

Wheeling Discussion Paper

A guide for municipal electricity distributors

March 2020

Background

South Africa has a regulated electricity supply market dominated by a central state utility that dominates generation, transmission and a significant share of distribution. Large public sector distribution utilities are however established in the major cities and in many secondary cities and towns. Many factors are challenging this structure and sources of generation outside of the state utility Eskom are attractive (to municipalities and the private sector) for economic, energy security and environmental reasons.

The electricity sector regulatory framework has been in a state of flux since the publication of the Energy White Paper in 1998. The framework for private sector participation was created with the enactment of the Electricity Regulation Act, 2006 (ERA) – in line with the White Paper. However, a 2007 cabinet decision designated Eskom as the Single Buyer of new generation and the 2011 Electricity regulation on New Generation replaced the market concept for renewable power development in favour of an IPP Procurement Programme.

The IPP program has brought new entrants to the generation space. These are utility scale projects and rely on the centralised procurement process to come into being. This process is both highly programmatic and political and requires a literal “ministerial determination” for capacity to be built. The right of municipal utilities to be an off-taker of an IPP was confirmed by the President in the State of the Nation Address (2020). However, many municipalities may not be in a financial position to guarantee such power purchase agreements.

An alternative mechanism for IPP generation of renewable energy is through the wheeling of power between IPP generators and customers that is supported by wheeling agreements that stipulate the terms under which the power can be wheeled across a distribution network or networks.

Wheeling is the delivery of electricity generated by a private operator in one location to a buyer or off-taker in another location via a third party network (Eskom or municipality).

Why wheel?

There is an ongoing debate as to the exact role/function of wheeling: is a 3rd party trader of power purely a middleman, or could they be seen as aggregators that pool small generation capacity, particularly renewable power, into an economically valuable proposition? Local government (and their distribution utilities) increasingly seems to have reason to publish wheeling tariff structures and enter into wheeling agreements with third parties:

1. A number of the larger metros have made commitments to be carbon neutral by 2050 which would almost certainly require them to enable/encourage alternative sources of renewable electricity.
2. Given emerging technology disruptions, most utilities recognise the need to move from an energy units based business model to selling grid services. Setting a wheeling tariff framework is a first step in this direction.

3. Linked to the above, larger distribution utilities are increasingly seeing their future in effective load and demand management. Wheeling of *embedded* generation offers an important opportunity here and reduces costly transmissions costs.
4. Supply disruptions have been a feature of the system since 2013 and 3rd party supply enhances security.
5. Rural and secondary local municipalities can have districts that are very expensive to supply (marginal cost of additional capacity) with grid electricity from Eskom injection points and wheeled power from local generation sources may offer a cheaper alternative.

The Regulatory Framework

The ERA¹ establishes a national regulatory framework for the electricity supply industry. The objectives of this Act which can apply to wheeling are:

- (c) facilitate investment in the electricity supply industry;
- (e) to promote the use of diverse energy and energy efficiency
- (f) to promote competitiveness and customer/end-user choice
- (g) facilitate a fair balance between the interests of customers and end users, licensees, investors in the electricity supply industry and the public.

Further policy instruments that address wheeling are:

- The Regulatory rules on network charges for Third Party Transportation of Energy². These clearly articulated the objective of non-discriminatory grid access: “Any load customer shall be free to go into bilateral arrangements with any third-party generator, i.e. non-Municipal and non-Eskom generator” (clause 6.7).
- The Grid Code³, section 4.2.1 (1) which states “The Distributor shall make capacity available on its networks and provide open non-discriminatory access for the use of this capacity to all South African Customers (loads), and Embedded Generators. In exchange for this service, the Distributor is entitled to a fair compensation through electricity tariffs.”
- The Electricity Pricing Policy (EPP)⁴, clause 2.6 which states “Network (transmission and distribution) owners have an obligation to allow customers access to and use of their networks, provided that the customers are not in arrears in paying all the relevant charges as approved by NERSA from time to time and that such access would not violate any technical and safety requirements as set out in the relevant grid codes license conditions and tariff schedules.

The regulatory framework makes it clear that Licensed Distributors may not refuse to enter into wheeling agreements provided the network access would not violate any technical and safety requirements as set out in the relevant grid codes license conditions and tariff schedules.

