

TOKENISING GREEN POWER TO UNLOCK MUNICIPAL WHEELING IN SOUTH AFRICA

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1 INTRODUCTION

Private power production will be critical for diversifying South Africa's energy mix and reducing reliance on the REIPPPP and other public procurement programmes, which are struggling to achieve the required renewable energy build-out rates. However, many multinational and exporting firms operating within municipal electricity supply areas face significant challenges in advancing their decarbonisation objectives due to the limitations of existing wheeling models. Token Wheeling offers an innovative and complementary solution alongside conventional and virtual wheeling approaches, which have limited reach in municipal networks. Working alongside these models, Token Wheeling offers a novel mechanism for expanding the addressable market for wheeled power, unlocking new opportunities for energy transition. This document contains an extract from a funding proposal for driving the development, demonstration and adoption of Token Wheeling as a scalable mechanism for driving sustainable energy solutions in South Africa.

2 THE NEED FOR TOKEN WHEELING

- Wheeling is an accounting and attribution system that enables the private buying and selling of power over the grid where end-customers are served by a single local (typically public sector) utility.
- In South Africa, practically all customers are supplied by public sector entities such as Eskom Distribution and Municipalities.
- While customers receive a standard (mostly coal-based) supply from their distributor, they vary significantly concerning the urgency of their decarbonisation and price hedging needs.
- Renewable energy power producers are currently unable to access more than half of the end-customer power market (smaller Eskom - and practically all municipal customers) due to the many challenges related to implementing existing wheeling models. These challenges include inadequate wheeling policies and tariffs, complex administrative requirements, high municipal debt owed to Eskom, and elevated credit risk, among others.
- Tokenising private power at the point of grid injection holds great promise for unlocking the market for private power and bringing significant benefits to all stakeholders.



- By changing the paradigm for implementing wheeling from conventional approaches to a tokenisation approach, it becomes possible to reduce the implementation burden and shift most of it away from municipalities and Eskom onto private sector service providers. This enables many of the current implementation bottlenecks to be overcome, unlocking the market for much faster renewables roll-out.
- For South Africa, Token Wheeling will:
 - Avoid the debilitating complexity for distributors of implementing conventional wheeling models, which includes NERSA-approved tariff restructuring, changes in supply agreements, and SAP- or Oracle-based municipal and Eskom billing system implementations.
 - Avoid the credit risk problems associated with Virtual Wheeling and the complex third-party escrow systems designed to overcome these to make projects bankable.
 - De-risk power procurement for customers by enabling them to adjust their monthly consumption of wheeled power in a liquid secondary market for tokens, or token supply agreements. This will enable customers to procure larger percentages of their power from green sources because they can manage the risk of over- or under supply.
 - Also de-risk the bankability of renewable projects due to the existence of a liquid secondary market for tokens and token supply agreements.
 - Enable IPPs to sell renewable energy to any customer on participating public networks.
 - Enable pre-payment customers to access lower-cost green power (via the pre-payment vendors who can purchase electricity credit wheeling tokens);
 - Replace the need for NERSA-approved municipal feed-in tariffs by enabling embedded generators to receive and sell tokens for power injected into the local grid.
 - Enable Municipalities and Eskom Distribution to protect sales revenues, by retaining customers on standard tariffs, while enabling their customers to hedge against energy tariff increases and obtain green power according to their needs.
- The development of the Token Wheeling infrastructure in South Africa will also make it much easier to implement wheeling in other African and developing countries where public utilities predominate.

3 TOKEN WHEELING IN A NUTSHELL

Token Wheeling has been developed as a complementary model to existing wheeling frameworks aiming to de-risk term-based power contracting for customers and IPPs (and their lenders) alike. The aim is to substantially reduce the complexity of implementing wheeling projects, especially within municipalities, thereby unlocking a more significant portion of the market.

A video explaining how Token Wheeling would work and other resources can be found at the following link:

<https://meridianeconomics.co.za/our-publications/oiling-the-wheels/>

Summary of Token Wheeling use cases



The Token Wheeling process is illustrated in Figure 1 below and explained in detail in the resources on our website.

