Zambia Renewable Feed-in Tariff (REFIT) Program

Grid Connection Guidelines

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1. **INTRODUCTION**

Grid connection is a vital consideration in bringing both new customers and new generating capacity (whether renewable or conventional) into the interconnected system, from the perspectives of proximity to the existing grid, spare grid capacity available and the impact on system stability/reliability.

In many instances the best sites for new generation projects, especially renewable energy options, are widely distributed geographically, which implies that it may not always be viable to connect the site to the grid at a particular point in time. It is therefore imperative that the technical and commercial viability screening that is often undertaken and has been proposed in the REFiT Guidelines should take account of ease of grid integration.

The Grid Connection Guidelines, together with the Grid Code and the regulatory tariff methodology provide the framework for customer access to and use of the national transmission and distribution networks.

2. **REFERENCES**

This document draws from previous work done by the Author in respect of the development of a Grid Connection Policy and Framework for the Electricity Control Board in Namibia.

3. **OBJECTIVE OF GRID CONNECTION GUIDELINE**

The overall objective of the Grid Connection Guidelines is to establish a standardized approach to dealing with power network connections and associated connection charges. More specifically, the objectives include:

(i) Identifying parties to whom the Grid Connection Guidelines apply.

(ii) Establishing a set of base connection charge principles.

(iii) Describing the process of application for new connections or upgrades to existing supply arrangements.

(iv) Identification of the different costs to be recovered via Connection Charges.

(v) Setting a standard methodology for determining Connection Charges.

(vi) Providing a governance mechanism to deal with network connection matters.
4. DEFINITIONS

(a) "Capital Contribution" – shall mean the proportional contribution made by a single Customer or group of Customers to the total capital costs of Connection Assets.

(b) "Connection Agreement" – shall mean the agreement concluded between the Customer and Network Licensee that governs the technical, operational and commercial arrangements between them.

(c) "Connection Assets" – shall mean the network infrastructure required to provide a grid connection.

(d) "Connection Charges" shall mean the charges payable by the Customer to cover the costs associated with the connection to the transmission or distribution network as applicable.

(e) "Connection Quote/Estimate Fee" shall mean the fee payable by the prospective Customer upon the application for a connection to the applicable Network Licensee to cover the costs of the quote/estimate.

(f) "Customer" – shall mean any user (generator or load) of the transmission or distribution network of a Network Licensee.

(g) "Dedicated Network" – shall mean an electricity transmission or distribution network that is used exclusively by a single Customer or group of Customers.

(h) "Deep Connection" - shall mean any additional network infrastructure, which is not solely dedicated to a single customer or a single group of Customers with common interest and is required in the Shared Network, at the time of the construction of the Customer's point of connection, to connect the Customer and enable the Customer to inject power (in the case of a generator) or take supply (in the case of a load) up to a specified maximum injection or off-take limit (capacity).

(i) "Deep Connection Assets" – shall mean network assets, which are used or of benefit to all Customers, generally (i.e. Shared Network).

(j) "Energy Regulation Board" – shall mean the energy industry regulatory body established in terms of the Energy Regulation Act of 1995, Chapter 436 of the Laws of Zambia following the issuance of Statutory Instrument number 6 of 1997 and the Energy Regulation Act (Commencement Order) of 27th January 1997.

(k) "Fixed Connection Cost Quotation" - shall mean the projected costs to the Network Licensee to make the network connection available, which, if
accepted by the Customer (i.e. fixed), will be charged by the Network Licensee without any further actual cost adjustments.

(l) "Grid Connection Guideline" - shall mean this guideline and any subsequent written amendments hereto.

(m) "Network Licensee" - shall mean any party licensed in terms of the Energy Regulation Act of 1995 read in conjunction with the Electricity Act of 1995 for the transmission or distribution of electricity.

(n) "Projected Connection Cost Quotation" - shall mean the projected costs to the Network Licensee to make the network connection available, which will be paid in advance, but will be subject to adjustment based on actual connection costs incurred, once the connection is completed.

(o) "QOS Standards" - shall mean the Zambian quality of supply standards as published by the Energy Regulation Board of Zambia.

(p) “Semi-Deep Connection Assets” – shall mean additional assets required within the Shared Network at the time of connection in order to connect the Customer and enable the Customer to inject power (in the case of a generator) or take supply (in the case of a load) up to a specified maximum injection or off-take limit (capacity).