¹ Available online:

<http://www.energy.gov.za/files/policies/ELECTRICITY%20REGULATION%20ACT%204%20OF%202006.pdf>

² NERSA (2012). Available online: http://www.cityenergy.org.za/uploads/resource_451.pdf

³ South African Distribution Code, Version 6, “Grid Code”. Available online:

<http://www.eskom.co.za/CustomerCare/TariffsAndCharges/Documents/RSA%20Distribution%20Tariff%20Code%20Vers%206.pdf>

⁴ Department of Minerals and Energy (2008). Available online:

http://www.eskom.co.za/CustomerCare/TariffsAndCharges/Documents/18671_not13981.pdf

Contractual Parties to a Wheeling Agreement

The information for this chapter was sourced from SAIPPA (2019)⁵

Since this discussion paper is aimed at supporting municipal electricity distributors, the wheeling situation is where the customer (off-taker) is within a municipality's distribution area.

Scenario 1: non-Eskom generator feeds into Eskom's transmission network.

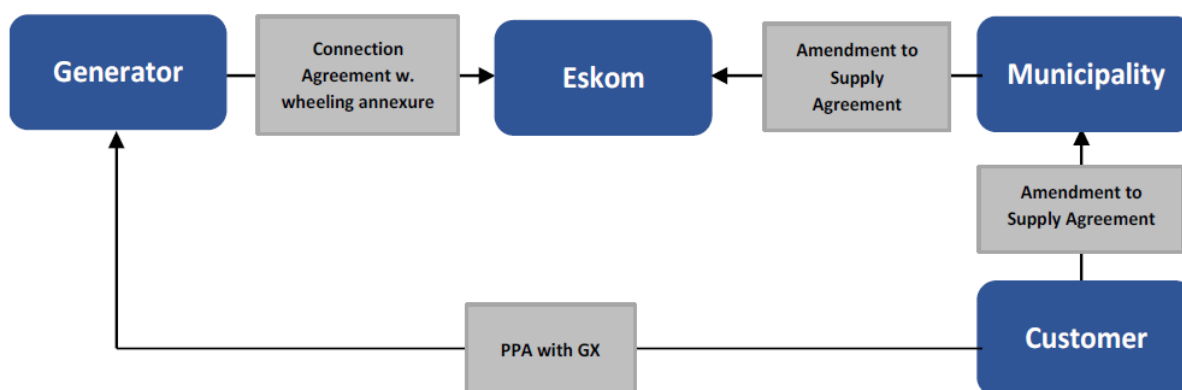


Figure 1: Contractual parties to a 'Scenario 1' wheeling agreement

The applicable contractual agreements are:

- Customer signs PPA with Generator
- Generator signs Connection/Use-of-System Agreement with Eskom, with a wheeling annexure.
- Electricity Supply Agreement (ESA) between Municipality and Eskom amended to reflect delivery of private power
- Electricity Supply Agreement between Customer and Municipality amended to reflect delivery of private power and a reconciliation agreement

Scenario 2: non-Eskom generator feeds into the municipality's distribution network (same municipality as the customer).

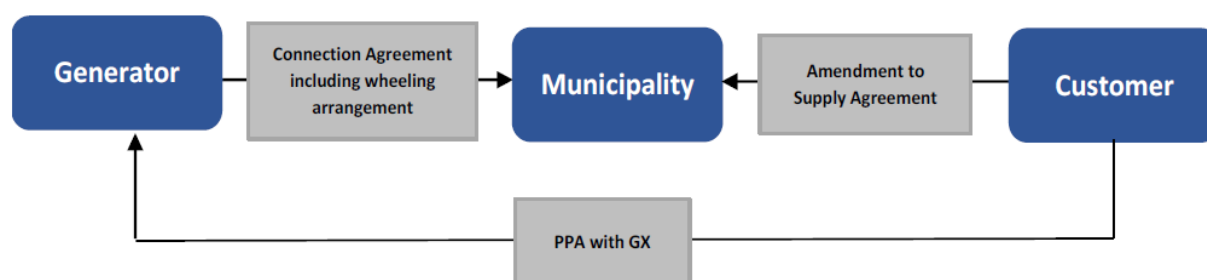


Figure 2: Contractual parties to a 'Scenario 2' wheeling agreement

The applicable contractual agreements are:

- Customer signs PPA with Generator

⁵ SAIPPA. 2019. *Legal Framework and Wheeling of Electricity*

- Generator signs Connection/Use-of-System Agreement with municipality, with a wheeling annexure.
- Electricity Supply Agreement (ESA) between Customer and Municipality amended to reflect delivery of private power and a reconciliation agreement

Standardising ESA amendments and Use-of-System Agreements – similar to the AMEU-SALGA resource pack for small-scale embedded generation⁶ – would reduce the administrative burden of entering into wheeling agreements. The development of these would aid the orderly proliferation of third-party grid users.

