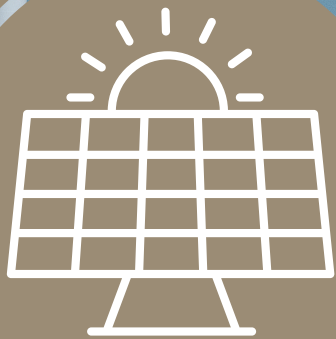


Virtual *Wheeling* Platform



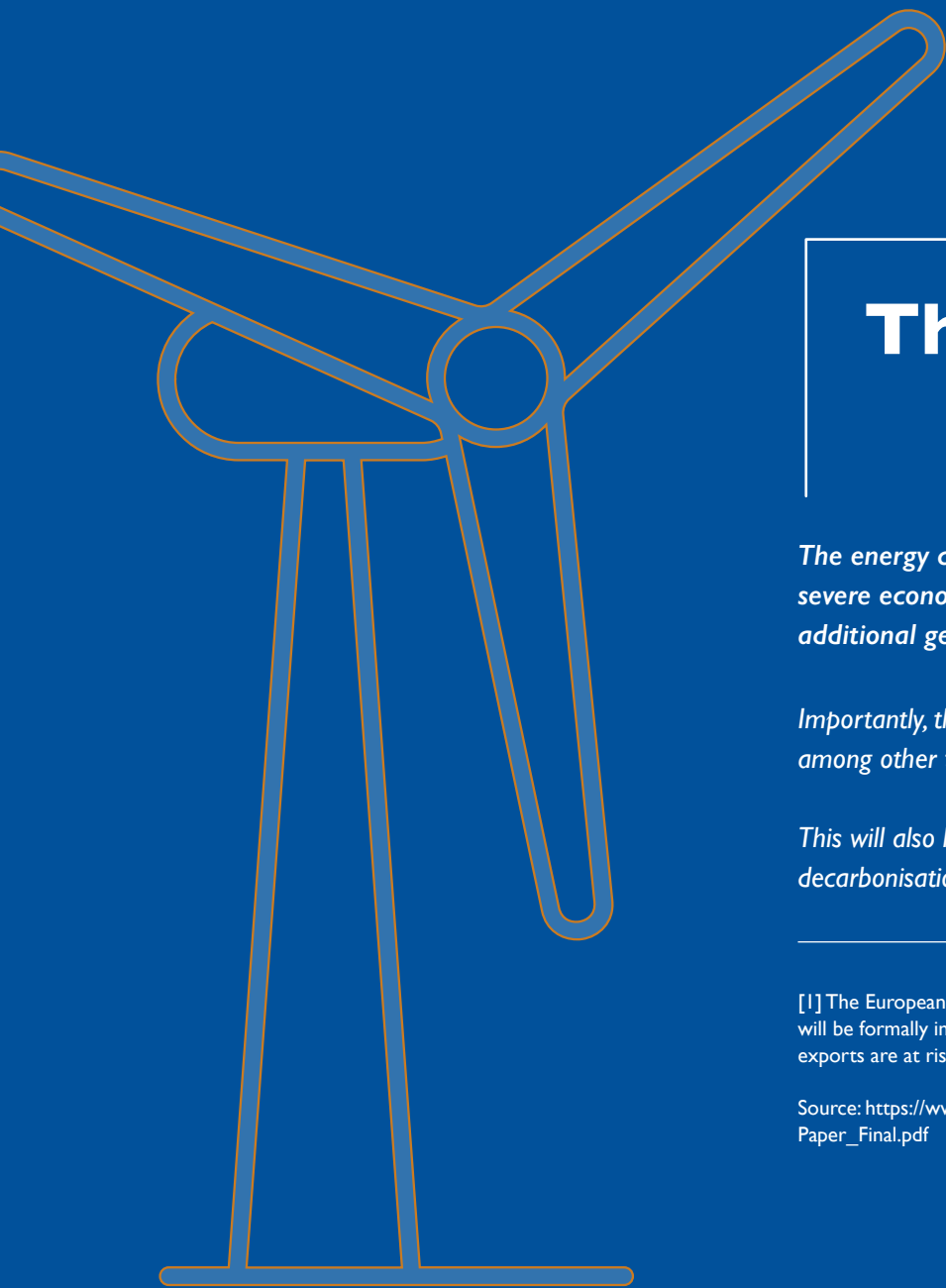
This document is an introduction to the principles of virtual wheeling and how a Virtual Wheeling Platform brings together the infrastructure, financial incentives and governance framework required to enable private sector investment in new energy generation capacity in South Africa.