(q) "Shallow Connection Assets" - shall mean assets, which are to be constructed in the immediate vicinity of a Customer, or group of Customers with common interest connection point and which shall be specifically for the use or benefit of a single Customer or single group of Customers with common interest (i.e. associated with a Dedicated Network).

(r) "Shallow Connection" - shall mean the infrastructure situated in the immediate vicinity of the Customer's point of connection and is solely for the purpose of connecting the Customer or a specific group of Customers (i.e. associated with a Dedicated Network). The Shallow Connection may be of a temporary or permanent nature.

(s) “Shared Network” – shall mean an electricity transmission or distribution network that is shared by a large number of Customers and cannot easily be attributed to individually identified Customers.

(t) "Special Connection" - shall mean a connection comprising Special Connection Assets.

(u) "Special Connection Assets" shall mean assets classified as special assets or equipment becoming stranded assets - i.e. made redundant before the end of their economic lives or assets that are specifically designed and constructed to the specific needs of the Customer, which are not standard equipment of the
Network Licensee and cannot be used elsewhere in the system. These assets may also need specialized or more frequent maintenance, depending on the operating conditions.

(v) "Standard Connection Cost" - shall mean the predetermined standardized costs published and levied by the Network Licensee to make a network connection available to a defined “small” Customer.

(w) "Temporary Connection" - shall mean a connection and associated assets that are required for a connection period of less than 18 (eighteen) months and are mainly used for the purpose of transmitting power whilst the Network Licensee is constructing the main power supply. On completion of the main supply, the temporary connection shall be disconnected.

5. GRID CONNECTION GUIDELINE APPLICABILITY

5.1. New Connections
The Grid Connection Guideline shall apply to all Customers entering into or who intend entering into a Connection Agreement with a Network Licensee. The requirements of the Grid Connection Guideline and any associated network agreements shall be supplementary to the general conditions set out in the individual Network Licensees’ standard conditions of service and/or supply and should be read in conjunction with these.

5.2. Existing Connection Agreements
The provisions of this Grid Connection Guideline shall not have retrospective applicability and shall not supersede Connection Agreements or Connection Charges already in place. These legacy agreements will be honored by the Network Licensee.

Changes to existing agreements, if and when required by the Customer, may invoke aspects of the Grid Connection Guideline that are legal, fair and in line with the key principles as well as technical and economic considerations. The Customer will be notified upon termination of a Connection Agreement, subject to the conditions contained therein. Once an existing Connection Agreement has terminated it will be replaced with a new Connection Agreement that complies with the principles set out in the Grid Connection Guideline as well as any other service or supply standards applicable.

6. KEY CONNECTION COST AND CHARGE PRINCIPLES
In formulating Connection Agreements and associated Connection Charges, the utility should seek to apply the following key principles:

(a) Equality:
This principle requires that there is no unfair discrimination between Customers or classes of Customers. In practice this means that Customers with similar connection arrangements should bear similar charges, subject to considerations of economic efficiency.

(b) Efficiency:
Economic efficiency is desirable as it encourages the best use of scarce resources. To this end it is recommended that:

(i) Prices are based on the cost of supply.

(ii) Where appropriate, any directly attributable costs are allocated to customers.

(iii) Use is made of appropriate tariff structures to encourage the efficient use of the infrastructure.

(c) Simplicity:
Any system of connection charges should be simple. This has a number of advantages:

(i) Faster quotations for customers (and an overall reduced connection time, thereby improving customer service).

(ii) Easy for the customer to understand.

(iii) Reduced administrative overheads.

(iv) Reduction in auditing overheads.

7. GRID CONNECTION APPLICATION PROCESS

7.1. Application process
Applications to connect to or disconnect from transmission or distribution networks under the Network Licensee’s control, or to effect changes in “demand” or “capacity” of existing connections must be made by the Customer in writing by completing the appropriate forms and submitting them to the Network Licensee by hand, mail courier or in electronic format. Upon receiving the application the Network Licensee shall process the application in terms of applicable quality of service standards or requirements.

The figure below illustrates a typical grid application process.
The above process flow shows that:

(a) The Grid Connection Guideline differentiates between “small” and “large” Customer connections.