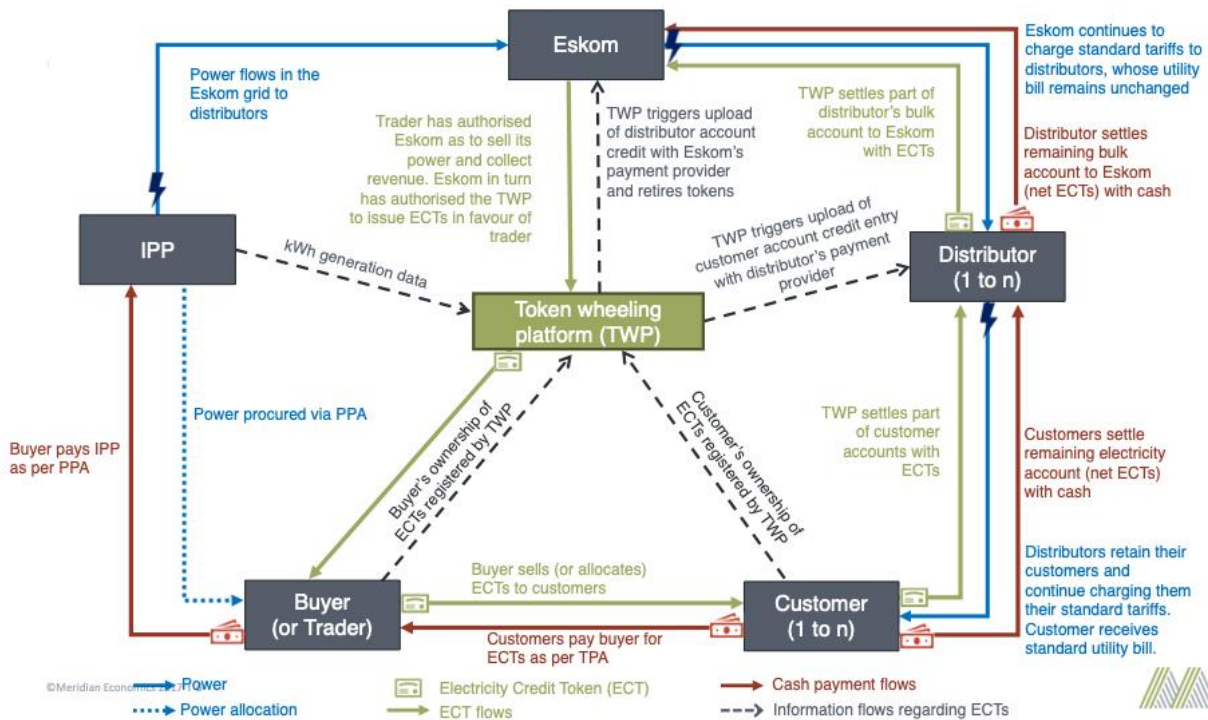


Figure 1: The Token Wheeling process

While it is not the purpose of this document to explain the Token Wheeling system in detail, in a nutshell, the key concepts underlying the system can be explained as follows.

Instead of implementing wheeling by requiring the utilities in the supply chain to change their billing systems to track wheeled power and implement corresponding credits in their customer's monthly bills, Token Wheeling relies on "vouchers" – tokenised bearer credit notes (electricity credit tokens – ECTs) to achieve the same outcome. In return for injecting power into the grid, an IPP (or a contracted trader with a PPA) receives a stream of tokenised credit notes from the utility responsible for the grid – in this case, Eskom. The credit value of these tokens, as with other wheeling models, is based on the utility's avoided cost of power (in this case, the WEPS tariff). Each token contains a detailed, immutable record of all the relevant information about the power generated including a timestamp, its credit value, technological source and carbon content. Tokens are sold and on-sold until they are in the hands of a final power consumer who uses these tokens as vouchers to settle their account with their local distributor (municipal or Eskom). The consumer also claims the associated green attributes for the power it consumed. Distributors then aggregate the received tokens and in turn use these to settle their bulk accounts with the original "issuer" (Eskom in this case) at which point the tokens are retired. In



practice, one or more Token Wheeling Platforms manage the entire process on behalf of all stakeholders throughout the value chain.

Token supply agreements can be thought of as a way of “chopping up” and on-selling the rights and obligations obtained by means of a PPA, thereby creating liquidity in the retail market and derisking IPP financing.

4 HOW TOKEN WHEELING ASSISTS WITH MEETING GREEN AND DONOR FUNDER OBJECTIVES

Token Wheeling will enable a wide range of use cases for customers and generators thereby unlocking substantially faster renewables deployment. Some of these use cases include the following:

- **Decarbonisation:** A manufacturer, retailer, or financial services entity located in a municipality needs to decarbonise its power to meet the needs of its export market (including CBAM), shareholders or lenders.
- **Supply chain decarbonisation:** A manufacturer that needs its suppliers to decarbonise the embedded electricity in its supply chain. For example, an aluminium products manufacturer can decarbonise the aluminium supplied to it by purchasing electricity credit tokens to cover the embedded carbon-based electricity. It will then use the tokens to part-settle its bill from its aluminium supplier. The aluminium producer then claims the green attributes of the associated power it paid for, and uses the tokens to part-settle its utility bill.
- **Off-take and supply risk mitigation:** Tokenisation of bearer credit notes enables a liquid secondary market in tokens, which substantially reduces off-take risk for IPPs and traders, and similarly reduces over- or under-supply risk for customers.
- **Price hedging:** Term token supply agreements with IPPs or traders enable customers to lock in their power costs and hedge against future Eskom and Municipal energy tariffs.
- **Replacing cumbersome feed-in tariffs:** A utility-scale or small-scale embedded generator in a municipality that needs to sell power into the grid can avoid waiting for the municipality to establish feed-in tariffs and obtain NERSA approvals. The Municipality can agree to issuing tokens based on the cost it has avoided (Eskom’s Megaflex tariff). Tokens will be tradeable within the municipality, or with Eskom’s cooperation, across the entire grid.
- **Green battery operations:** Investors in battery capacity embedded in distribution grids (Municipal or Eskom’s) can redeem tokens to charge their batteries and generate tokens when they inject power into the grid (at peak times or as required by the municipality).
- **Cheaper and green pre-payment power:** Vendors of normal municipal or Eskom pre-payment power can purchase long-term, lower-cost green wheeling tokens and settle their obligations to the utility with these tokens.