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*For more information
on the Eskom Virtual Wheeling
policy, please refer to the
Eskom website
www.eskom.co.za/tariffs*

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The *problem*

The energy crisis in South Africa, where the supply of electricity is insufficient to meet demand, has severe economic and social impacts. As part of the solution, wheeling has been identified as an enabler of additional generation through bi-lateral trade between private parties.

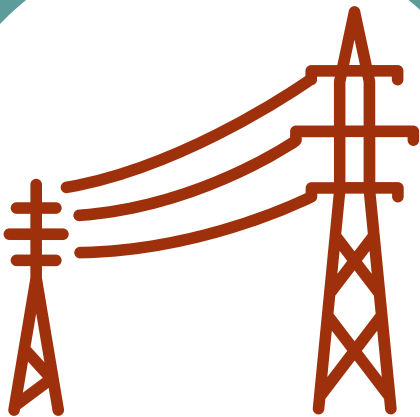
Importantly, the 2023 budget speech noted that the implementation of a wheeling framework will, among other things, “provide certainty to private producers investing in energy projects”.

This will also help address enterprise environmental, social, and governance (ESG) ambitions which are aligned to decarbonisation and will help reduce carbon taxes with trading partners¹.

[1] The European Union (EU) accounts for almost 20% of SA total exports. The EU's Carbon Border Adjustment Mechanism (CBAM), which will be formally implemented in 2026, is a carbon border tax on carbon-intensive products imported into the EU. Approximately \$1.5B of SA exports are at risk.

Source: https://www.energypartnership.org.za/fileadmin/user_upload/southafrica/media_elements/EP_Carbon_Discussion_Paper_Final.pdf

Introduction to *Wheeling*



The Energy Action Plan² outlined by the Presidency in July 2022 is the government's plan to address load shedding and achieve energy security through short- and longer-term interventions. Removing the generation licensing threshold is one such measure and will accelerate the entry of Independent Power Producers (IPPs). This change to the legislation offers a feasible mechanism towards ending load shedding in the short to medium term. The transmission and distribution network, "the grid", is the crucial link between supply and demand of electricity between sellers and buyers.

[2] <https://www.thepresidency.gov.za/speeches/address-president-cyril-ramaphosa-actions-address-electricity-crisis%2C-union-buildings%2C-tshwane>