Tariff Construction

An important departure point when constructing a wheeling tariff is to decide whether the tariffs will be based on actual point-to-point costs or the alternative which is average costs. Industry experts have emphasised that calculating point-to-point costs is an arduous and impractical to perform on a case-by-case basis for each customer that decides to wheel. It is therefore recommended that distributors accept the wheeled energy onto their grids and distribute it in the same manner as they would with Eskom's energy. In effect, wheeling transactions are an accounting practice and the electrons do not need to follow the same path as the money. This points to the use of average costs, rather than point-to-point costs.

Contrasting interpretations of the regulatory framework have led to different approaches to constructing wheeling tariffs. The two approaches reviewed are the cost-neutral approach and the revenue-neutral approach.

Cost Neutral Wheeling Tariffs

Clause 2.6 of the EPP states: *"...The full cost to operate the networks should be reflected in the various connection and use of system charges. In other words, no additional charges are needed to facilitate the wheeling of electricity between two parties unless such wheeling would result in incremental charges."*

Based on this statement, municipalities should unbundle their tariffs into the associated cost-reflective tariff elements and charge a wheeling tariff which recovers the costs associated with wheeling. Additionally, the EPP states that a fair return on the capital employed is necessary, so municipalities may add a reasonable margin onto these costs.

Cost-neutral wheeling tariffs, or tariffs that cover the cost of using the network, are required by legislation. However, the calculation of cost-neutral wheeling tariffs require an understanding of the costs involved with maintaining a distribution network – these are determined through a cost of supply study. Distributors are mandated by the EPP to perform cost of supply studies every 5 years to inform their tariff determinations. However, very few municipalities have up-to-date cost of supply studies, and even fewer have their cost of supply studies accepted by NERSA.

As a result, municipalities have developed revenue neutral wheeling tariffs.

Revenue Neutral Wheeling Tariffs

South Africa's electricity distribution industry (EDI) is a regulated industry. The current regulation model is a Cost Plus model whereby licensees' allowable revenues are regulated to cover the full cost of activities plus a reasonable margin (ERA, 2006). This approach functions well under most circumstances. However, when there is a major discrepancy between asset values used for

⁶ <https://www.sseg.org.za/category/ameu-salga-resource-pack/>.

regulatory tariff setting and new asset values, it creates a potential funding shortfall when new assets are introduced. South Africa finds itself in this situation which has been brought about by many years of surplus capacity resulting in low levels of investments and highly depreciated assets, coupled with relatively high inflation (EPP, 2008)

As a result, in order to provide non-discriminatory access to the network and to allow for wheeling, network operators have devised the revenue-neutral approach. The premise of the revenue-neutral approach is that only wholesale energy charges are avoided in a wheeling transaction. This approach ensures that wheeling does not reduce a customer’s contribution to the municipal subsidies, surpluses, network charges, and even the inefficiencies which are inherent in our context of the Cost Plus accounting model.

Proponents of revenue neutral wheeling tariffs have explained that municipalities are regulated entities with regulated revenue requirements. This implies that a wheeling tariff which is *not* revenue-neutral is a discrimination against customers who do not enter into wheeling agreements, since they will have to pick up these costs.

In the absence of unbundled costs, municipal distributors can still enter into ‘fair’ wheeling agreements by utilising the revenue-neutral approach.

The figure below illustrates the difference between revenue-neutral and cost-neutral wheeling tariffs.

