



Lesotho Electricity Authority

Electricity Connection Charges Guidelines

Electricity Connection Charges Guidelines

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Electricity Connection Charges Guidelines

Executive Summary

The main objectives of developing 'Electricity Connection Charges Guidelines' are to:-

- a) Set a standard methodology for determining connection charges for transmission and distribution customers in the country;
- b) Describe the technical requirement and arrangements for the connection; and
- c) Provide a governance structure to deal with future developments. This includes a resolution process to deal with disputes relating to connection arrangements and charges.

The Connection Charge Guidelines will ensure that electricity licensees, clearly and transparently, define the basis on which connection charges will be calculated and that there is no 'free-riding' and that all customers make a fair contribution to the cost of upstream network and any cross-subsidy is clearly reflected.

Finally, the Guidelines require the electricity licensees to design connection charges based on 'shallowish approach' as opposed to 'deep approach'. Under shallowish approach, the customer will only be required to pay dedicated costs of connections while in the later, the customer will be required to pay all the costs associated with the connection, including upstream network reinforcements, if any. The shallowish approach is likely to encourage more connections and reduce incidence where customers require connection refunds. The shallowish approach is also consistent with the 1998 Power Sector Policy Statement of the Government of Lesotho.

The Guidelines also contain the Initial Connection Refund Formulae (ICRF) that will be used by licensees to refund customers who had fully financed dedicated infrastructure when other customers are connected to such infrastructure. The ICRF states that existing customer(s) will qualify for a refund in the event that new customers will share (either partly or fully) the existing dedicated infrastructure. The refund will be paid by the utility and will be recovered from:

- All customers if the decision is to charge a standard connection to all customers.
- The new customers if the decision is not to charge a standard connection to customers connected to the dedicated infrastructure.

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The refund is based on the Initial Connection Charge (excluding the cost of any premium services), the time value of money, the remaining life of the agreement and then pro-rated to reflect size of the respective connections.

The Guidelines provide for definitions of basic terminologies used in connection charges, provide explanation on what are the connection charges, and define connection charge methodologies and the principles used for allocating the costs. The Guidelines further define various types of connection charges, how connection charges should be financed, including how the customers should repay remaining costs. Finally, the Guidelines define basic connection and how costs should be allocated between basic and premium connection types.

1. Background

All customers make a contribution towards licensee's costs incurred in providing capacity on the distribution and transmission networks as well as the cost of providing a connection to these networks. The contribution is regulated by the Lesotho Electricity Authority (LEA) and should be recovered by means of:

- a) Tariff charges such as network charges or Distribution Use of System (DUoS) charges which cover shared or pooled costs.
- b) Connection charges which recover dedicated and shared costs associated with the supply.

The use-of-system charge is applied for upstream network investment for shared network by all customers, irrespective of whether or not upstream strengthening is actually required in order to make the specific connection. This ensures that there is no "free-riding" and that all customers make a fair contribution to the cost of upstream networks, while at the same time providing a pricing signal to customers that reflects the cost of providing capacity on upstream networks.

The connection charge is the charge allocated to a customer for the capital costs of new or additional capacity not recovered in the tariff. It is payable as an up-front payment or as a Monthly Connection Charge (MCC) where licensee can provide the option of financing the costs of connection and the customer repays this over a period not exceeding 25 years.

The "boundary" between connection and use-of-system charges needs to be defined in order to determine the costs to be allocated to a customer as a connection charge. A Connection Charge should be recouped from the customer irrespective of whether new investment is required or not. This means that the licensee's connection charge principle and methodology should be based on a "shallowish" approach where all dedicated costs to be incurred as a result of connection to the system are allocated to the customer but the customer makes a contribution to upstream costs after connection has been made.

