

69TH AMEU CONVENTION

1 - 4 October 2023

CSIR International Convention Centre

Confronting South Africa's Electricity Crisis in the context of a 'Balanced Just Energy Transition' (BJET) and the need for a reliable and resilient national electricity grid

A Cost of Supply (COS) and Electricity Tariff Design Approach for Municipal Electricity Distributors in South Africa

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PRESENTATION OVERVIEW

1. Project Background
2. COS Tool Overview
3. Case Studies
4. Tariff Design
5. Benefits of the Tool
6. The COS Toolkit
7. Concluding Remarks

PROJECT BACKGROUND AND CONTEXT

Regulatory Context

- NERSA's Guideline and Benchmarking Method used to evaluate and approve municipal electricity tariff applications was **declared unlawful**
- High Court allowed NERSA one year to remedy this and adopt a **COS approach**
- In accordance with the **Electricity Pricing Policy** :

Electricity distributors shall undertake Cost of Supply (COS) studies at least every five years, but at least when significant licensee structure changes occur, such as in customer base, relationships between cost components and sales volumes. This must be done according to the approved National Energy Regulator of South Africa (NERSA or 'the Energy Regulator') standard to reflect changing costs and customer behaviour.

Source: Policy Position 23, Electricity Pricing Policy, 1998

Project Context

- Part of the South African-German Energy Programme (SAGEN) through funding from **National Treasury** and the German government and implemented by **GIZ**
- Ricardo **upgraded the COS tool** developed by Sustainable Energy Africa using international best practices
- **Supported two metropolitan electricity distributors** in undertaking COS studies using the new COS tool

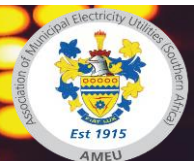


national treasury

Department:
National Treasury
REPUBLIC OF SOUTH AFRICA



Deutsche Gesellschaft
für Internationale
Zusammenarbeit (GIZ) GmbH

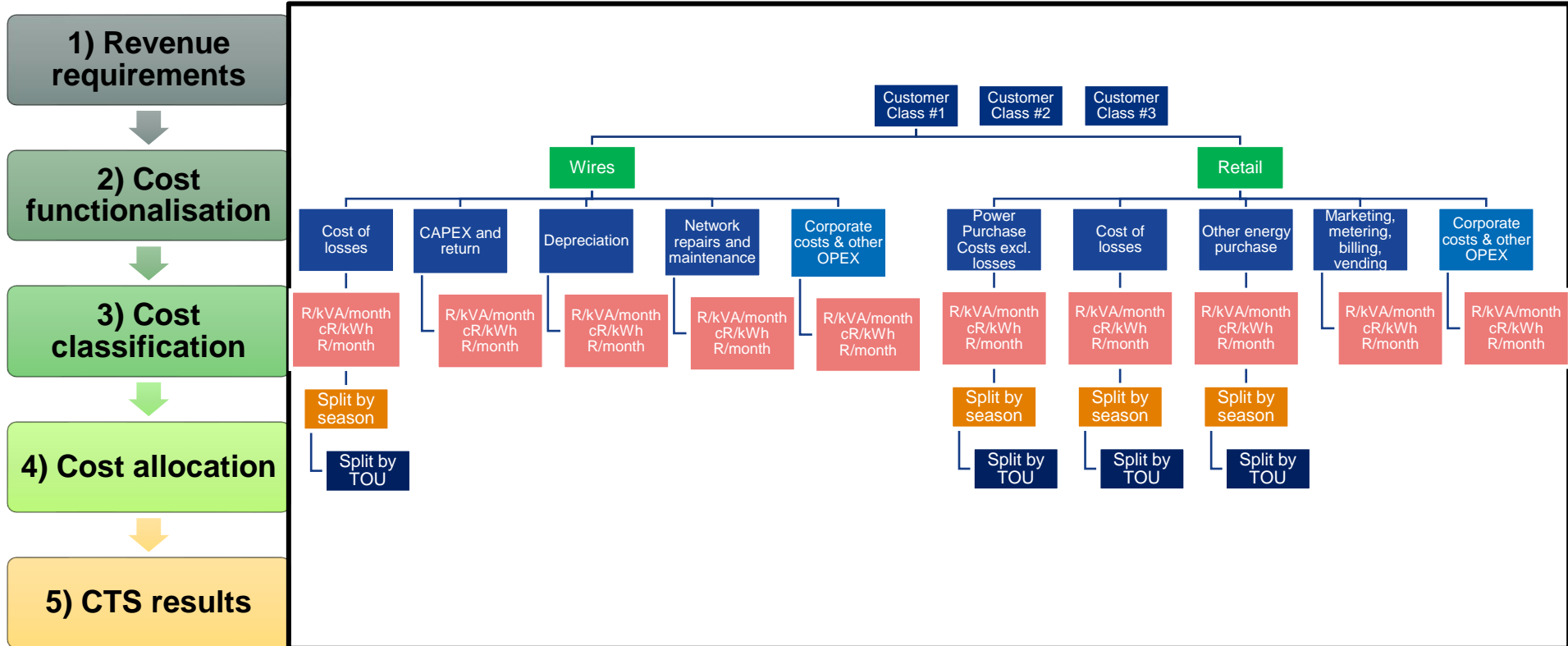


DEVELOPMENT OF THE COS TOOL

- **Incorporate best international practice**
- **Be consistent** with / smooth transition from **current practice**
- **Enable** the computation of **wheeling / use of system** tariffs
- **Enable** utilities to support **distributed generation (DG) deployment**, whilst mitigating impact on utility financial sustainability
- **Flexible enough** for different utilities (size, capability level, etc.) to use
 - ✓ **Support the piloting** of pricing methodology recommendations
 - ✓ **Informed by lessons learned** through case studies with two metros
 - ✓ **Capitalise on previous work** and “locks in” key achievements under the SAGEN programme

whilst addressing identified gaps of SEA’s simplified COS model

COS MODELLING STEPS



COS TOOL – MODES OF OPERATION

	COS Methodology Options	OPEX	Customer Categories	Revenue Requirements	Purchases	Advanced Technical Inputs
Advanced Mode	Fully flexible	Detailed and split by business area and function	Flexible and option to test new categories	Rate of Return or Surplus	Essential to complete	Essential to complete
Simplified Mode	Pre-populated and pre-defined	Pre-defined OPEX categories	Pre-defined (monthly data sufficient)	Surplus only	Year 0 data is essential to complete but the forecast is pre-populated	<ul style="list-style-type: none"> • Pre-populated • Detailed calculation sheets hidden