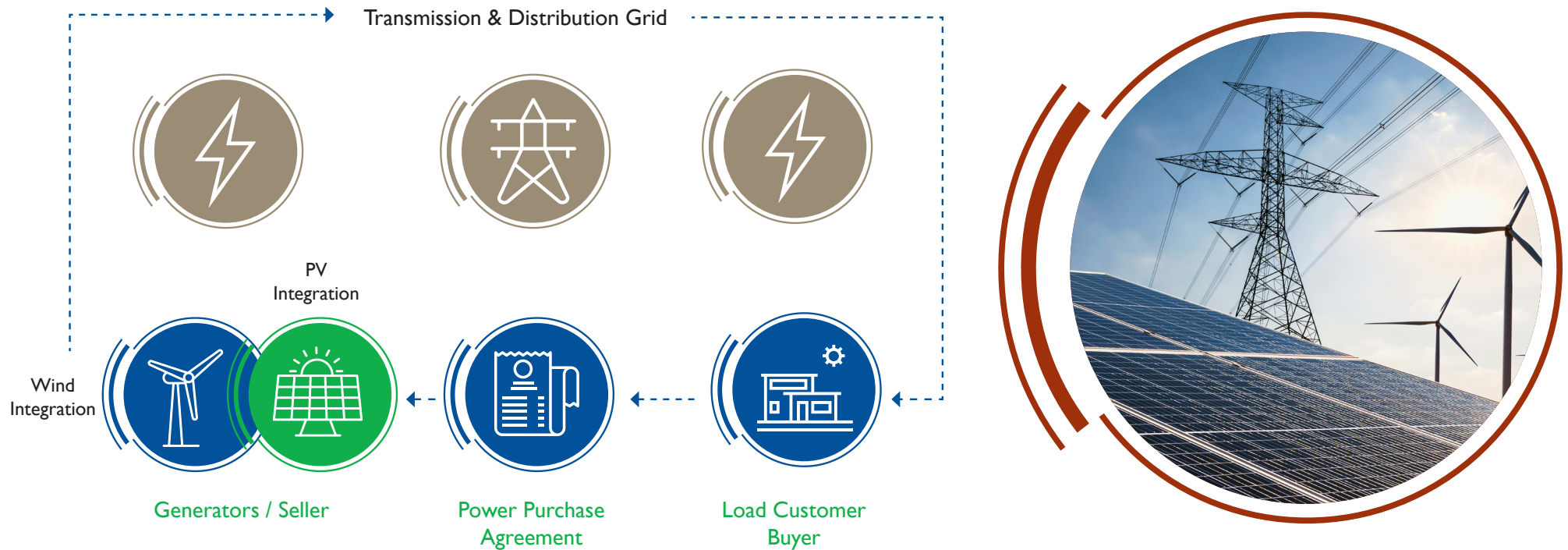


Figure I – Traditional third-party wheeling of electricity

Third-party wheeling is a common practice across the world and was introduced by Eskom in 2008 and subsequently also by a few local Municipalities. In South Africa, third-party wheeling has traditionally been between larger generators and buyers of electricity connected at medium and high voltages (higher than 1kV). Under this approach, there is a direct relationship between the generator and the buyer, and the wheeled energy credit is processed on the customer bill for the electricity delivered but not supplied by the Licensee (Eskom).

Traditional third-party wheeling however, requires an amendment to the Electricity Supply Agreement (ESA) between the Buyer and Eskom for Eskom connected off-takers. However, where offtake of wheeled energy occurs within a municipality, the ESA between municipalities and Eskom also requires amendment. These pre-conditions have resulted in a limited uptake, thus third-party wheeling has largely been restricted to larger Eskom-connected buyers.

In addition, there are now increasing requests to be able to allow third-party wheeling to low and medium voltage industry stakeholders.