As network associated tariff charges recover a portion of network capital costs incurred and the customer is charged for dedicated costs plus shared upstream costs, there is a possibility that a customer may be double charged for the cost of the network. For this reason, a capital allowance should be granted based on the average amount of capital-related revenue recovered through the network tariff charges. The cost to be allocated to the customer for providing a connection is therefore reduced once-off by the capital allowance. The capital allowance is the contribution to shared or dedicated assets paid through future tariff rates i.e. average capital costs recovered over time through the tariff rates. The capital

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contribution payable for the cost of providing new equipment is offset by the capital allowance.

2. The Purpose of the Guidelines

The 'Electricity Connection Charges Guidelines' will, amongst others:-

- a) Set a standard methodology for determining connection charges for transmission and distribution customers in the country;
- b) Describe the technical requirement and arrangements for the connection; and
- c) Provide a governance structure to deal with future developments. This includes a resolution process to deal with disputes relating to connection arrangements and charges.

The Guidelines will further ensure that licensees, clearly and transparently, define the basis on which connection charges are calculated and that there is no 'free-riding' and that all customers make a fair contribution to the cost of upstream network and any cross-subsidy is clearly reflected.

3. Connection Charge Methodology

In terms of its license, a licensee has an obligation to supply any customer who applies for electricity. The investment required to provide the supply must be prudent and justified in terms of the licensee's Distribution Grid Code network investment criteria. Furthermore, in terms of LEA (Electricity Price Review and Structure) Regulations, 2009, the licensees are required to frame or set prices charged to customers or to classes of customers for connection to the licensee's network at such level by the licensee as to reflect the appropriate costs of making such connection to such customers.

3.1. General Principles

Since the connection charge is made up of shared network charges, pro-rated actual costs, shared line costs and dedicated costs less the applicable capital allowance, the methodology to be applied when determining connection charges should be.

- The customer pays for all dedicated costs

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- Dedicated costs will be based on the investment made to meet the customer's capacity requirements, at the minimum technical standards, as stipulated in the Network Code.
- In addition to the dedicated costs, customers will be allocated a standard l/kWh and/or M/kVA contribution based on replacement costs for shared upstream costs, whether strengthening costs are allocated to the customer or not.

3.2. Dedicated vs. Shared Costs

The concept "dedicated" or "shared" is important when deciding how to allocate connection costs. The following table sets out these differences.

Table 1 A – Dedicated and shared assets

Dedicated	Shared
Dedicated usually refers to assets that no other customer can utilize.	Other customers use or will benefit now or in the foreseeable future from the asset being created.
It is unlikely that at the time of connection it will be shared by another supply within a reasonable foreseeable period in the distributor's planning horizon.	It is likely that at the time of connection it will be shared by another supply within a reasonable foreseeable period
Rural networks and urban HV networks (above 33 kV) are considered dedicated.	Except for the service connection and meter, urban MV and LV networks are usually considered shared
Dedicated costs are always allocated to the customer and may be rebated ¹ by the capital allowance.	Shared costs are recovered through the tariff or through shared network charges (SNC).
Dedicated costs later shared must be refunded.	
Costs are fully allocated.	Costs are shared

¹ Rebates shall occur where part of dedicated assets are now shared.

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3.3. Allocating Dedicated Costs

Where equipment installed is dedicated to one customer, and it is unlikely to be shared, the full costs of that equipment is payable and no pro-rating of the equipment cost is done. Therefore, if available capacity is unlikely to be shared, the customer is required to pay full cost, i.e. not pro-rated.

If costs originally considered dedicated are shared, any monthly connection charge (previous and/or new) calculated must be reduced to take into account this sharing.

Actual costs are payable on new assets created for the benefit of one (or more if they all occur at the same time) customer and shared network charges are payable on any assets shared by other customers, for example.

Example 1

A customer is taking supply from an existing MV or HV backbone network, but a portion of MV or HV network has to be built to connect the customer to the backbone network plus a dedicated transformer.

- The customer will pay SNC for the shared backbone MV or HV line, plus actual costs for the portion of MV or HV line that is dedicated.
- The customer will pay actual costs for the transformer and not SNC
- Should the customer upgrade in future, SNC will be payable only on assets not allocated in the original charge.