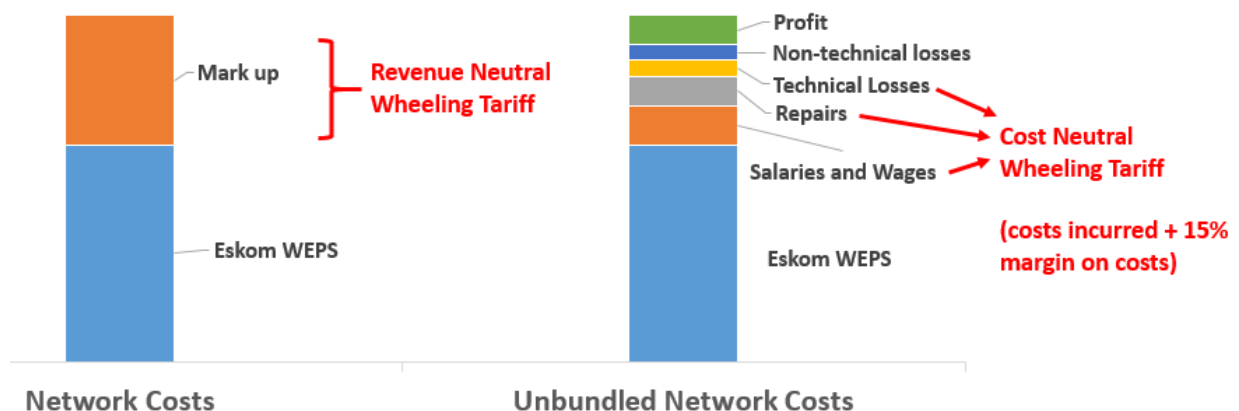


Figure 3: Revenue-neutral vs cost-neutral wheeling tariffs

The urgency to move towards cost-neutral wheeling tariffs

It is recognised internationally that cost reflective tariffs are the best price signal. Whenever deviations from cost are applied as a measure to achieve a specific objective the economic signal would be distorted which could in turn lead to inefficient allocation of resources in the economy (EPP, 2008).

Implementing cost neutral wheeling tariffs requires a thorough understanding of the cost-drivers of the distribution network. Cost neutral wheeling tariffs are the desired and required outcome and accurate costing is the foundation for any good business. For the sake of our economy and society, municipalities are strongly encouraged to do everything in their powers to perform detailed cost of supply studies. There is an urgency for the EDI to apply cost reflective tariffs, this should be regulated with strict time frames.

The Practicalities of Implementing Wheeling Tariffs

In the absence of unbundled costs, municipal distributors can still enter into ‘fair’ wheeling agreements by utilising the revenue-neutral approach. The foundation of this approach is to protect municipal revenue since this is considered “the *full cost of operating the network*” as required by the EPP.

The municipality’s billing process for a revenue-neutral wheeling agreement can be simplified into the following three steps:

1. The customer is charged in full (as usual) for all energy consumed
2. The customer is credited for wheeled energy to the value of avoided purchases i.e. Eskom purchase costs less distribution technical losses
3. The customer is charged an additional administration charge to cover the cost of the wheeling transaction

If the generator is located on Eskom’s transmission network (scenario 1 in the previous chapter) then Eskom will meter the amount of electricity generated. At the end of each month, Eskom will credit the municipality to the value of the generated electricity less transmission losses at Eskom Megaflex Time-of-Use tariffs. The municipality then credits the customer this amount less distribution losses.

If the generator is located within the municipality’s distribution network (scenario 2 in the previous chapter) then the municipality will need to meter the amount of electricity generated on a TOU meter. At the end of each month, the municipality credits the customer to the value of the avoided purchases for this wheeled energy at Eskom Megaflex Time-of-Use tariffs. The municipality then credits the customer this amount less distribution losses.

A consensus has not been reached on how wheeling tariffs should be constructed. This is a grey area and strong guidance is required from NERSA and National Treasury. In the absence of national legislation, it is expected that these issues will be resolved through litigation.

Case Studies

This chapter reviews two case studies where developments in the wheeling space are apparent.

City of Cape Town: An emerging distribution retail market

The City of Cape Town is developing a wheeling framework. The framework proposed by the City is based on the concept that wheeled energy is a precursor to a liberalized energy market and the model begins to create a parallel market environment. The framework is designed to facilitate renewable energy and stop customer arbitrage or cost shifting of subsidies/surcharges.

The City’s framework is based on the premise that the only costs that are avoided in a wheeling transaction are the energy costs. In effect, wheeling is only viable when the trader can provide energy at a lower price than WEPS.