(b) The responsibilities of the parties are clearly defined with set maximum timeframes within which certain tasks must be completed.

7.2. Application Types

In addition to the practical differentiation between “small” and “large” connections, the connection application would fall under one of the categories noted below:

(a) Permanent supply of electricity

(b) Temporary supply of electricity (e.g. construction site supply, public performance supply etc.)

(c) Permanent disconnection of electricity supply

(d) Temporary disconnection of electricity supply

(e) Application for change of demand/capacity
7.3. Connection Cost Estimates, Quotations and Fees

As appropriate, the Network Licensee will present the Customer with a predetermined standard cost, or a cost estimate and quotation, based on the Customer’s application, associated time frames, locality of the intended connection, evaluation of the network, site conditions, tenders and equipment prices amongst other factors.

The proposed approach is summarized below:

**Standard Connection Costs**

A predetermined Standard Connection Cost available in tabulated form and payable without delay to the Network Licensee will be charged to secure the connection (typically associated with a “small” Customer connection).

**Cost Estimates and Quotations**

For “large” Customer connections, the Network Licensee, should deal with costing as follows:

(a) A **budget cost estimate** - issued to the customer to give an indication of the costs involved. Upon acceptance of the cost estimate, a quotation is prepared.

(b) A **connection quotation** - a cost offer which is binding subject to conditions. Upon acceptance of the offer, payment of the specified amounts and compliance with applicable conditions the connection process continues.

In respect of investments in infrastructure at distribution voltage level (< 66kV), the quotation may be based on either a Fixed Cost or a Total Costs to Project quote. The Network Licensee reserves the right to negotiate what type of quotation is made available to the Customer.

(c) A **Fixed Connection Cost Quotation**, which comprises the fixed capital cost payable by the Customer to make the connection available. Such a quotation is not subject to any further adjustment resulting from actual connection costs incurred.

(d) A **Projected Connection Cost Quotation** which comprises a quote whereby the estimated costs of the planned connection are provided and charged to the applicant. However, upon completion of the connection, the Customer is liable for actual costs incurred. In the event that actual costs are lower than the amount quoted, the Network Licensee will refund the Customer the difference between quoted and actual costs incurred. In the event that actual costs exceed the amount quoted, the Customer will be liable to pay the difference to the Network Licensee.

For investments in infrastructure at transmission voltage level (>=66kV), the connection quotation will only be based on a Projected Connection Cost Quotation and adjusted for actual costs incurred as set out above. On completion of the
connection, the project will be audited internally by the Network Licensee and final payments by the Customer will be adjusted accordingly. The Customer reserves the right to have the project audited externally, at the cost of the Customer.

**Connection Estimate/Quotation Fees**

It is noted that there may be costs incurred by the Network Licensee associated with providing such budget cost estimates or quotations. The Network Licensees may charge a cost-based Connection Estimate/Quotation Fee for the preparation of cost estimates and quotations.

8. **GRID CONNECTION COSTS**

It is important to recognize that there are a number of potentially complex aspects to consider in respect of allowable connection costs. The Grid Connection Guidelines provide Network Licensees and Customers with clear direction on which network assets may be deemed contribute to connection costs that may be recovered from Customers.

One of the key principles for Connection Charges is that they should, as far as possible, reflect underlying costs. The aim of Connection Charges is thus to recover the costs incurred by the Network Licensee in respect of the specific connection assets provided for the use or benefit of the Customer.

The costs that may be recovered via Connection Charges may be grouped under the following key headings:

a) Capital costs
b) Operating and Maintenance costs
c) Insurance costs
d) Premature replacement, early termination and ongoing costs
e) Connection Quote/Estimate Costs

These costs are discussed in more detail below and serve as input into the determination of Connection Charges that may be levied.

8.1. **Capital Costs**

The capital costs to be recovered essentially cover the network infrastructure (Connection Assets) required to provide the connection. The most common debate regarding the appropriate definition of allowable Connection Costs typically revolves around the extent to which new Customers should be liable for shouldering the burden of incremental network costs imposed by the applicant’s request for a connection.