CASE STUDIES: OBJECTIVES AND PROCESS

Objectives

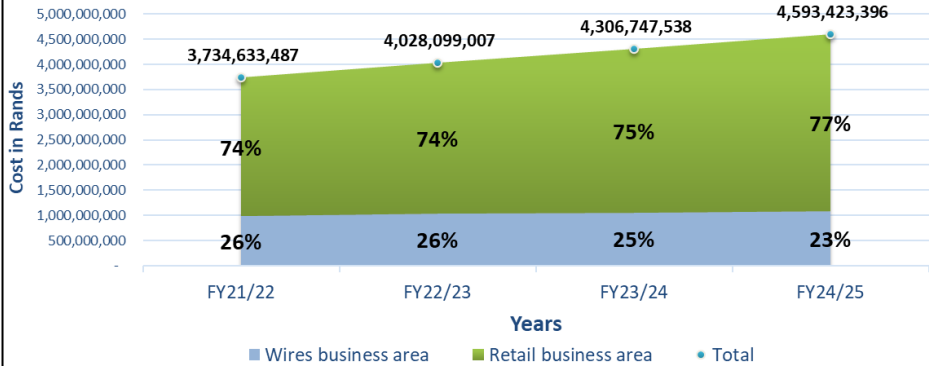
- Assisting participating electricity distributors **in undertaking COS studies**
- **COS capacity building** within metros
- **Applying a tariff development framework** for setting electricity tariffs
- *Note: Respective NDAs prevent the discussion of the actual inputs and results*

How

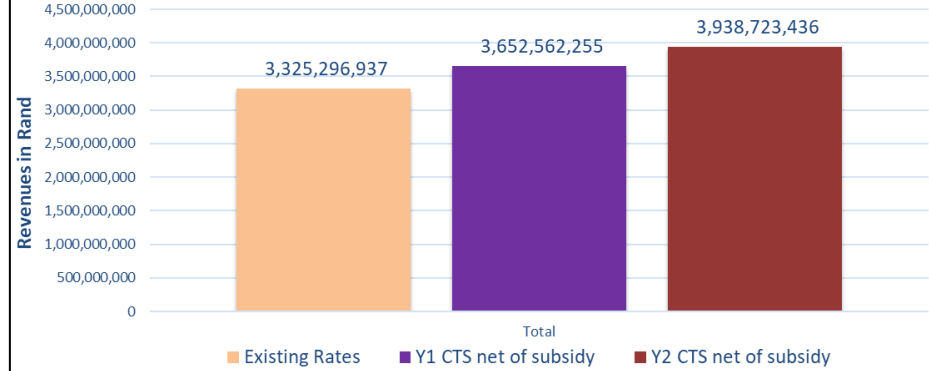
- Informed by **NERSA COS Framework, NRS 058, and international best practice**
- **Information request** to metros
- **Analysis and transformation** of data
- **Regular engagements** with metros
- **Adjustments made** based on specific requirements or conditions of the metro

INTERPRETATION OF TYPICAL RESULTS

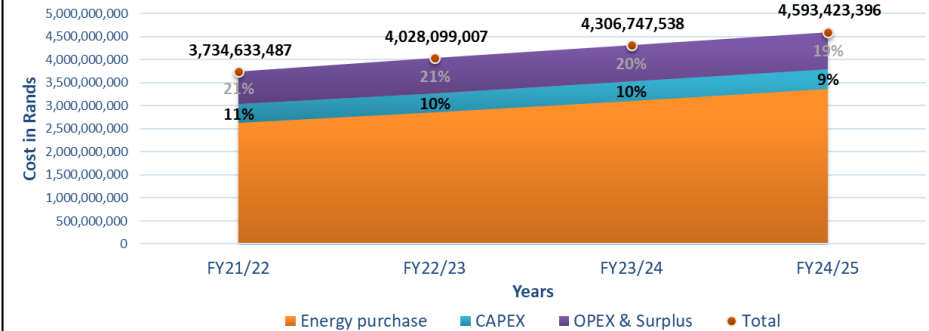
Yearly Cost Breakdown by Business Area



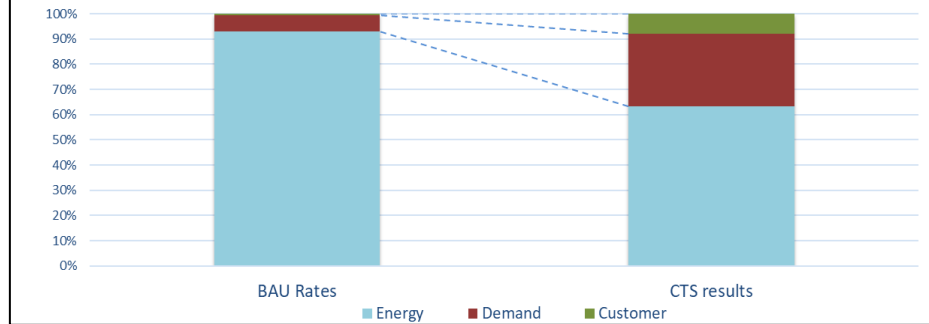
BAU Revenue Recovery Comparison (FY21/22 and 22/23 Forecast)



Year Cost Breakdown by Function



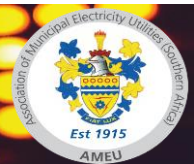
Comparison of BAU Revenue and Cost Structure (FY22/23 Forecast)