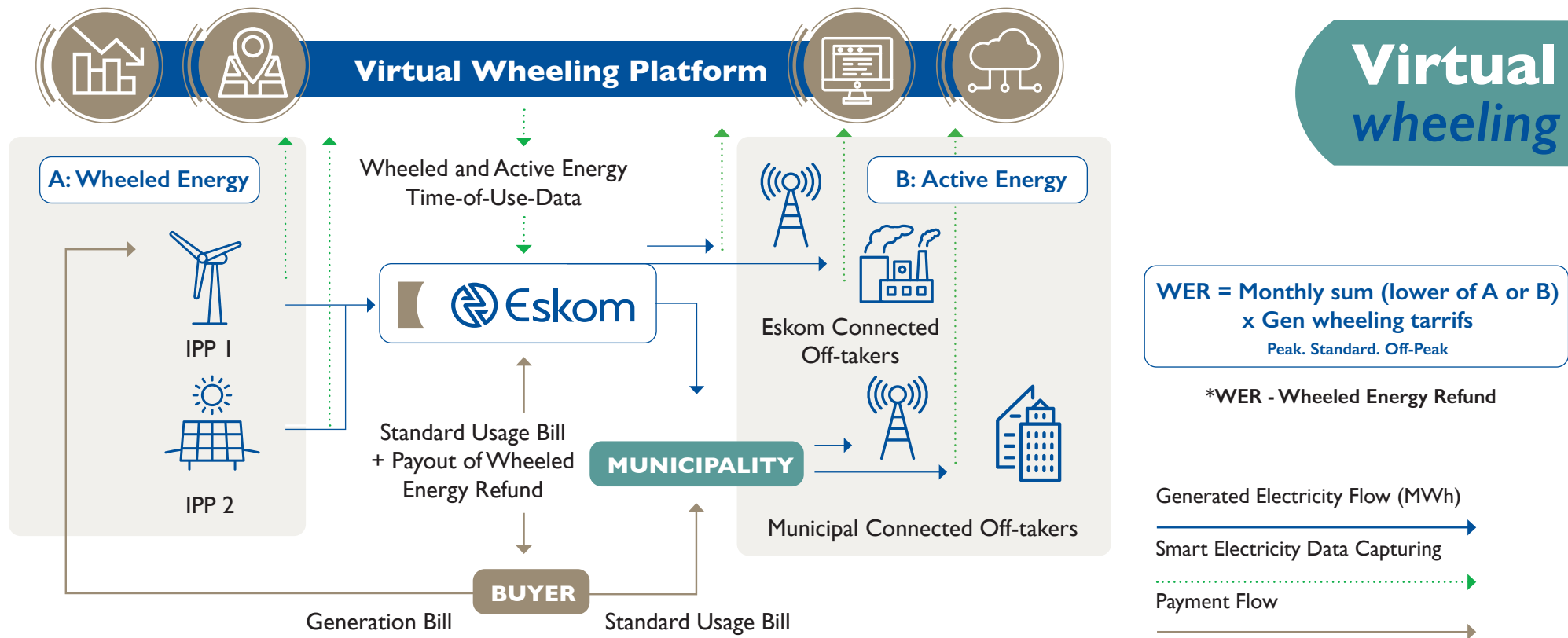


Fig.2. High level schematic of the Virtual Wheeling Platform design.

To accommodate this demand, traditional third-party wheeling needs to evolve and a concept called virtual wheeling is under development by Eskom. Virtual wheeling will connect buyers that have multiple off-take sites (including those behind municipal boundaries) to generators, via the Eskom or Municipal grids.

This would require processes to be set up to enable virtual wheeling and the development of digital platforms to automate the virtual wheeling. Figure 2 above gives an overview of what such a platform would entail.

The VWP is a digital tool used to collect, aggregate, process, and report TOU data for both energy generation and consumption. This is necessary for Eskom to calculate the buyer's wheeled energy refund (not a credit as with traditional wheeling).

The VWP will provide a control tower view across the wheeling transactions and the respective wheeling activities from the IPP generation and the load off-takers, namely the Municipal connected and Eskom direct connected end users.

A critical component of the platform is the ability to aggregate generation and consumption data - across the footprint of the buyer - into the Eskom TOU periods (standard, peak, and off-peak) in hourly intervals. These datasets are provided via an application programming interface (API) to the Eskom system in a format prescribed by Eskom and inform the wheeled energy refund process.

The TOU data for both offtakers and generators must be provided using Eskom approved meters³ that are compliant with SANS requirements⁴.

This would include municipal connected off-takers and, therefore smart meters are required to be installed by the buyer so that the municipal meter is not impacted or interfered with. Data from the meters is integrated into the VWP based on Eskom requirements. This will give the buyer and Eskom a view of energy consumption and generation data across different levels of the business, e.g. national, local, and hyperlocal. This can inform management decision-making and planning regarding rational use, energy efficiency optimisation, and asset management etc. All VWP data will be auditable.

The figure below (Figure 3) provides a high-level example of a virtual wheeling architecture needed to support the collection, aggregation and rendering of data from the supply and demand side. The data, for example, could be collected via cloud-to-cloud integration on the supply side and be managed within a cloud hosted secure repository that presents data against TOU requirements into the Eskom's system.

This will then be used by Eskom to process the refund, plus provides dashboards to inform other business and administrative decision-making.