This debate is made more complex by a range of factors including

(a) The fact that network investments are typically “lumpy” in nature. This implies that networks are often oversized to cater for future growth in electricity sales.
If this were not done as a matter of course, networks would have to be expanded or even replaced on a frequent basis with new connections, which would be inefficient and increase costs significantly. The question is thus whether a customer requesting a new network connection should be required to contribute to this oversizing of the network which is essentially strategic and intended for future customers and demand growth.

(b) To ensure that quality of supply and network integrity are maintained, additional network assets are often required deep inside the existing “shared or integrated network”. In many instances these assets, would in any event, have been created at some time in the future. The debate then revolves around whether these costs should be absorbed by the customer seeking a new connection or not.

A clear classification of assets assists in simplifying this dilemma.

**Connection Asset Classifications**

In principle, there are various approaches to addressing these issues. The most common of these are illustrated by way of Figure 2 below.

**Figure 2: Connection Asset Classification**

The figure shows that there are two primary groupings of network assets, namely:

(c) **Dedicated network assets** – defined as those network assets that are used exclusively by the Customer or group of Customers seeking the new connection (also referred to as Shallow Connection Assets); these assets are typically situated in the immediate vicinity of the Customer point(s) of connection and are established solely for the purpose of connecting a single Customer or specific group of Customers with common interest on a Dedicated Network.
Shared network assets – those assets that are shared by a range of customers and whose benefit cannot easily be attributed to a single customer or group of customers.

Figure 2 also illustrates that Shared Network assets may be further divided into two sub-categories, namely:

(i) Deep Connection Assets

- Assets within the Shared Network (i.e. typically located some distance from the new connection) that are used or of benefit to all Customers, generally (but where there may be network strengthening or augmentation required to support new connections).

- Deep Connection Assets may be newly created or already be part of the existing network

(ii) Semi-Deep Connection Assets - those assets within the Shared Network located at or near the customer’s point of connection that need to be reinforced or strengthened in order to connect the Customer and enable the Customer to inject power (in the case of a generator) or take supply (in the case of a load) up to a specified maximum injection or off-take limit (capacity). Key attributes include assets that:

- Would not otherwise have been required in the absence of the new Customer connection in question,

- Do not fall within the definition of Shallow Connection Assets,

- Do not include assets beyond the next point of voltage transformation (voltage change),

- Are easily identifiable and their costs can be apportioned to individual Customers or Customer groupings without difficulty.

In addition to the above classifications, it is noted that Shallow Connection Assets may be connected by way of a Permanent-, Special- or Temporary Connection depending on the nature of the connection sought.

(iii) Special Connection Assets

- Assets or equipment that may become stranded (i.e. made redundant before the end of their economic lives), or
• Assets that are specifically designed and constructed to the custom needs of the Customer, which are not standard equipment of the network entity and cannot be used elsewhere in the system (e.g. required to deliver a “premium supply” that exceeds the quality of supply standards applicable to the rest of the network)

(iv) Temporary Connection Assets

• Connection assets that are required for a connection period of shorter than say eighteen months (e.g. a temporary connection that is mainly used for the purpose of construction supply, whilst the network entity is constructing the permanent connection).

Connection Asset Capital Costing Considerations

There are various ways in which the Shallow Connection Assets may be constructed, owned and operated. These arrangements are subject to negotiated agreement between the Network Licensee and Customer and could include, for example:

(a) The Network Licensee designs, constructs, owns and operates the assets.

(b) Customers may, in consultation with the Network Licensee and in accordance with the Network Licensee’s standard requirements and specifications, offer to construct the Connection Assets on behalf of the Network Licensee. In the event, the offer is accepted, the Customer is obliged upon completion, and at no cost, to hand over the infrastructure (Shallow Connection assets) to the Network Licensee to own, operate and maintain. Such requests are typically only be considered under exceptional circumstances.

In the event that the Network Licensee elects to install additional infrastructure, either within the Dedicated or Shared Network, to allow for future growth over and above that required by the Customer, the costs associated with such additional infrastructure should not be recoverable from the Customer.

The cost recovery approach and associated Connection Charges will naturally take account of any such arrangements.