Increase of COSTS FY21/22 to FY22/23 = **7.9%** (including Eskom purchase)
6.1% (net of Eskom purchase)

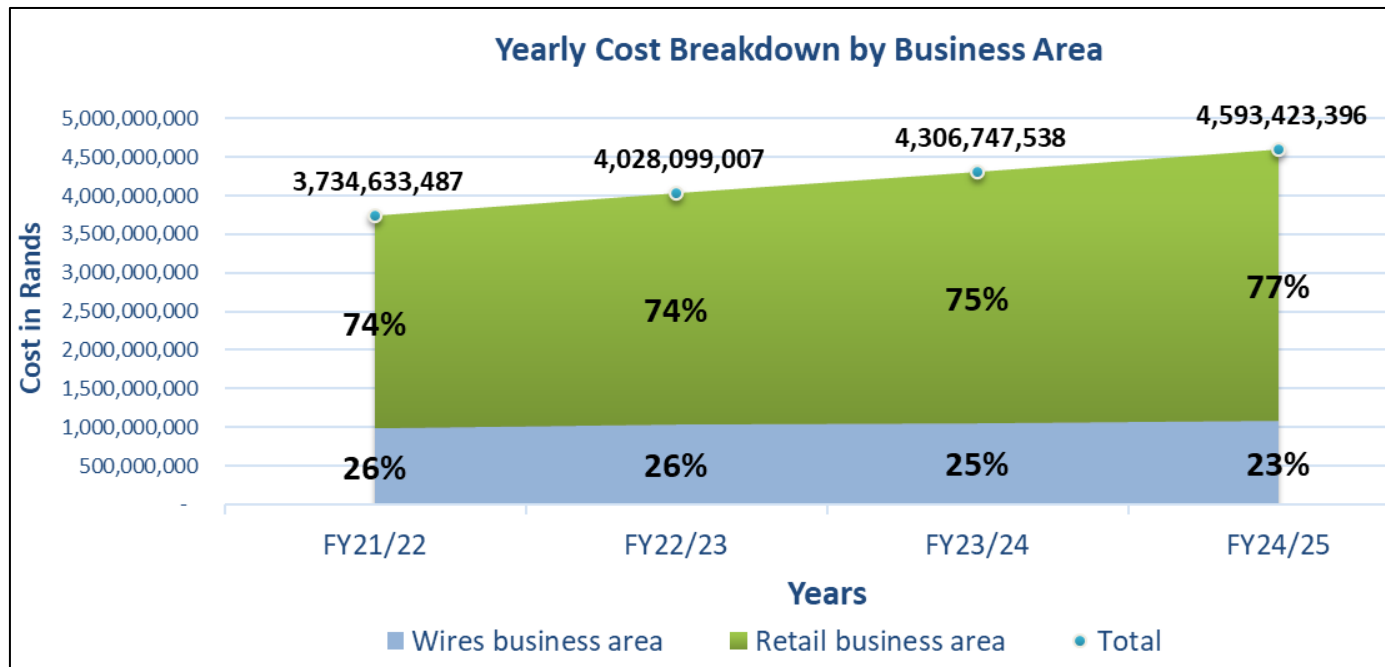
Estimated ratio of revenues over allowable costs in FY21/22= **91.0%**

Increase in RATES to achieve full cost-reflectivity in FY21/22 = **9.8%**
 Increase in RATES to achieve full cost-reflectivity in FY22/23 = **18.4%**



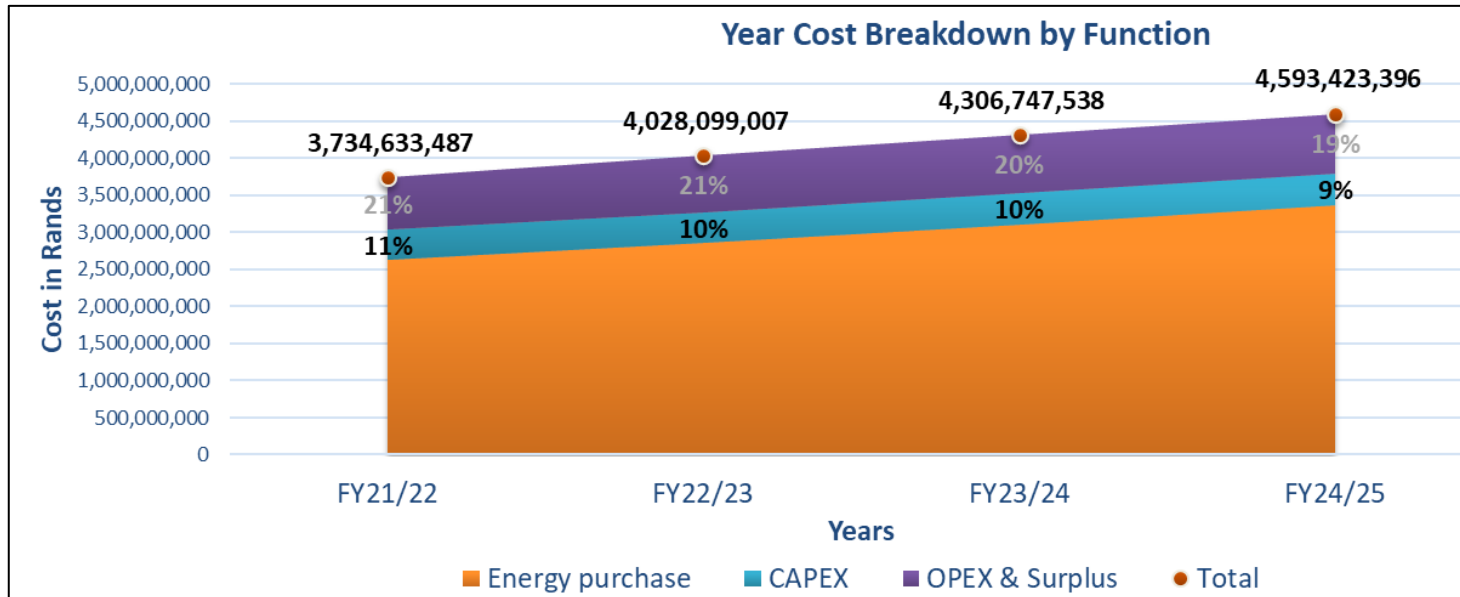
INTERPRETATION OF TYPICAL RESULTS (1/3)

