNO would be entitled to 'claim' a portion of that revenue from the IDNO. But under existing processes the DNO also invoices the IDNO to recover its portion of UoS charges in respect of those end customers. As a result, the IDNO would be required to pay a credit back to the PNO as well as settling the DNO upstream invoice. Members of the Working Group were concerned that this could result in a reduced IDNO margin.

In order to reconcile these concerns, the Working Group considered the revenue which would be available to an IDNO under equivalent scenarios with and without a PNO operating the LV network. **Figure 1** shows a typical scenario with customers connected to an IDNO network.

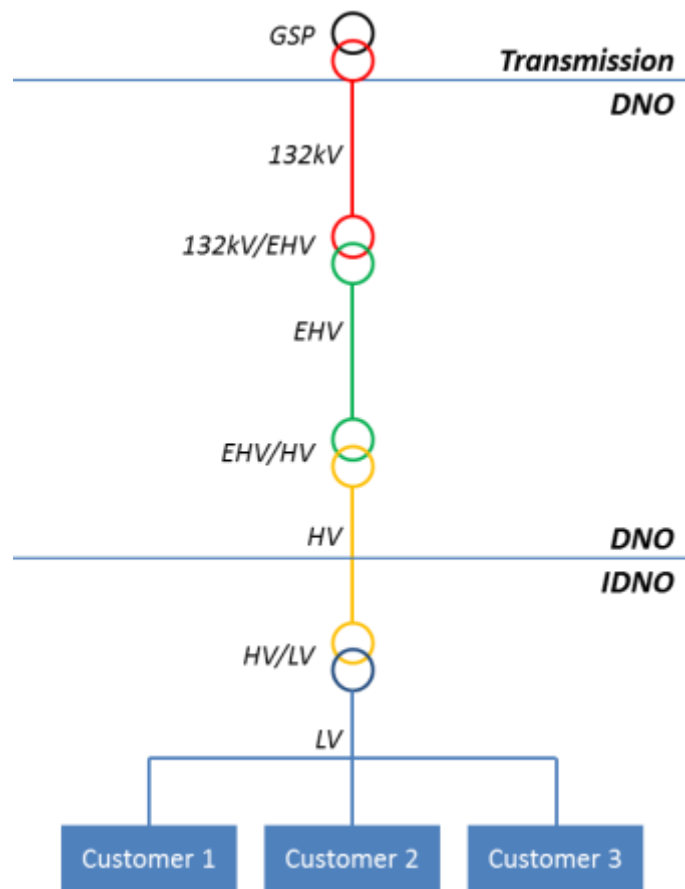


Figure 1 - IDNO connected end customers without PNO

Under this arrangement, the IDNO would invoice the Suppliers of the end customers, typically using the tariff which the host DNO would apply if the customers were connected direct to the host DNO's network. The DNO would then invoice the IDNO 'discounted' UoS charges in respect of those end customers – in this case with the discounts calculated to take into account that the IDNO is connected to the host DNO network at HV and is supplying LV customers, so should be entitled to revenue in respect of a portion of the HV circuits network level, and all of the HV/LV transformation and LV circuits network levels.

Figure 2 shows an equivalent scenario, but with a PNO owning and operating the LV network.

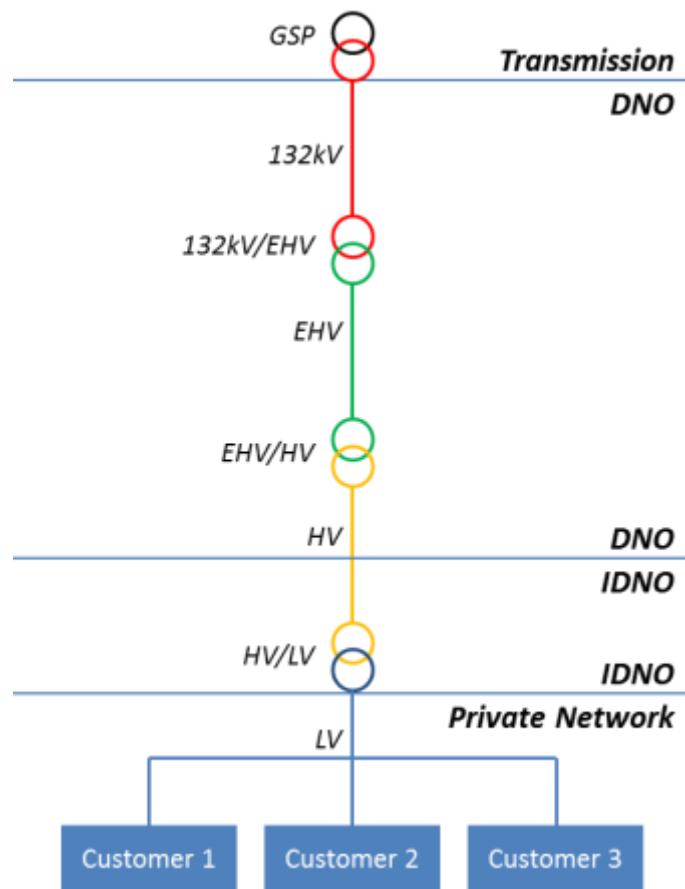


Figure 2 - PNO connected end customers with PNO network connected to IDNO network

As under the more standard arrangement shown in Figure 1, the IDNO would invoice the Suppliers of the end customers, typically using the tariff which the host DNO would apply if the customers were connected direct to the host DNO's network. The DNO would then invoice the IDNO 'discounted' UoS charges in respect of those end customers. The DNO would be 'blind' to the involvement of the PNO, and so would apply the same charges as under the standard IDNO arrangement shown in Figure 1 – i.e. with the discounts calculated to take into account that the IDNO is connected to the host DNO network at HV and is supplying LV customers, so the DNO should not recover revenue in respect of a portion of the HV circuits network level, and all of the HV/LV transformation and LV circuits network levels. With this transaction complete, the IDNO is left with all UoS revenue in respect of the LV circuits and HV/LV transformation network levels and a portion of the HV circuits network level.