Capital Cost Recovery Options

The capital costs associated with the Connection Assets (Shallow, Semi-Deep and Deep) attributable to each Customer (often referred to as the Customer’s Capital Contribution) should be determined based on the proportional utilization of the assets by that Customer relative to other Customers, taking account of capacity required and distance of the Connection.
The Customer’s Capital Contribution may be recovered via an Initial Connection Charge upfront as a percentage of the total Customer Capital Contribution, with the balance recovered via a Monthly Connection Charge. The proposed approach to be followed for the different Connection Asset types is summarized below.

Table 1: Capital Contribution Recovery Approach

<table>
<thead>
<tr>
<th>Connection Asset Type</th>
<th>Initial Connection Charge</th>
<th>Monthly Connection Charge</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shallow Connection Assets</td>
<td>25%-100%</td>
<td>Balance over defined term</td>
</tr>
<tr>
<td>Semi-Deep Connection Assets</td>
<td>25%-100%</td>
<td>Balance over defined term</td>
</tr>
<tr>
<td>Deep Connection Assets</td>
<td>25%-100%</td>
<td>Balance over defined term</td>
</tr>
<tr>
<td>Special Connection Assets</td>
<td>100%</td>
<td>N/A</td>
</tr>
<tr>
<td>Temporary Connection Assets</td>
<td>100%</td>
<td>N/A</td>
</tr>
</tbody>
</table>

For the purpose of calculating Monthly Connection Charge an "equal principal payment" approach may be followed, similar to the asset financing approach applied by commercial banks. This method is deemed to be simple and fair and provides for "late-comers" who subsequently make use of the connection assets.

The Monthly Connection Charge (Capital Contribution component) may thus calculated taking into account:

a) The total Customer Capital Contribution.

b) The Initial Connection Charge.

c) Number of total and remaining instalment periods.

d) The utility's cost of capital (or regulated rate of return (nominal and before tax) as determined by the ERB, as applicable.

The capital recovery approach adopted should, furthermore, provide flexibility for the Customer to make additional payments against the remaining principal at any time.

In practice many utilities are not in a position to fund their portion of the connection assets (specifically the capital connection cost needed to establish the infrastructure but that is not allocated to the customer). In many instances this funding constraints becomes a real stumbling block in the development of network infrastructure.
One of the ways to overcome this obstacle is for the customer to fund the Network Licensee’s portion of the required capital connection costs. Upon successful completion and commission of the infrastructure the assets are transferred to the utility for compensation. The compensation arrangement between customer and Network Licensee is negotiated upfront and is usually over a long period of time. The details of these arrangements are typically included in the Connection Agreement.

**Capital Contribution Revisions and Refunds**

In order to retain the principles of cost-reflectivity and equality, if there are “late comers” who wish to make use of the existing Connection Assets, it is vital that the Network Licensee considers proportional capital revisions and refunds to capital contributions via the Initial and Monthly Connection Charges to existing Customers. Capital refunds will be based on the proportional capacity required by the new applicant(s).

If the Network Licensee elects to allocate the connection costs to existing and new Customers then the money needed to for the capital refunds to existing Customers would be collected from the new “late-comer” Customers.

If, however, the Network Licensee elects to pool all connection costs during the Customer repayment period, then the funds needed to compensate the existing Customers would form part of the utility’s revenue requirement and be recovered via the access/use-of-system charges.

**8.2. Operating and Maintenance and Insurance Costs**

**Operating and Maintenance (O&M) Costs**

The cost of operating and maintaining the connection assets may be treated in one of two ways.

(a) **Allocated Costs** – under the first approach the costs of maintaining and operating dedicated connection assets are ring-fenced and allocated directly to the Customer or group of Customers. This is a cost-reflective approach but it is complex and difficult to administer considering that there could be multiple connection agreements to cover. This approach would impose a significant administrative burden to accurately ring-fence the applicable costs and it is thus proposed that such direct cost allocation be restricted to the larger costs associated with Shallow and Special Connection Assets at transmission level. These allocated costs would then be recovered from Customers via the Monthly Connection Charge, which could, for example be determined as a simple O&M percentage of the connection asset value.

(b) **Pooled Costs** - the second method is to pool the operating and maintenance costs associated with the connection assets and to spread these over all the network customers according to the prevailing approved transmission or
distribution pricing methodologies. This approach is less cost-reflective but is substantially simpler and more cost-effective to implement. It is thus applied to operating and maintenance costs associated with all Connection Assets other than those identified under a) above. Such pooled costs do not form part of the Connection Charges and are recovered via network access/use-of-system (UOS) charges applied to all Customers.