- Forecast of **revenue requirements**
- **Greater proportion** of costs incurred by **Retail** (74%)
- Wires business accounts for 26%
- **Revenue requirement increases substantially** year-on-year



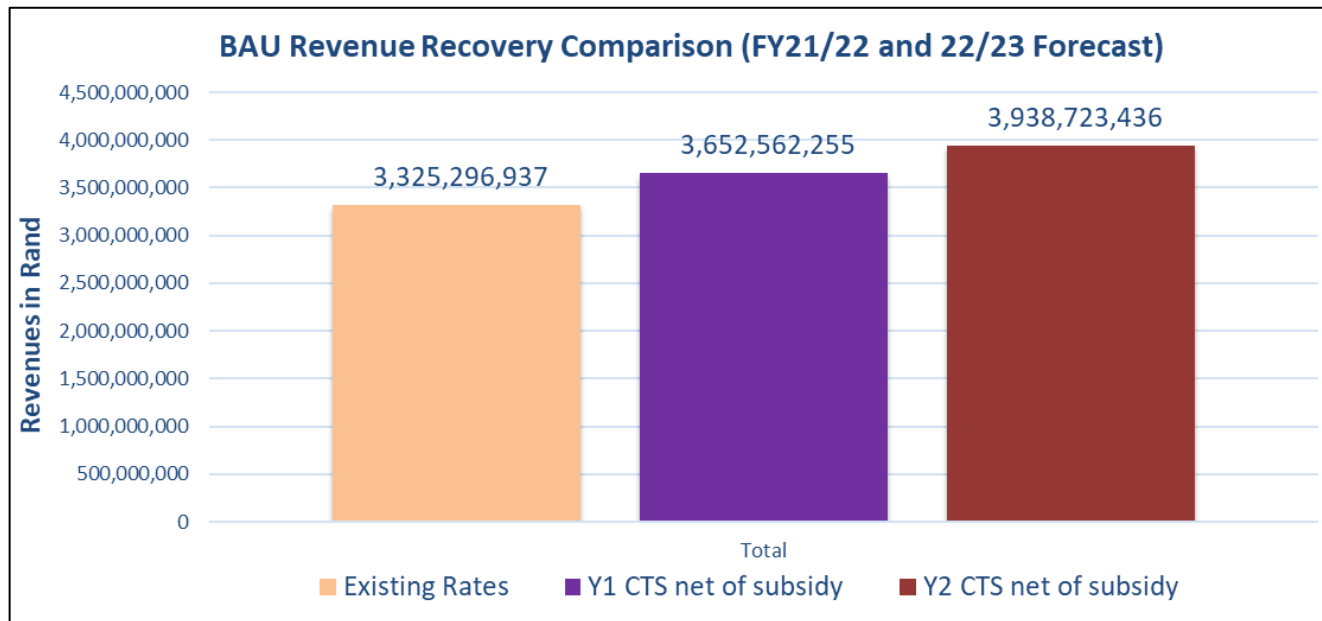
INTERPRETATION OF TYPICAL RESULTS (1/3)

- Shows main functions of: **energy purchases, capital expenditure, operating expenditure and surplus**
- Reinforces that **energy purchases are the dominant cost**
- CAPEX costs are dependent on the **rate of return** selected by the user



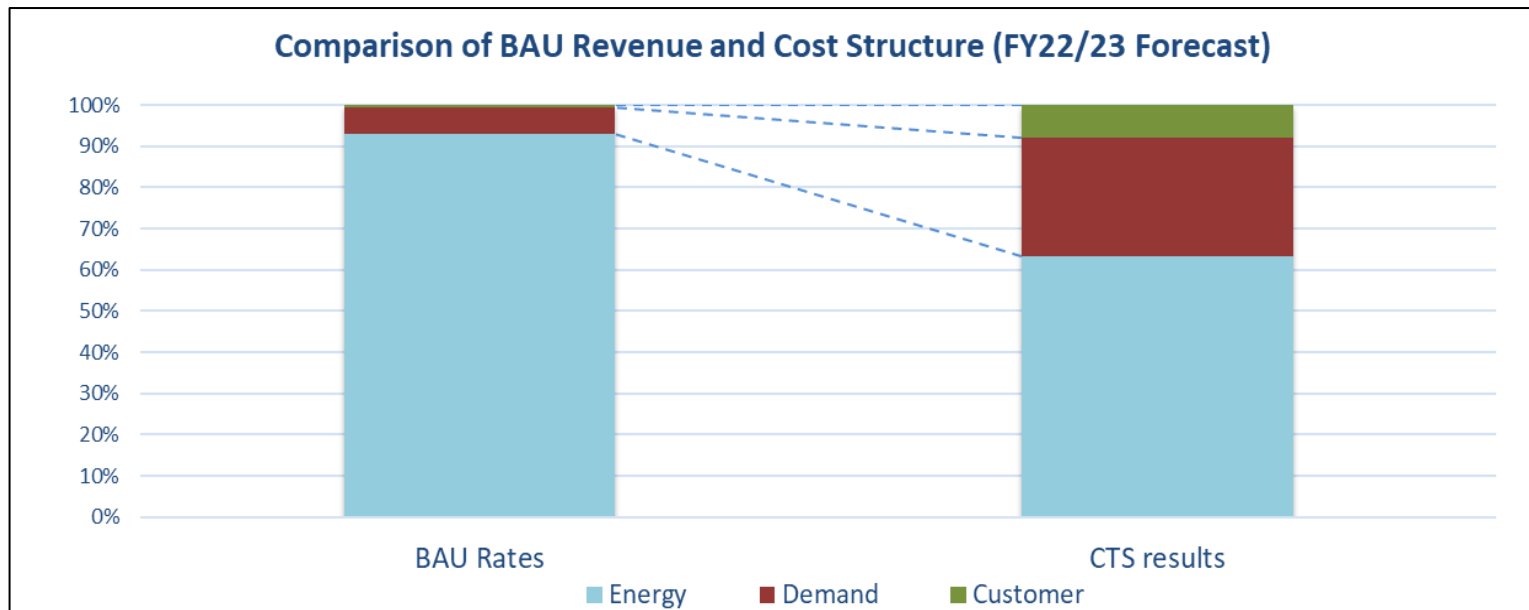
INTERPRETATION OF TYPICAL RESULTS (1/3)