A customer, therefore, cannot be charged SNC and actual costs for the same part of the installation, for instance.

Example 2

A totally new asset is created such as a new substation and/or new HV or MV network from the substation for a customer.

- The customer will be charged actual costs for the asset and not SNC.

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- If this new asset is considered likely to be shared in the future, then instead of SNC, a prorated allocation of these costs is payable. SNC will not be charged in addition to actual costs.
- However, if the customer upgrades in future, SNC will be payable for the additional capacity.

If due to new capacity being created, upstream strengthening occurs, then according to the above table, this cost is considered shared i.e. other customers benefit/use part of the asset being created, and therefore SNC is payable.

3.4. Allocating Shared Costs

Costs are shared when more than one customer benefit from the provision of network infrastructure. This share may be allocated either through a SNC, a share calculated by pro-rating capacity or a share calculated by allocating common line costs.

3.5. Shared Network Charges – SNC

New customers taking supply, whose requirements obligate licensee to undertake upstream network strengthening investment in order to provide the supply available, run the risk of having to make a substantial contribution towards upstream costs incurred by licensee. This approach is more of a deep connection charge methodology for the customer initiating the investment. Subsequent customers taking new supplies from the same network infrastructure may end up not having to make any contribution towards licensee's costs, i.e. it leads to free riding problems where subsequent connections benefit from using assets for which a previous customer has already paid. This clearly has the result of penalizing some customers unfairly.

A licensee should develop a fair and equitable solution to this problem where a M/kVA, is allocated to all customers taking new supplies, irrespective of whether or not actual upstream strengthening costs are incurred by licensee. This charge should be a national average charge that is revised annually and should be based on the replacement costs of equipment utilized for network construction.

Adopting the above methodology would average the investment costs among all new customers taking supply and connection costs would be calculated based on the supply size required by each new customer. No individual customer receiving a new supply would be unfairly penalized by the timing of the investment taking place. Any investment costs made by licensee that are not recovered from the initial customers taking supply

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who caused the investment to be undertaken would be pooled into the cost base, but will be recovered over time from subsequent new customers at replacement costs when they take supply from the already strengthened network.

The SNC therefore ensures that all customers that require additional capacity make a contribution towards shared networks, irrespective of whether new investment is required or not.

A customer cannot be charged SNC and actual costs for the same part of the installation, i.e. if a network from a substation is totally new, the customer will only pay pro-rated actual costs and not SNC for that part of the installation.

3.6. Sharing Through Prorating of Costs – Based on Capacity

Pro-rating would take place where SNCs are not applicable and where new work is required and this new work is likely to be shared by other customers. Pro-rating would always be based on capacity required. Pro-rating would normally be done for urban supplies, or where the customer takes the largest percentage of the load or where HV work would be required for rural supplies.

3.7. Sharing by Allocating Common Line Costs – Based on Distance

Sharing of common line costs would generally only occur where there are overhead lines. In this method, a customer would pay for the dedicated line costs and when a subsequent customer takes supply any common line between the customers would be shared equally and the connection charge of the original supply would be reduced or refunded.

4. Connection Charges

4.1. Types of Connection Charges – Standard and Premium

Initially, there may be two types of connection charges – standard connection charges (SCC) and premium connection charges (PCC), and the type of connection charge may depend on the investment to be made.

- **Standard Connection Charge (SCC):** This would be where the investment required to connect a customer satisfies a least life cycle cost,

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technically acceptable solution to provide a quality of supply in terms of QOSSS.

- **Premium Connection Charge (PCC):** This would be where the investment required to connect a customer requires additional networks or capacity to be installed at the costs above the least life cycle cost, and where licensee cannot justify the connection at costs above the least life cycle cost, and the investment as a standard supply. Other customers should not have to pay for such investment in the tariffs. The concerned customer must always pay for investment above the least life cycle cost.