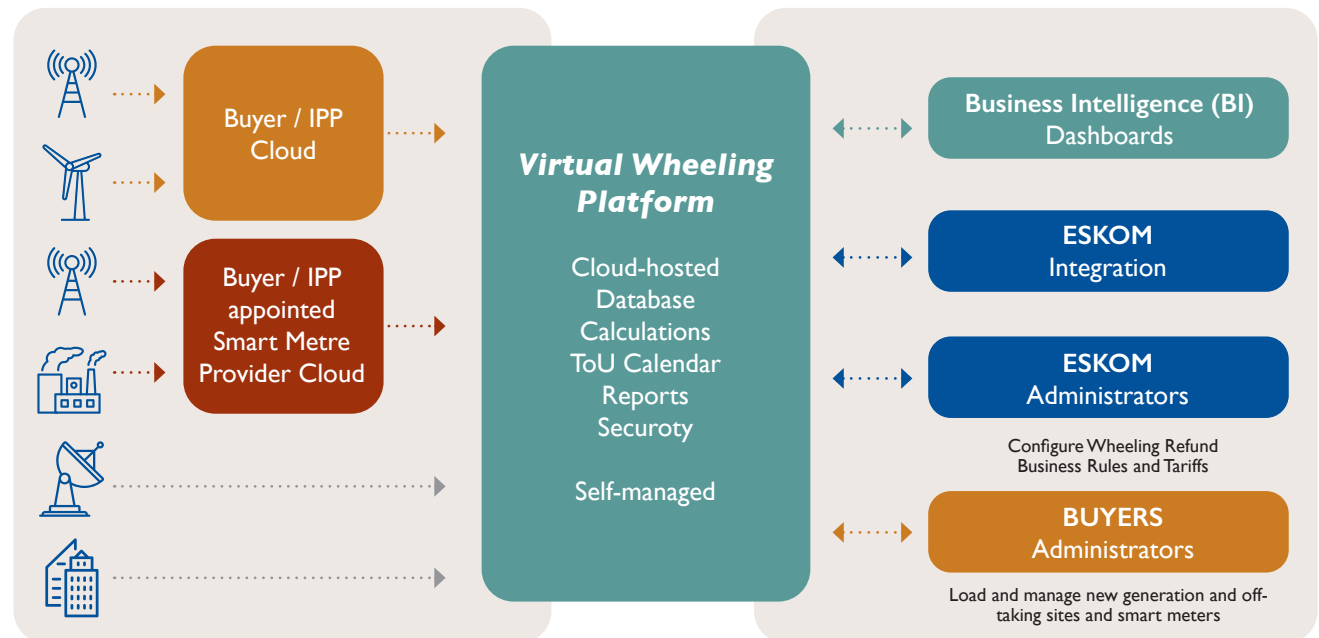


Fig.3. The Virtual Wheeling Platform data architecture.

[3] https://www.eskom.co.za/wp-content/uploads/2021/03/FAQS_SmatMeters.pdf

[4] <https://www.sseg.org.za/wp-content/uploads/2019/03/NRS-057-Electricity-Metering.pdf>

The determination of the wheeled energy refund

The wheeled energy refund is for the energy supplied to the Eskom grid, but not generated by Eskom that needs to be refunded to the buyer. This refund is based on the lower of the sum of the off-takers' active consumed energy or the wheeled (generated) energy, multiplied per TOU period at the Eskom Gen-Wheeling tariff using the following formula:

$$\begin{aligned} & \text{Monthly } \Sigma (\text{Lower of Active Consumed Energy}_{P,S,O} \text{ or Wheeled Energy}_{P,S,O}) \\ & \quad \times \text{Gen Wheeling tariff}_{P,S,O} \\ & = \text{Wheeled Energy Refund.} \end{aligned}$$

The refund shall be processed at the end of a calendar month, and not necessarily aligned to each off-taker's billing period. Eskom will not be responsible for the allocation of energy to each individual off-taker as the refund is done on an aggregated basis to the buyer and not at individual account level.

The principles behind this approach are⁵:

- The wheeled energy refund is paid to the buyer at Eskom-determined rates.
- Monthly consumption and generation data will determine the value of the wheeled energy refund as measured in the Eskom time-of-use (TOU) periods (peak, standard and off-peak) for each month at each offtake point of delivery and the generators exported energy at the generator's point of connection.
- The data will be provided on a platform.
- Buyer-specific excess energy (where generation exceeds consumption) per TOU period shall not be refunded but may be sold to Eskom using the Standard Offer Platform.
- It is important to note that off-takers will continue to pay Eskom and/or the municipality (it is 'business as usual' and the off-takers' tariffs remain unchanged) for energy consumed and the buyer pays the IPP for the energy generated. The Eskom wheeled energy refund is a separate transaction processed by Eskom monthly.

Virtual wheeling and the accompanying wheeled energy refund mechanism - amongst other interventions - will stimulate a significant influx of new buyers which in turn will increase IPP investment and market activity.

[5] Eskom Virtual Wheeling Policy www.eskom.co.za/tariffs

Eskom virtual wheeling policy statement

The following policy principles have been approved by Eskom for further development of a proof of concept:

The refund to the buyer will be based on a wholesale rate, excluding losses, as losses are payable.

There is no avoidance of any tariff charges on each off-taker's account.

Eskom-connected off-takers must be on a time-of-use (TOU) tariff, and the refund will also be TOU-based.

The refund will not be based on any generated energy that exceeds consumption, but such excess may be sold to another entity.

Eskom will not contract with the individual off-takers for such refund, only with the buyer. This includes municipalities as there is no relationship between Eskom and municipalities for virtual wheeling. Municipal revenue will not be affected.