- Compares **revenue recovery** based on:
 - Existing rate regime
 - Year 1 cost to serve results
 - Year 2 cost to serve results
- Current rate regime **does not provide complete cost recovery**

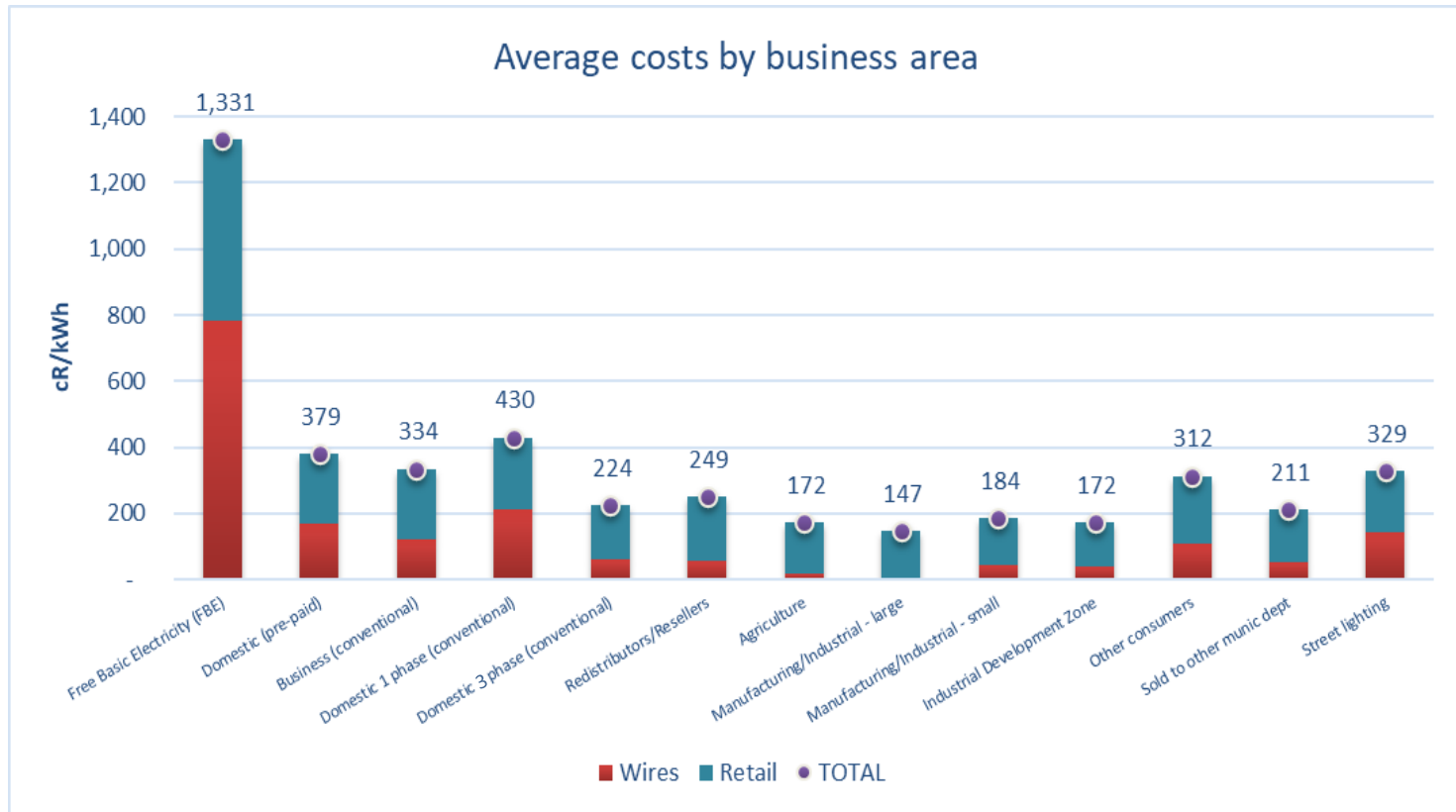


INTERPRETATION OF TYPICAL RESULTS (1/3)