Notwithstanding the cost approaches outlined above, should the period of use of Temporary Connection Assets at transmission level exceed 18 (eighteen) months, the Network Licensee may elect to allocate the operating and maintenance costs to the Customer and recover these via the Monthly Connection Charge, as indicated.

**Insurance Costs**

As with the operating and maintenance costs discussed above, the two costing approaches are applied to the costs of insuring the Connection Assets.

(c) **Allocated Costs** – as with O&M costs this approach is restricted to the insurance costs associated with Shallow and Special Connection Assets at transmission level. Allocated costs are recovered via the Monthly Connection Charge.

(d) **Pooled Costs** – similarly, this approach is applied to insurance costs associated with all Connection Assets other than those identified under a) above. Pooled costs do not form part of the Connection Charges and are recovered via network Access/Use-of-System (UOS) Charges.

**Summary**

The O&M and Insurance Cost approaches for the different Connection Asset types are summarized below for transmission and distribution networks respectively.
Table 2: O&M and Insurance Costing Approaches

<table>
<thead>
<tr>
<th>Connection Asset Type</th>
<th>Transmission Networks</th>
<th>Distribution Networks</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>O&amp;M Costs</td>
<td>Insurance Costs</td>
</tr>
<tr>
<td>Shallow Connection Assets</td>
<td>Allocated</td>
<td>Allocated</td>
</tr>
<tr>
<td>Semi-Deep Connection Assets</td>
<td>Pooled</td>
<td>Pooled</td>
</tr>
<tr>
<td>Deep Connection Assets</td>
<td>Pooled</td>
<td>Pooled</td>
</tr>
<tr>
<td>Special Connection Assets</td>
<td>Allocated</td>
<td>Allocated</td>
</tr>
<tr>
<td>Temporary Connection Assets</td>
<td>Pooled</td>
<td>Pooled</td>
</tr>
</tbody>
</table>

8.3. Premature Replacement, Early Termination and Ongoing Costs

Premature Replacement

It may arise that that certain Connection Assets must be replaced before they have reached the end of their expected economic lives or before reaching the full term of the Connection Agreement. This could transpire for several reasons including unexpected damage (e.g. lightning strike), theft, inadequate design, poor manufacturing, inferior installation, insufficient maintenance or incorrect operation.

The Grid Connection Guidelines propose that such costs for premature replacement of Connection Assets are not recovered from the Customer provided that the Customer was not the principal cause of the damage, either through its equipment or through its action.

Early Termination Costs

In order to manage the Network Licensee’s overall financial exposure for facilitating the new connection in the event of early termination:

(a) The Customer may be required to pay an upfront amount of the total capital connection costs as determined by the Network Licensee; and

(b) The Connection Agreement should include an early termination clause to recover any outstanding capital costs owed to the Network Licensee.

Ongoing Connection Asset Costs

It is recognized that once a Connection Agreement has expired the cost of any dedicated connection assets that need to be replaced will be for the account of a new connecting customer. If a new Connection Agreement is not concluded then the Connection Assets should be incorporated into the pooled or Shared Network
infrastructure so that any ongoing capital, O&M and insurance costs are then recovered from all customers via the access/use-of-system charges.

8.4. Connection Quote/Estimate Costs

As noted in the Connection Application Process, there may be costs incurred to provide budget cost estimates, conduct network integration studies and initial design work and compile cost quotations for new connections or upgrades. These costs may be recovered in full prior to the Network Licensees undertaking work via a non-refundable Connection Quote/Estimate Fee.

9. Grid Connection Charges

9.1. Risk of double counting

It is important to note that Grid Connection Charges are separate from other network access and use-of-system charges. The following figure summarizes the typical relationships between the main costs and charges for a transmission or distribution network entity.