The buyer will be responsible for providing the data of all the municipality-connected off-takers in a format to be prescribed by Eskom.

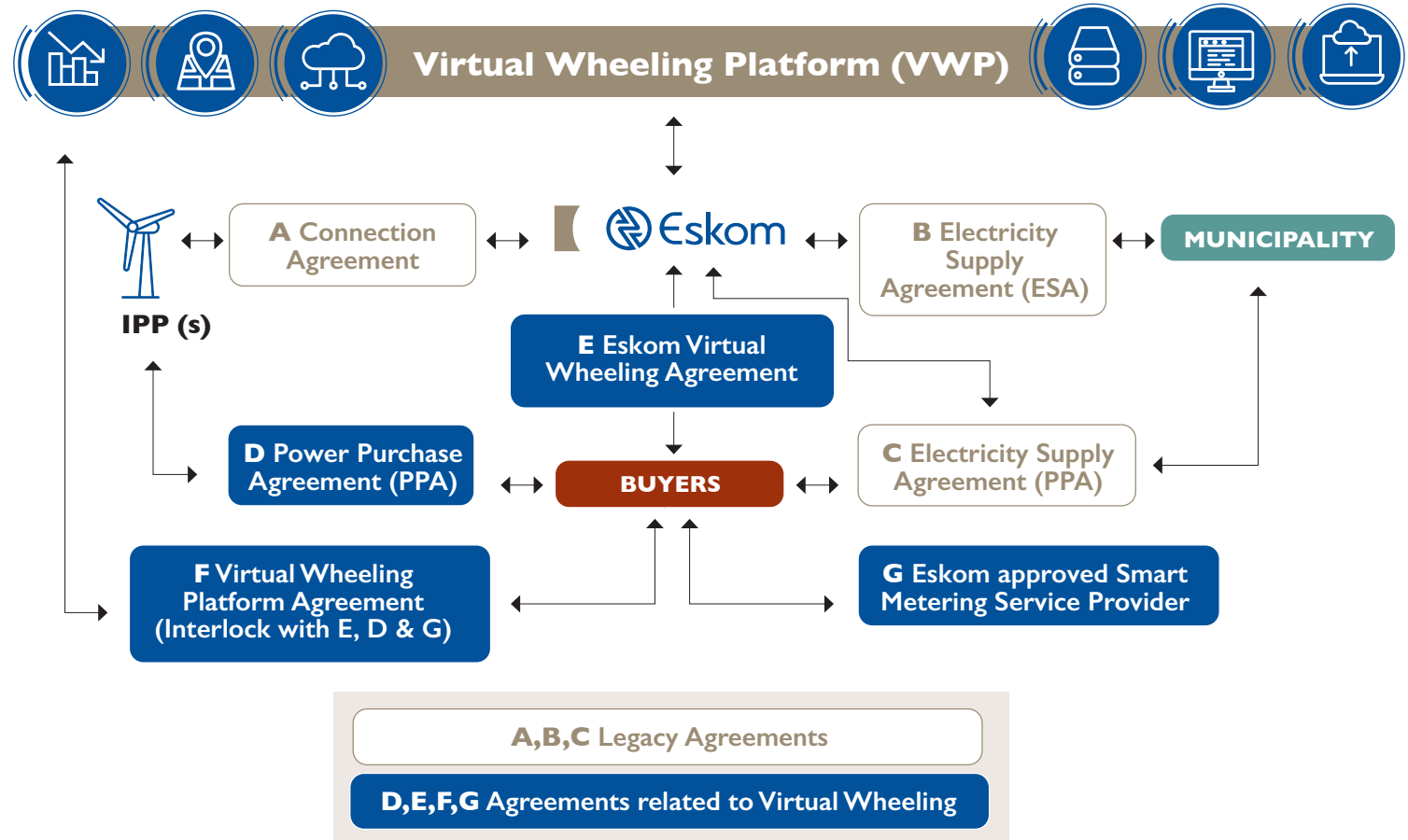
Where an Eskom connected off-taker or a municipality with municipal-connected off-takers is in debt to Eskom, there will be no wheeled energy refund processed for the wheeled energy associated with the off-taker until the Eskom account is in good standing.