- Full-cost escrow functionality:** In cases where Eskom is concerned about recovering grid and other fixed charges when enabling Token Wheeling into a municipality with a poor payment record, Eskom can require settlements using a combination of electricity credit tokens and a specified proportion of “infra-tokens.” These infra-tokens represent non-power credit notes, issued based on prior cash payments to Eskom. By linking infra-tokens with energy tokens for Eskom settlements, this approach essentially functions as an “escrow” mechanism for both the variable and fixed cost recovery of the Eskom supply to the municipality for token wheeling purposes. It secures recovery of Eskom’s costs associated with supplying power for municipal Token Wheeling customers, thereby eliminating Eskom’s financial risks in these municipal transactions.

Token Wheeling will unlock a larger addressable market for renewables off-take by enabling a wide range of use cases. Figure 2 below shows a simplified estimate (in red) of the addressable market that can be reached using conventional wheeling models (although not without challenges). This is mostly limited to the Eskom grid. The development of current Virtual Wheeling efforts will likely increase the addressable market somewhat, especially on the Eskom grid. However, Token Wheeling (ECTs) could further support these initiatives by (a) substantially increasing the size of the addressable market for renewable energy (in blue) and (b) establishing a highly liquid secondary market, both of which will support an accelerated build-out of renewable energy in South Africa.

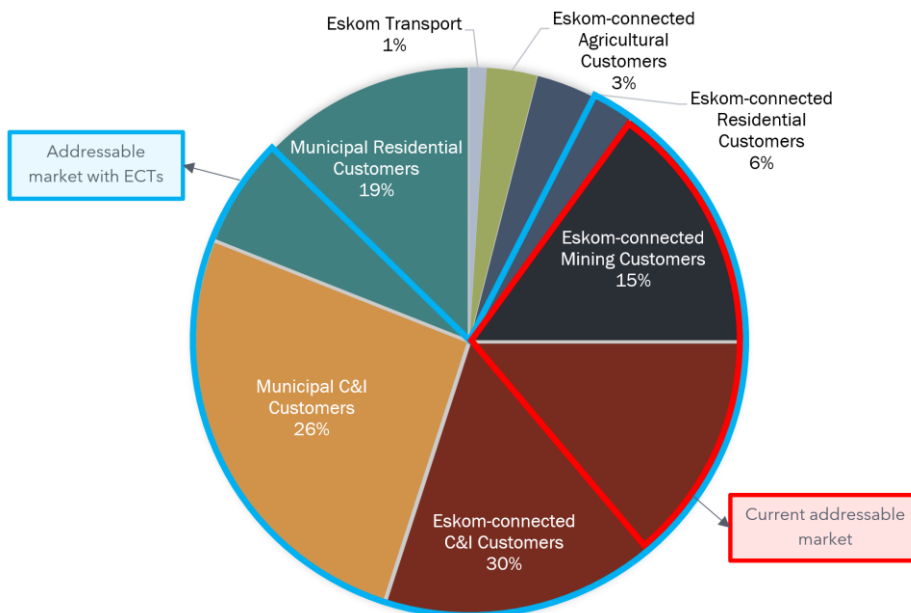


Figure 2: Addressable market size that can be unlocked with Token Wheeling (kWh)



5 PROGRESS TO DATE

The development of Token Wheeling was born out of a Meridian Economics study commissioned by the International Finance Corporation (IFC), which focused on how the IFC could effectively support the growth of South Africa’s C&I power market. As part of this study, the wheeling, trading, and aggregation landscape were studied in detail, and the critical barriers to efficiently scaling current commercial models were identified. Following this study Meridian produced a Concept Proposal for a Token Wheeling system to overcome the challenges with current wheeling models. Figure 3 outlines the key milestones and work that led up to this funding proposal.



Figure 3: Key milestones of work done on Token Wheeling

Much of the work over the last nine months has focused on stakeholder engagement, which has involved socialising the concept, receiving feedback for modification to the concept, and creating buy-in for the roll-out of demonstration projects. Figure 4 shows the key stakeholders that have been engaged thus far and that have shown support for the further evolution and implementation of the model.

Policy Stakeholders	Eskom	Municipalities	Customers	IPPS/Traders	Funders	Platform Providers
 	 <ul style="list-style-type: none"> Monde Bala: Group Executive Distribution Keith Bowen: Senior Manager Market Operator Kevin Pillay: Business Improvement & Strategy Malcolm Van Harte: Senior Manager Smart Grid & Telecom Ronald Marais: Transmission Strategic Grid Planning Manager Terry Njuna: Pricing and Programme Management 	 	 	 	 	

Figure 4: Key stakeholders engaged