Figure 3: Typical Network Costs and Charges and their relationships

<table>
<thead>
<tr>
<th>Network Costs</th>
<th>Network Charges</th>
</tr>
</thead>
<tbody>
<tr>
<td>Connection costs</td>
<td>Connection Charges</td>
</tr>
<tr>
<td>Energy Trading costs (losses)</td>
<td>Usage Charges (losses)</td>
</tr>
<tr>
<td>Customer Services costs</td>
<td>Customer Service Charges</td>
</tr>
<tr>
<td>Network O&amp;M costs</td>
<td>Use of System Charges</td>
</tr>
<tr>
<td>Network costs</td>
<td>• Access Charges</td>
</tr>
<tr>
<td></td>
<td>• Demand Charges</td>
</tr>
<tr>
<td></td>
<td>• Capacity Charges</td>
</tr>
</tbody>
</table>

The main points to note are:

(a) Connection costs are recovered from the customer via specific Connection charges.

(b) Connection charges is one of potentially several charges that form part of the network entity’s revenues.

The significance from a policy and regulatory perspective is that that the regulator must ensure that Customers do not pay twice for the same assets. The practice of “double counting” of connection costs happens surprisingly often not because of
deliberate actions but rather due to insufficient policy guidance and unclear tariff methodology.

Double counting occurs when a customer pays for connection costs via connection charges, and then pays for network costs via access and use-of-system charges (which in many instances include connection assets in the rate base).

Therefore Connection Assets should be excluded from rate of return and depreciation calculations and income from monthly O&M and Insurance Connection Charges should be subtracted from allowed revenue requirement.

In practice this implies further that that the definition of Connection Costs should be included not only in the Grid Connection Guidelines but also in the applicable tariff methodology. More specifically the tariff methodology must provide clear guidance on whether the utility is allowed to include or exclude the connection assets from the rate base.

**9.2. Connection Charge Summary**

As discussed in the Grid Connection Cost section above, Connection Charges for new connections to the transmission or distribution networks would typically comprise the following key elements:

(a) Connection Quote/Estimate Fee

(b) Initial Connection Charges

(c) Monthly Connection Charges
   (i) Monthly Capital Contribution
   (ii) Monthly Operating and Maintenance
   (iii) Monthly Insurance

(d) Connection Charge Refunds and Revisions

A proposed Connection Charge approach is summarized in Table 3 below.
### Table 3: Connection Charge Summary Approach

<table>
<thead>
<tr>
<th></th>
<th>Shallow Connection (Tx)</th>
<th>Shallow Connection (Dx)</th>
<th>Semi-Deep or Deep Connection (Tx&amp;Dx)</th>
<th>Special Connection (Tx&amp;Dx)</th>
<th>Temporary Connection (Tx&amp;Dx)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Initial Connection Charge</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Capital Contribution</td>
<td>25-100%</td>
<td>25-100%</td>
<td>25-100%</td>
<td>100%</td>
<td>100%</td>
</tr>
<tr>
<td><strong>Monthly Connection Charge</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Capital Contribution</td>
<td>Balance Capital Contribution</td>
<td>Balance Capital Contribution</td>
<td>✓</td>
<td>✗</td>
<td>✗</td>
</tr>
<tr>
<td>O&amp;M Costs</td>
<td>✓ (allocated)</td>
<td>✗ (pooled)</td>
<td>✓ (pooled)</td>
<td>✓ (allocated)</td>
<td>✗ (pooled)</td>
</tr>
<tr>
<td>Insurance Costs</td>
<td>✓ (allocated)</td>
<td>✗ (pooled)</td>
<td>✗ (pooled)</td>
<td>✓ (allocated)</td>
<td>✗ (pooled)</td>
</tr>
</tbody>
</table>

### 10. Financial Security Arrangements

A financial Security Deposit is typically applicable on Connection Agreements as security for the due payment of the accounts to be rendered in terms of the Connection Agreement. Although this is a “deposit” and not a “charge” as such, the successful connection of the Customer is reliant on the provision of this Security Deposit, and so it is included here for completeness.

The amount of the deposit may be varied at any time by Network Licensee so that the amount of the security shall be sufficient to cover, for example, the estimated amount payable by the Customer for a Connection Charges and electricity consumed during any three (3) month period.

The Security Deposit should be returned to the Customer upon termination of the Connection Agreement within a defined period, provided that such termination is not due to any breach of contract on the part of the Customer and subject to all amounts owed to the Network Licensee under the agreements being paid in full.

### 11. Governance

#### 11.1. Dispute Resolution

Disputes between Customers and Network Licensees should be directed to the ERB and dealt with according to the provisions set out in the Grid Code.