4.2. Determination of Monthly Connection Charges

The monthly connection charge consists of two components, namely monthly loan and interest repayment. There are at least four methods to calculate the loan and interest repayment charges. These are the add-on, discount, equal total payment and equal principal payment methods. The first two methods are generally not in use because they result in much higher effective interest rates due to the fact that interest is charged in the principal that is already been paid. The most common in remaining two methods is that the interest is calculated on the outstanding being principal amount. Under the 'Equal Total Payment' method the annual payments from the beginning to the end remain constant while under 'Equal Principal Payment' method the annual principal repayment is the same but the total annual repayment is different due to declining interest charge as it is charged on remaining principal balance.

The 'Equal Principal Payment' method is more suitable for determining the monthly connection charges because it reflects the correct remaining (outstanding) value of the assets and it is consistent with LEA's revenue requirement methodology for capital charges which is based on depreciation (similar to equal principal) and return on net asset value (similar to interest on outstanding principal). It is recommended that the "Equal Principal Payment" method be used to calculate the Monthly Connection Charge.

4.3. Refund of the Initial Connection Charge

The existing connectee(s) will qualify for a refund in the event that new connectees will share (either partly or fully) the existing dedicated infrastructure. The refund will be paid by the utility and will be recovered from:

- All customers if the decision is to pool to connection costs

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- The new connectees if the decision is not to pool the connection costs.

The refund must be based on the Initial Connection Charge (excluding the cost of any premium services), the time value of money, the remaining life of the agreement and then pro-rated to reflect size of the respective connections.

The refund formulae for the initial connection charge (basic calculation) is shown below:

$$RFP_i = ICC_t \times TVM_Factor \times RT_Factor \times Size_Factor$$

Where:

RFP_i = Refund Payment by i^{th} new connectee

ICC_t = Total Initial Connection Charge (sum of Initial Connection Charge of all existing connectees) excluding the cost of premium services and unshared infrastructure

TVM_Factor = The Time Value of Money factor addresses the principle that money received later is worth less than the money received sooner.

$$= \prod_{n=1}^w (1 + R_n) = (1 + R_1) \times (1 + R_2) \times \dots \times (1 + R_w)$$

RT_Factor = The Remaining Time Factor determines the remaining value of the asset given that the assets have already been used
= n/N

$Size_Factor$ = The Size Factor apportions the obligation for refund payment between the new connectees
= kVA_i / kVA_T

The refund payment can therefore be written as:

$$RFP_i = ICC_t \times \prod_{n=1}^w (1 + R_n) \times (N - w)/N \times kVA_i / kVA_T$$

Where,

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RFP_i	=Refund Payment by i^{th} new connectee
ICC_t	=Total Initial Connection Charge (sum of Initial Connection Charge of all existing connectees) excluding the cost of premium services and unshared infrastructure.
R_n	= Utility's Rate of Return (nominal, pre-tax) in month n E.g. 12%/12 (months in year) =1%
ω	= Number of months since the ICC_t payment was made
N	= Total period of the connection Agreement (in number of months)
kVA_i	= kVA requested by i^{th} new connectee
kVA_T	=Total kVA for all customers connected to shared infrastructure

The refund to the existing connectee(s) will be the sum of all the RFP_i 's of all new connectees. If there is more than one existing connectee then the refund will be shared in the same ratio as their Initial Connection Charge contributions.

4.4. The Capital Allowance

The capital allowance would be equivalent to the amount of capital recovered over a period of time through the tariff rates. The capital contribution payable by the customer for the cost of providing new or additional equipment would be reduced by the capital allowance to ensure that licensee does not recover the cost twice, i.e. through the tariff and through the connection charge.

The capital allowance would be subtracted from the allocated costs in order to calculate the standard connection charge that would be required from the customer. The capital allowance is the maximum allowance given. Where the allocated costs are less than the capital allowance value, no further allowance may be given, except when sharing common line costs.

The capital allowance for rural networks would be split into a capacity allowance and a line allowance due to distance being a significant component of costs in rural networks and the capital allowance for most tariffs would be largely subsidized.