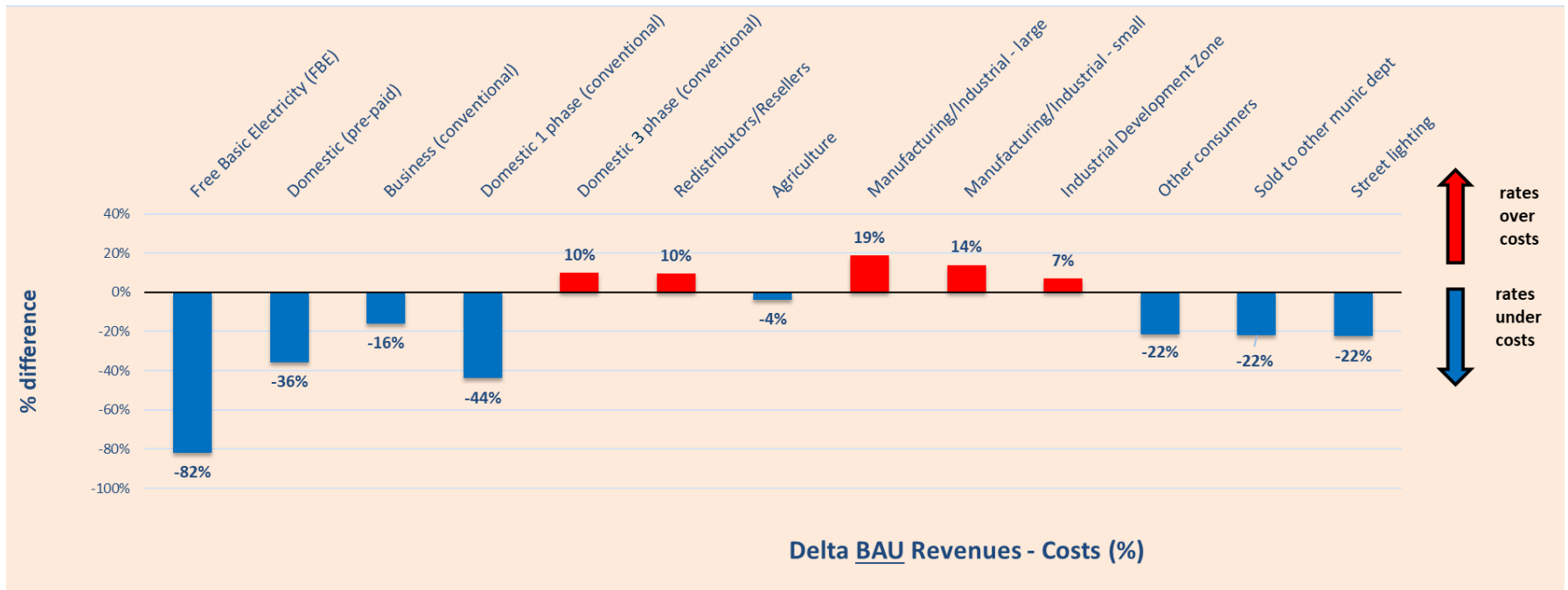
- Costs are broken down according to **energy-, demand- and customer-driven cost classifications**
- **Misalignment between revenue breakdown and cost model**
- Exposes municipalities to **volumetric risk**, especially if driven by the uptake of distributed generation



AVERAGE COST FOR VARIOUS CUSTOMER CATEGORIES



COST VERSUS REVENUE FORECASTS



TARIFF DESIGN

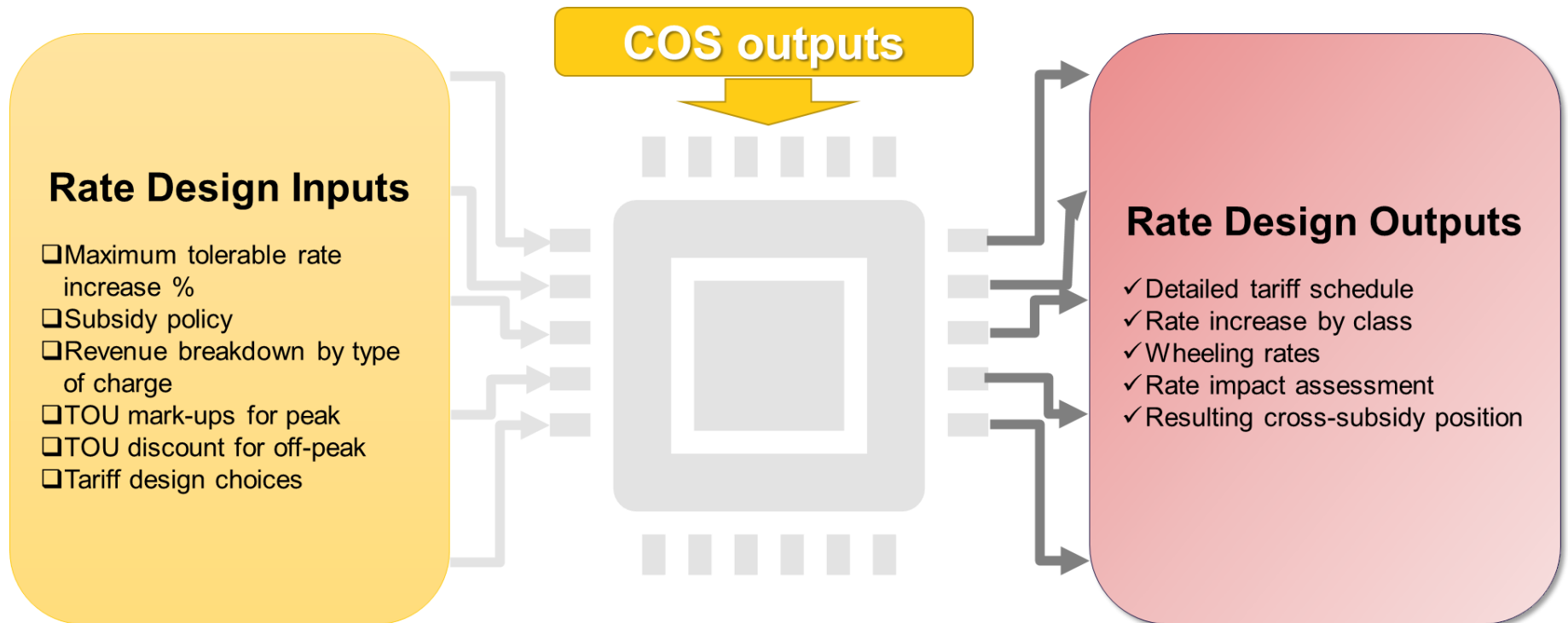
Objectives

- Attempt to **balance the COS results with the revenue from the designed rates**
- Design tariffs to **recover the total cost to serve while considering various factors**