The proposed model compares the wheeled energy into the distribution grid with the wheeling customer’s consumption on a half-hourly basis – a move towards real-time pricing. The tariffs and proposed operating model are as follows:

- The customer pays a UOS charge for each kWh consumed, regardless of it being supplied by Eskom or the trader. The UOS charge is the same as for a non-wheeling customer i.e. retail tariff minus WEPS.
- For each kWh of municipal energy consumed – when more energy is consumed by the customer than wheeled by the trader in a half-hourly period – the customer pays the regulated municipal price for that energy
- For each kWh of energy that is not consumed – when less energy is consumed by the customer than wheeled by the trader in a half-hourly period – the customer is credited a feed-in tariff, the value of these have not been confirmed (the proposed value of FIT is the lesser of WEPS or latest REIPPP bid price minus green benefit)

Therefore, all transactions are between the municipality and the customer. This proposal requires a large number of calculations and requires advanced metering infrastructure, which should develop alongside with smart grid initiatives. There will be extensive testing and pilot phase of this model within municipal operations before opening to customers.

PowerX and Nelson Mandela Bay Metropolitan Municipality

All information for this case study was extracted from SAWEA⁷.

PowerX is a licensed electricity trader in South Africa, of energy generated from clean sources including RE and Gas fired plant. Several companies are investigating the opportunity to enter into bilateral supply transactions with IPPs. However, besides PowerX, there are no publicly reported “wheeling” transactions, that can be easily identified in South Africa.

PowerX’s customers are currently all in Nelson Mandela Bay (NMB). They sell mainly to commercial/industrial customers which include (amongst others): grocery stores, shopping centres, fast food franchises, manufacturers, light industrial, automotive, hotels and golf courses.

PowerX procures energy from a variety of generators – Bethlehem Hydro, Electrawind, Genergy, Emergent, FedGroup, Darling Wind Farm, co-generators (e.g. TSB Sugar, Umfolozi Sugar) as well as numerous small rooftop PV installations within NMB. PowerX procure energy from generators and on sell this energy to consumers in NMB. For the use of their distribution network, PowerX pays a Use of Systems fee to NMB. Similarly, PowerX also pays a wheeling fee to Eskom for use of their distribution network. The wheeling charge varies depending on who the end-customer is i.e. the wheeling charge for post-paid customers is different to the wheeling charge for pre-paid customers.

NMB customers only pay for the energy consumed when contracting with PowerX. All other costs that are ordinarily applicable to NMB customers would still be charged. The monthly account from the Municipality therefore includes all the existing charges; however, with one additional line item, which is a kWh “offset” on green energy. PowerX then send the customer a separate invoice for the same amount of kWh that has been ‘offset’ on the NMB invoice. In the case of NMB, the same company manages the settlements and metering for both NMB and PowerX, which proves efficient.

PowerX’s customers will displace energy from NMB, who will lose out on this margin. PowerX have confirmed that they have negotiated different wheeling charges with NMB and Eskom – which theoretically should cover the loss of this margin.

NERSA’s reason for decision on PowerX’s licensing applications notes: “The NMBM does not charge wheeling price to energy generated within its boundaries. Energy generated outside the municipal

⁷Decentralised Generation Study. 2019. SAWEA. Available online: https://sawea.org.za/wp-content/uploads/2019/01/20190128_SAWEA_DG_Final-Report.pdf

boundaries (external generation) are charged at 7% of the product of the NMBM price and the total kilowatt-hour (kWh) of commercial energy supplied to PowerX”.

Steps to take to welcome wheeling

Many metro utility vision/strategy processes now view wheeling as a key element in a ‘basket’ of energy supply and load management options. At the same time, a second Energy Trader (EnergyXchange) has been licensed by the Regulator and, along with PowerX, these companies are pushing – due to growing demand in the generator and off-taker sectors – to develop trading agreements. It is clear that municipalities are under pressure to respond, and allowing wheeling is encouraged as a first move towards separating the “energy business” from the “wires business”.

Municipalities are encouraged to take a stepwise approach, and to learn through pilots. Municipalities should be especially aware of the risk of long term wheeling agreements. These may leave municipalities bound to expensive electricity purchase obligations, especially when contracts are bound to CPI increases rather than being linked to Eskom’s wholesale electricity pricing structure (WEPS).

The following steps are proposed to welcome wheeling in a municipal electricity utility:

- 1. Develop a Wheeling Framework**
- 2. Develop a Wheeling Tariff that ensure municipal revenue is reasonably protected**
- 3. Develop the legal capacity to evaluate and agree on a reasonable Use of Systems Agreement**

Sustainable Energy Africa, 2020