4.5. Financing of Connection Charges

Licensee may provide financing for that portion of the connection charge that is not paid up front subject to associated risk. The initial connection charge must be calculated based on the utility's financial security position and such charges will be approved by the Authority. Such financing will always be subjected to the availability of funds and will be recovered from customers as MCC payable over a period not exceeding the expected average economic life-span of the assets. Customers may be required to provide guarantees where large investments occur and where licensee provides financing.

5. Allocation of Costs

5.1. Allocation of Costs for a Basic Connection for Smaller Customers

A basic connection would be a connection for smaller customers with the minimum investment required.

The basic connection would therefore be defined as a single-phase 60Amp and 20Amp for both urban and rural supply, respectively, with up to 50 metres of underground cable or an equivalent allowance for overhead conductor. The connection will always be designed to meet the customer needs irrespective of where a person lives.

The connection charge for the basic connection would be the standard connection fee and no other costs would be allocated for individual supplies. Urban developments and subdivisions would not be considered as basic connections.

5.2. Allocation of Costs for Standards Supplies

A standard supply will always be the least life cycle cost investment, minimum standard technology required to provide an adequate supply and to comply with Quality of Supply and Service Standards (QOSSS). Licensee, with LEA's approval, reserves the right to determine the technical standard.

For each new point of supply that is not a basic connection, or changes to a point of supply, the relevant costs allocated would be based on the methodology to be applied.

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5.3. Allocation of Costs for Premium Supplies

Actual costs would be allocated to all premium connections. However, SNCs can be used as a proxy for upstream premium costs if a premium supply is required on the upstream assets and the actual costs are not known.

Definitions

Additional Capacity

Additional Capacity is the additional amount of power rated in kVA or kW that a customer adds to the existing notified maximum demand.

Allocated Costs.

All costs allocated as the cost of providing the capacity a customer requires, including where applicable, dedicated new costs, pro-rated new costs, shared network costs and shared line costs.

Available Capacity

Available capacity (for pro-rating calculation purposes) is the maximum limit of upstream network capacity at which point system strengthening is generally undertaken. This is not the maximum technical limit of the network and can also be referred to as the Economic Capacity.

Capital Allowance

The capital allowance is the contribution to shared or dedicated assets paid through future tariff rates – i.e. average capital costs recovered over time through the tariff rates. The capital contribution payable for the cost of providing new equipment is offset by the capital allowance.

Capital Charges

Capital charges encompass charges raised through tariff rates, connection fees, monthly network connection charges (Standard Connection Charge and Premium Connection Charge) and up-front contribution towards the cost of providing or upgrading a supply of electricity.

Charging Parameters

The component or unit used to charge a customer through a tariff. Typical charging parameters could be l/kWh, M/kVA and M/customer.

Connection Fee

The minimum up-front standard fee payable by the customer for the cost of a new connection.

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Connection Charge

Charge recouped from the customer for the cost of providing new or additional capacity (irrespective of whether new investment is required or not). This is recovered in addition to the tariff charges as an up-front payment or as a monthly charge where the distributor finances the connection.

Consumption

The energy used by a customer during a specific period, measured in kWh.

Conversion Fee

The minimum up-front contribution payable when there are tariff changes, meter changes, changes in installation or when a supply point is shifted.

Dedicated Supply/Costs

A network or a portion of network is dedicated when the connection asset is specific to the user and does not form part of the connection to any other user and it is unlikely that it will be shared by another user within a reasonable foreseeable period.

HV (High Voltage) Network

Nominal voltage levels equal or greater than 33 kV up to and including 132 kV.

Irrecoverable Costs

Costs for labour, transport, dismantling, installations and equipment that cannot be re-used.

Guarantee for Irrecoverable Costs (GIC)

A Guarantee for Irrecoverable Costs is a guarantee provided by the customer to cover the value of the total irrecoverable and dismantling costs where it is believed there is risk to the distributor.