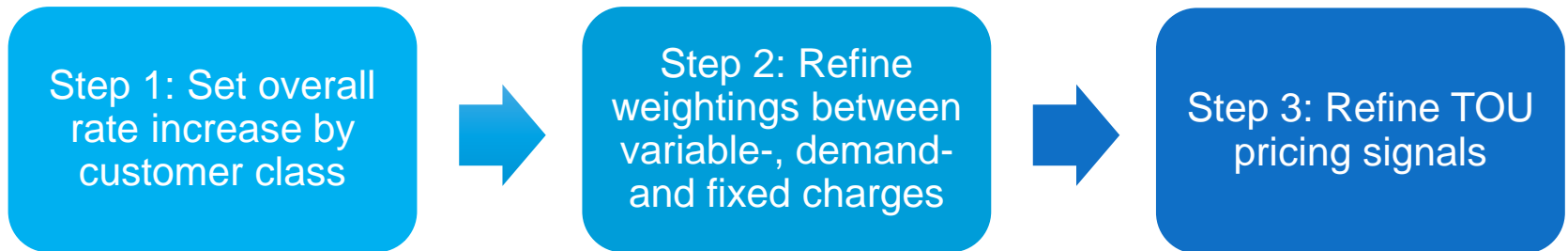
Rate Design Dashboard (Year 2)

<i>Results BEFORE phasing</i>			
	BAU	COS (net of subsidies)	New rates (Dashboard selection)
Total revenue forecast (with new rates)	3,325,296,937	3,938,723,436	3,325,296,937
			Delta = - 613,426,499
Average increase in rates	0.0%	←	
Average increase in rates to reach overall cost-reflectivity	18.4%		
Share of total cost recovered with the new rates	84.4%		
Share of total costs recovered (existing rates)	84.4%		

TARIFF DESIGN FEATURES



TARIFF DESIGN PROCESS



Customer Categories	Average Increase in Rates (%)	Increase Required to Reach Full Cost-Reflectivity (%)
Free Basic Electricity (FBE)	0.0%	449.9%
Domestic (pre-paid)	5.0%	55.6%
Business (conventional)	25.0%	18.9%
Domestic 1 phase (conventional)	15.0%	78.1%
Domestic 3 phase (conventional)	15.0%	-9.2%
Redistributors/Resellers	15.0%	-8.8%
Agriculture	15.0%	3.9%
Manufacturing/Industrial - large	8.0%	-15.8%
Manufacturing/Industrial - small	8.0%	-12.3%

TARIFF DESIGN PROCESS

Step 1: Set overall rate increase by customer class



Step 2: Refine weightings between variable-, demand- and fixed charges



Step 3: Refine TOU pricing signals

Rate structure inputs

Customer Categories	Type of kVA Charge	1			2			3		
		Share of Revenues Recovered from <u>Variable</u> Charges (cR/kWh)	BAU	CTS	Share of Revenues Recovered from <u>Demand</u> Charges (R/kVA/month)	BAU	CTS	Share of Revenues Recovered from <u>Fixed</u> Charges (R/POD/month)	BAU	CTS
Free Basic Electricity (FBE)		100.0%	100%	18%	0.0%	0%	69%	0.0%	0%	13%
Domestic (pre-paid)		100.0%	100%	38%	0.0%	0%	48%	0.0%	0%	13%
Business (conventional)		90.0%	100%	43%	0.0%	0%	20%	10.0%	0%	37%
Domestic 1 phase (conventional)		100.0%	100%	34%	0.0%	0%	63%	0.0%	0%	3%
Domestic 3 phase (conventional)		97.8%	98%	65%	0.0%	0%	29%	2.2%	2%	6%
Redistributors/Resellers		93.2%	93%	58%	0.0%	0%	4%	6.8%	7%	38%
Agriculture	per KVA of MD metered	81.0%	81%	84%	16.3%	16%	10%	2.7%	3%	6%
Manufacturing/Industrial - large	per KVA of MD metered	91.7%	92%	98%	8.2%	8%	1%	0.1%	0%	0%
Manufacturing/Industrial - small	per KVA of MD metered	80.0%	90%	69%	12.0%	7%	22%	8.0%	3%	10%

TARIFF DESIGN PROCESS

Step 1: Set overall rate increase by customer class



Step 2: Refine weightings between variable-, demand- and fixed charges



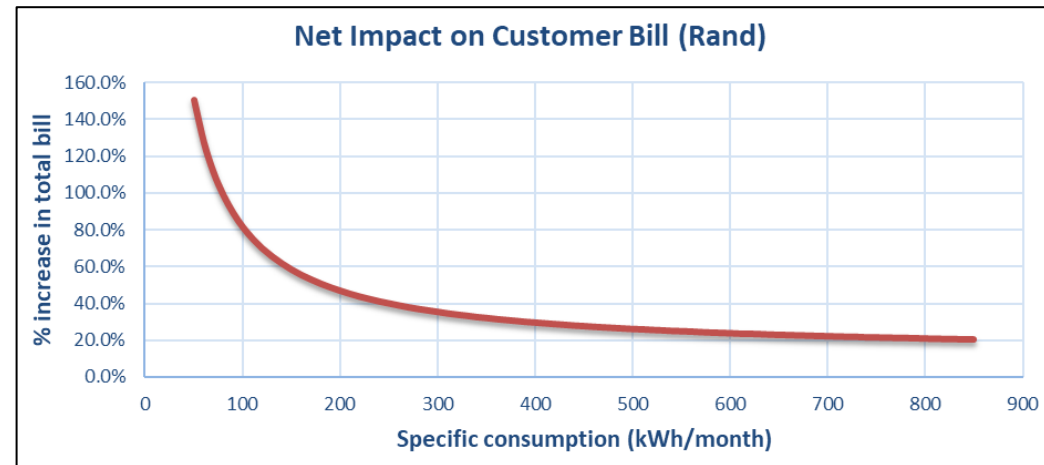
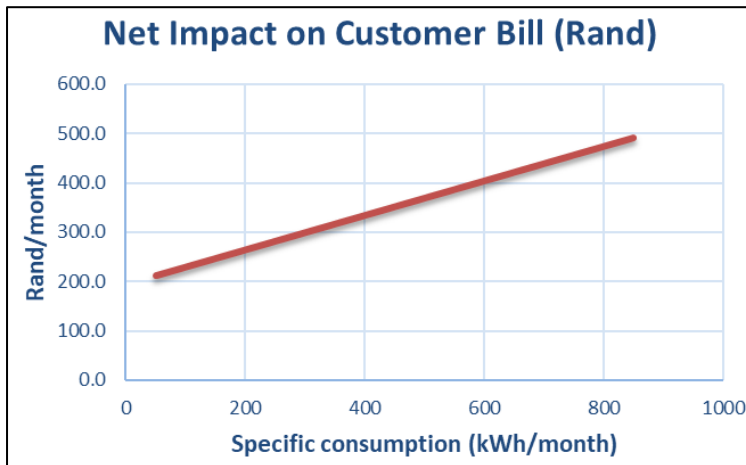
Step 3: Refine TOU pricing signals