Under the option being considered, the PNO would be entitled to claim some UoS revenue from the IDNO. In this example, the PNO would be entitled to claim UoS revenue in respect of the LV circuits network level. This being the case, the IDNO will be left with all UoS revenue in respect of the HV/LV transformation network level and a portion of the HV circuits network level, being those network levels where it owns and operates assets.

Option 4 – Invoice the PNO direct (not to be considered further)

Under this approach, the Distributor would invoice UoS charges direct to the PNO based on total units at the boundary, with no charges applied to the units recorded in Settlement against MPANs which relate to customers connected to the private network or against the boundary MPAN if applicable. The PNO may then directly pass through the Distributor's charges to customers connected to the private network or recover those costs through another means (e.g. an appropriate commercial agreement).

Scenario	Pros	Cons
Overall	<ul style="list-style-type: none">Tariffs would be assigned at the boundary, so the Distributor is invoicing only in respect of its own assets. This solution avoids the issues presented in option one where the boundary supplier is being invoiced UoS charges in respect of units which it has not supplied (under the difference metering approach). Unlike option one this option is also compatible with all metering approaches.	<ul style="list-style-type: none">Need for zero tariffs to be applied to MPANs on private network for 'standard' Supplier invoicesPNOs do not accede to the DCUSA, so DCUSA obligations covering Distributor to Supplier invoices (e.g. the obligation to pay) would not apply.In order to invoice all units, this solution requires the Distributor to either receive all relevant data associated with the tariff at the boundary, where Settlement will only show net units (i.e. with units used by embedded customers having been differenced from the boundary MPAN). There is a potential that the Distributor will have to deal with bad debt risk.
All HH Site Specific Settled with difference metering	<ul style="list-style-type: none">Achieves the same position as option 1, albeit charges have been levied on the PNO rather than the boundary Supplier.	
All HH Site Specific Settled with full settlement metering	<ul style="list-style-type: none">Enables more appropriate capacity charging than option one as charges are levied for the network as a whole.	<ul style="list-style-type: none">Reactive power charging would not be fully accurate as reactive power flows at the boundary will not be equivalent to the sum of reactive power flows at embedded customer metering points.
All NHH or HH Aggregate		

Settled with full settlement metering		<ul style="list-style-type: none"> Would require meter reads for private network customers to be disaggregated from meter reads for other customers to enable the invoices to the PNO to be calculated.
Combination of HH and NHH Settled with full settlement metering		

Consumer Impacts

None identified

After consideration of the above the Working Group concluded that this option was not appropriate as PNOs cannot accede to DCUSA and as such would introduce the need for numerous bilateral agreements to cater for invoice and payment processes with the PNOs.

Option 5 – Invoice all Suppliers based on new use of system charges which only include elements of charging which relate to voltage levels provided by the Distributor

Under this approach, the Distributor would invoice UoS charges to both the boundary Supplier and the Supplier of embedded customers (under the difference metering approach) or the Suppliers of all embedded customers (under the full Settlement or shared metering approach), based on units received through Settlement, using new tariffs calculated for each Distribution network to private network boundary voltage based on the voltage levels which the Distributor provides. This could be carried out using the calculations in the Common Distribution Charging Methodology which are calculated on a voltage level basis prior to being aggregated to tariff level.

Provided the breakdown of which tariff elements should and should not apply for a given end user (based on the Distribution network to private network boundary) treats LV services and LV mains distinctly, this solution would resolve the issue of multiple fixed charges as the fixed charge is recovered in respect of service assets which would always be owned by the PNO and so the Distributor would not be charging a fixed charge. For capacity charging, some means of capacity allocation may be required to split the agreed capacity at the Distribution network to private network boundary between the connected customers.

Scenario	Pros	Cons
Overall	<ul style="list-style-type: none"> Process of charging would be more straightforward for Suppliers as there 	<ul style="list-style-type: none"> Need for a large number of new tariffs (every tariff with every possible voltage

	would be dedicated distribution tariffs for these customers, hence the customers should benefit from competition.	level of ownership boundary between the Distributor and the PNO).
All HH Site Specific Settled with difference metering		<ul style="list-style-type: none"> Capacity charging will rely on the Distributor 'assigning' some of the boundary capacity to each embedded customer. The Distributor has no basis for doing so, and risks indicating that each embedded customer has that agreed capacity – the only agreed capacity which is relevant to the embedded customers is that with the PNO.
All HH Site Specific Settled with full settlement metering		<ul style="list-style-type: none"> If the Distributor splits capacity between embedded customers, it may also levy excess capacity charges for individual embedded customers, when each customer may well have operated within their agreed capacity with the PNO and in aggregate (because of diversity between embedded customers) remained below the agreed capacity for the private network, but exceeded their 'portion' of the boundary capacity. Reactive power flows through each embedded customer's metering will not sum to the reactive power flows at the boundary, so reactive power charging will be inaccurate.
All NHH or HH Aggregate Settled with full		

settlement metering	<ul style="list-style-type: none"> Enables differences between the Distributor to private network and end customer voltage to be appropriately considered (i.e. Distributor tariffs 'discounted' to reflect Distributor assets not used). 	
Combination of HH and NHH Settled with full settlement metering		

Consumer Impacts

None identified.