LV (Low voltage) Network

Nominal voltage levels up to and including but not exceeding 400 V

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Maximum Demand

The highest averaged demand measured in kVA or kW, during any integrating period within a designated billing period (usually one month).

Monthly Connection Charge

A monthly connection charge is a monthly repayment of the required capital contribution where licensee provides a customer with financing. A monthly connection charge may be a SCC or a PCC.

MV (Medium voltage) Network

Nominal voltage levels greater than 400V and less than 33kV.

Network Charges (NC)

Charges designed to recover costs (including capital operations, maintenance and refurbishment) associated with the provision of network capacity required by and reserved for the customer.

Premise or Point of Delivery (POD)

The premise or POD is either a single POS or a grouping of POS located at the same electrical substation, for one customer at the same voltage and same tariff and can be a metering or summation point.

Point of Supply (POS)

A point of supply or POS is a physical point on the electrical network where electricity is delivered to a customer.

Premium Connection Charge (PCC)

The PCC is a monthly repayment of the required capital contribution where a licensee provides a customer with financing, for any above standard supply costs. The calculation of the PCC is based on a repayment period not exceeding a maximum of 25 years at a given interest rate (see also SCC). No consumption or demand based rebates are given on PCCs.

Premium Supply

Where the customer's requirements exceed the specifications of a standard supply.

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Project Costs

Project costs are the total estimated costs for new capital investment, including application shared network charges (SNC).

Pro-rating of costs

Where costs are apportioned based on capacity required/capacity available

Recoverable Work

Work performed not for the purpose of establishing a new connection or enhancement – e.g. the shifting of a line. The cost of this work is always recovered up front from a customer or where a third party is liable for the cost of such work i.e. it is never pooled in to the tariff rates. This could typically arise where licensee acts as a contractor.

Reticulation

The reticulation network performs the function of transporting and dispatching power from the distribution network to the point on the network where the service connection is made. This is usually done at voltages of 22kV or lower.

Rural Tariffs/Areas

Refers to all areas that are sparsely populated and not defined as urban.

Service Connections

The service connection consists of the equipment connecting the customer to the reticulation network. This usually includes the switchgear, cables/lines and metering.

Sharing of Line Costs

Sharing of line costs occurs when a line originally dedicated, is later shared by other customers. Due to sharing, the original SCC may be reduced and the new customer(s) be required to contribute to any sharing of line. Sharing of line costs will only occur for rural tariffs and is based on distance (not capacity as in the case of pro-rating).

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Shared Network Charges (SNC)

These are national average charges raised outside the tariff rates for the shared costs of networks (line and capacity). These charges are applicable to urban and rural tariffs and are used to calculate the capital contribution payable by the customer for shared costs.

Standard Connection Charge (SCC)

The standard connection charge or SCC is a monthly repayment of a capital contribution where licensee provides a customer with financing and is payable for a standard supply only. The calculation of the SCC is based on a repayment period not exceeding a maximum of 25 years at a given interest rate (see also PCC). Consumption and demand-based rebates are not applicable on SCCs.

Standard Supply

A standard supply is defined as the lowest life-cycle costs design that meets the specifications in terms of Quality of Supply and Service Standard (QOSSS) and the Power Quality directives for a technically acceptable solution.

Standby Supply

Capacity supplied by licensee for a customer's partial supply to meet the possible demand that a self-generator could request from licensee, due to an outage of the customer's generating equipment.

Tariff

Combination of monthly charges each at a particular rate that is usually escalated annually and is applied to recover measured quantities such as consumption and capacity costs and unmeasured quantities such as service costs.

Temporary supply

A supply to a customer that is of a temporary nature.

Urban Tariffs/Areas

Areas that are densely populated proclaimed residential areas or areas designated by licensee to be Urban.

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Up-front Contribution

A once-off, generally, non-refundable cash payment for costs covered by tariff charges.

Upstream Strengthening

Upstream strengthening occurs where due to the provision of new capacity; investment is made on upstream networks located before a customer's POD or POS.