Tariff TOU design inputs

Customer Categories	TOU Energy Rates?	Seasonal Energy Rates?	Seasonal Demand Rates?	Peak Pricing Signal	BAU	CTS	Standard Pricing Signal	BAU	CTS	Offpeak Pricing Signal	BAU	CTS
Free Basic Electricity (FBE)	FALSE	FALSE	FALSE	0%	100%	218%	0%	100%	95%	239%	100%	61%
Domestic (pre-paid)	FALSE	FALSE	FALSE	0%	100%	218%	0%	100%	95%	239%	100%	61%
Business (conventional)	FALSE	FALSE	FALSE	0%	100%	218%	0%	100%	95%	239%	100%	61%
Domestic 1 phase (conventional)	FALSE	FALSE	FALSE	0%	100%	218%	0%	100%	95%	239%	100%	61%
Domestic 3 phase (conventional)	FALSE	FALSE	FALSE	0%	100%	218%	0%	100%	95%	239%	100%	61%
Redistributors/Resellers	FALSE	FALSE	FALSE	0%	100%	218%	0%	100%	95%	239%	100%	61%
Agriculture	FALSE	FALSE	FALSE	0%	99%	218%	0%	102%	95%	239%	98%	61%
Manufacturing/Industrial - large	TRUE	TRUE	TRUE	184%	210%	184%	101%	94%	101%	62%	57%	62%
Manufacturing/Industrial - small	TRUE	TRUE	TRUE	162%	194%	162%	100%	90%	86%	60%	54%	80%

BENEFITS OF THE TOOL: RATE IMPACT ANALYSIS

- Structural changes made to existing rates may affect customers **disproportionately**
- COS tool includes a rate impact analysis feature to **detect anomalies** prior to tariff implementation
- **Significant price distortions** may indicate that **further tariff segmentation** may be required



BENEFITS OF THE TOOL: DETERMINATION OF WHEELING CHARGES

- Key feature of the COS tool is the **separation of the wires business from the retail business**
- Allows network operators to **determine wheeling rates**
- Tariff setting module allows selection of **tariff scope as “Wires Only”** vs. “Wires+Retail”

Tariff Schedule (Year 2)

This sheet summarise the tariff schedule for Year 2 based on inputs on Rate Design Dashboard

Scope of tariffs calculated: **Wires+Retail**

RATE COMPARISON

New rates for Year 2 (dashboard) (Wires+Retail)

Customer Categories	Standing Charge	Average Demand Rate	Average Energy Rate	Total Average Rate
	Rand/month	Rand/kVA/month	cR/kWh	cR/kWh
Free Basic Electricity (FBE)	-	-	213	213
Domestic (pre-paid)	-	-	256	256
Business (conventional)	194	-	316	351
Domestic 1 phase (conventional)	-	-	278	278
Domestic 2 phase (conventional)	62	-	278	284
Redistributors/Resellers	305	-	293	314
Agriculture	1,041	349	154	190
Manufacturing/Industrial - large	1,404	203	173	189
Manufacturing/Industrial - small	3,461	332	181	227
Industrial Development Zone	6,375	231	175	193
Other consumers	2,362	173	118	312
Sold to other munic dept	519	-	211	211
Street lighting	342	-	328	329

Tariff Schedule (Year 2)

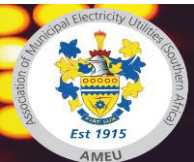
This sheet summarise the tariff schedule for Year 2 based on inputs on Rate Design Dashboard

Scope of tariffs calculated: **Wires only**

RATE COMPARISON

New rates for Year 2 (dashboard) (Wires only)

Customer Categories	Standing Charge	Average Demand Rate	Average Energy Rate	Total Average Rate
	Rand/month	Rand/kVA/month	cR/kWh	cR/kWh
Free Basic Electricity (FBE)	-	-	690	690
Domestic (pre-paid)	-	-	168	168
Business (conventional)	67	-	108	120
Domestic 1 phase (conventional)	-	-	213	213
Domestic 2 phase (conventional)	13	-	60	61
Redistributors/Resellers	55	-	53	57
Agriculture	108	36	16	20
Manufacturing/Industrial - large	18	3	2	2
Manufacturing/Industrial - small	687	66	36	45
Industrial Development Zone	1,316	48	36	40
Other consumers	823	60	41	109
Sold to other munic dept	133	-	54	54
Street lighting	147	-	141	141



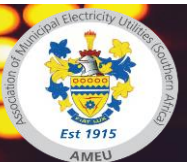
THE COS TOOLKIT

Distribution-Form Add-On

- **Automated population** of the simplified mode using data from a **D-form**
- Assist NERSA with **reviewing applications timeously**
- **Support municipalities** that are building their data repositories and/or capabilities

Distributed Generation Export Add-On

<https://share.synthesia.io/841bc5f4-c98f-4456-b669-48acbb31420e>



CONCLUDING REMARKS

- The **COS tool is compliant** with the current **NERSA Cost of Supply Framework** and **NRS 058**
- NERSA was **fully engaged with the specifications, development and validation of results** from the model
- The **COS tool is flexible** and can cater to the needs of both smaller municipalities and metros
- The DG export rate setting add-on helps municipalities to set **cost-reflective export rates** which will help **accelerate the BJET in SA**

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Thank you!