No updated deposits or amendment agreements to the supply agreement shall be required for virtual wheeling agreements

To participate in virtual wheeling, the buyer will need to enter into a Virtual Wheeling Agreement with Eskom and a back-to-back virtual wheeling platform (VWP) agreement with a VWP vendor (a party appointed by the Buyer) certified by Eskom to inter-operate with Eskom's systems.

The schematic on the right (Figure 4) illustrates an overview of the virtual wheeling contractual framework. It should be noted that, although related and formally recorded in the Virtual Wheeling Agreements, the Electricity Supply Agreement (ESA) between Eskom and the individual off-takers and between Municipalities and their customers that are off-takers are not impacted and remain unchanged.

The Virtual Wheeling Platform Contractual Arrangement



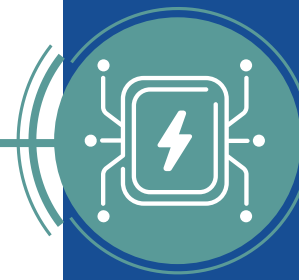
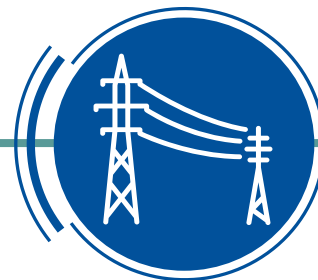
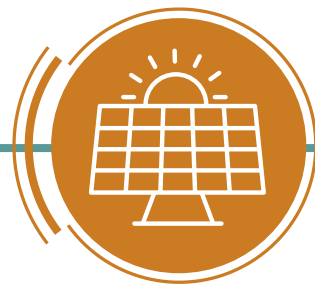
Note: All ecosystem activities governed by Eskom Virtual Wheeling Policy

Fig.4. Contractual arrangements for a Virtual Wheeling Platform

The power purchase agreement (PPA) is between the buyer and their appointed IPP(s) and the related IPP connection and use-of-system agreements with Eskom for the generation connections (and its payment) also remain unchanged and are treated as legacy agreements that are only recorded and referenced by the Wheeling Agreements.

Once the wheeling agreements with Eskom and buyers are signed, buyers can register on an Eskom certified VWP and populate their wheeled and active energy estate data, e.g. a list of all IPPs and Eskom connected and Municipality connected off-takers.

Buyers will need to establish the necessary meter access with generators (IPPs) under PPAs and, via the meter vendor cloud, link all meters to the VWP. The buyer will be expected to run pre-production verification testing and, subject to Eskom's requirements, potentially share other information, for example, a report⁶ with Eskom for approval. Once approved, a production account will be activated and the VWP and Eskom system will automatically run scheduled monthly reconciliation reports that will determine the Wheeled Energy Refund to be paid to the buyer.



[6] The report needs to show (a) that each consumption site has a live meter reading over a predefined test period and (b) that the pre-loaded business rules are aligned with the contracted business rules agreed with Eskom.

Key stakeholders and value proposition

The key value that the VWP unlocks for Eskom is the ability to aggregate TOU energy generation and consumption data (kWh) across multiple distributed buyer estates for the purpose of calculating the monthly Eskom wheeled energy refund payable to the buyer. With respect to IPPs, traders and buyers, the VWP enables access to wheeling to low-medium energy buyers and off-takers with a distributed consumption base - a significant portion of the commercial enterprise and consumer market segments in South Africa.

In many cases, municipalities, especially the metros, are the primary distributor to these off-takers. It is important to note that municipalities are not disadvantaged in any way by Virtual Wheeling and can also use the VWP themselves to wheel energy from third-party generators via the municipality distribution system to its commercial, residential, and public buyers.

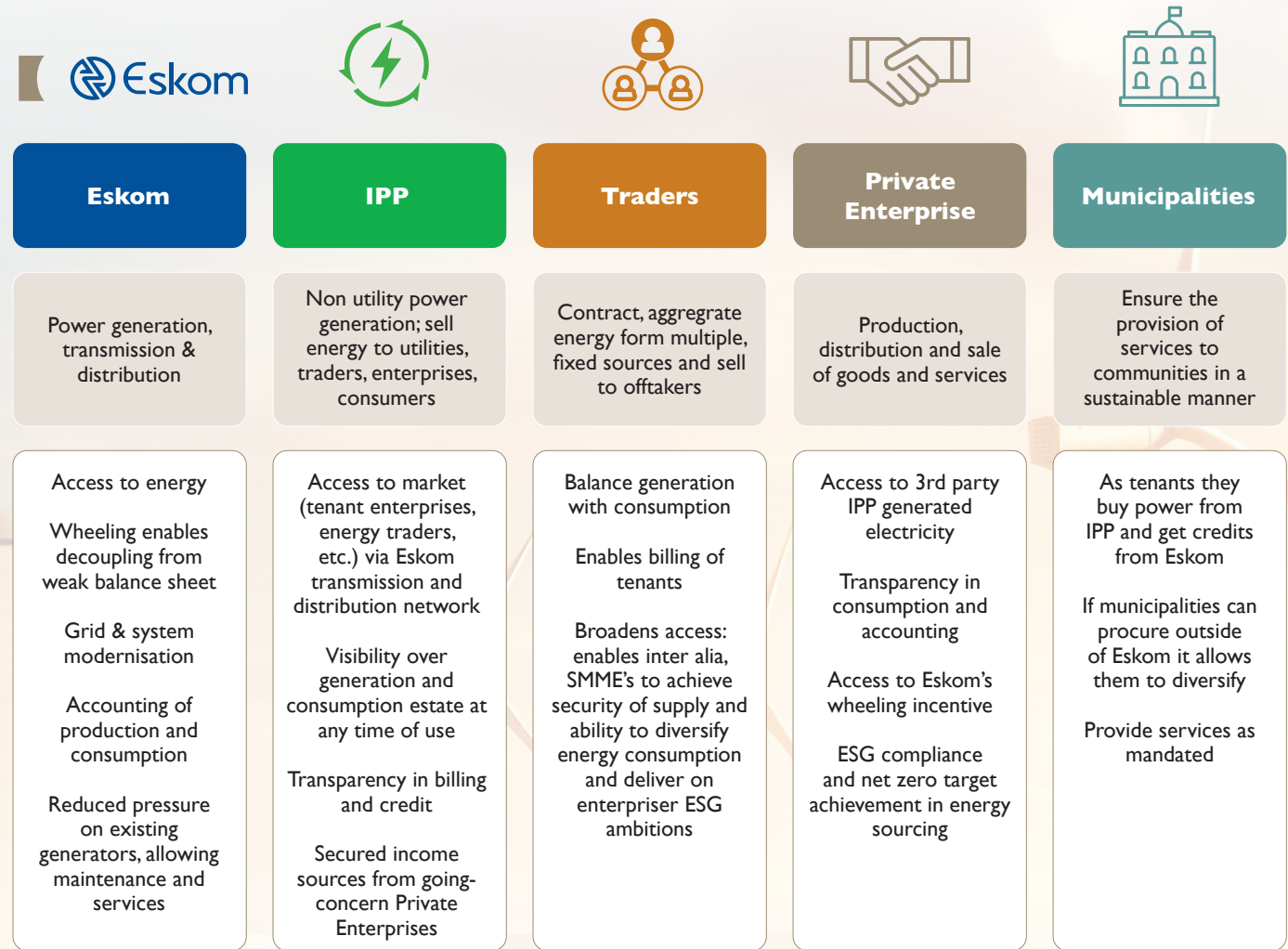


Fig.5. Value propositions per stakeholder with the Virtual Wheeling Platform

Conclusion

Traditional third-party wheeling is an existing mechanism that allows private energy producers to sell energy to buyers using Eskom's transmission and distribution networks. The current energy crisis in South Africa necessitates urgent short- and medium-term interventions including the scale up of renewable energy generation. Accordingly, Eskom, is supporting wheeling by:

1. Expanding traditional third-party wheeling to enable smaller buyers of energy with a distributed off-taker base including within municipalities (most are low- to medium-voltage users and therefore more challenging to manage administratively) to benefit from purchasing energy from IPPs or traders through an Eskom Virtual Wheeling mechanism.

2. Accommodating traditional third-party wheeling where a customer can procure energy from an IPP and this wheeled energy is accounted for on the bill through a credit mechanism for the energy not supplied but delivered by Eskom.



Virtual Wheeling is therefore a new digital concept that accelerates access to alternative and additional energy sources, helping to reduce the current 8-10 GW gap in supply. This will contribute to the Presidency's Energy Action Plan under NECOM in achieving its stated objectives.

For more information on the Eskom Virtual Wheeling policy, please refer to the Eskom website www.eskom.co.za/tariffs

