68TH AMEU CONVENTION 2022

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A JUST ENERGY TRANSITION ("JET") FOR SOUTH AFRICA

Technical and Financial Impacts of SSEG on the Municipal Energy Sector

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GLS Consulting (Pty) Ltd

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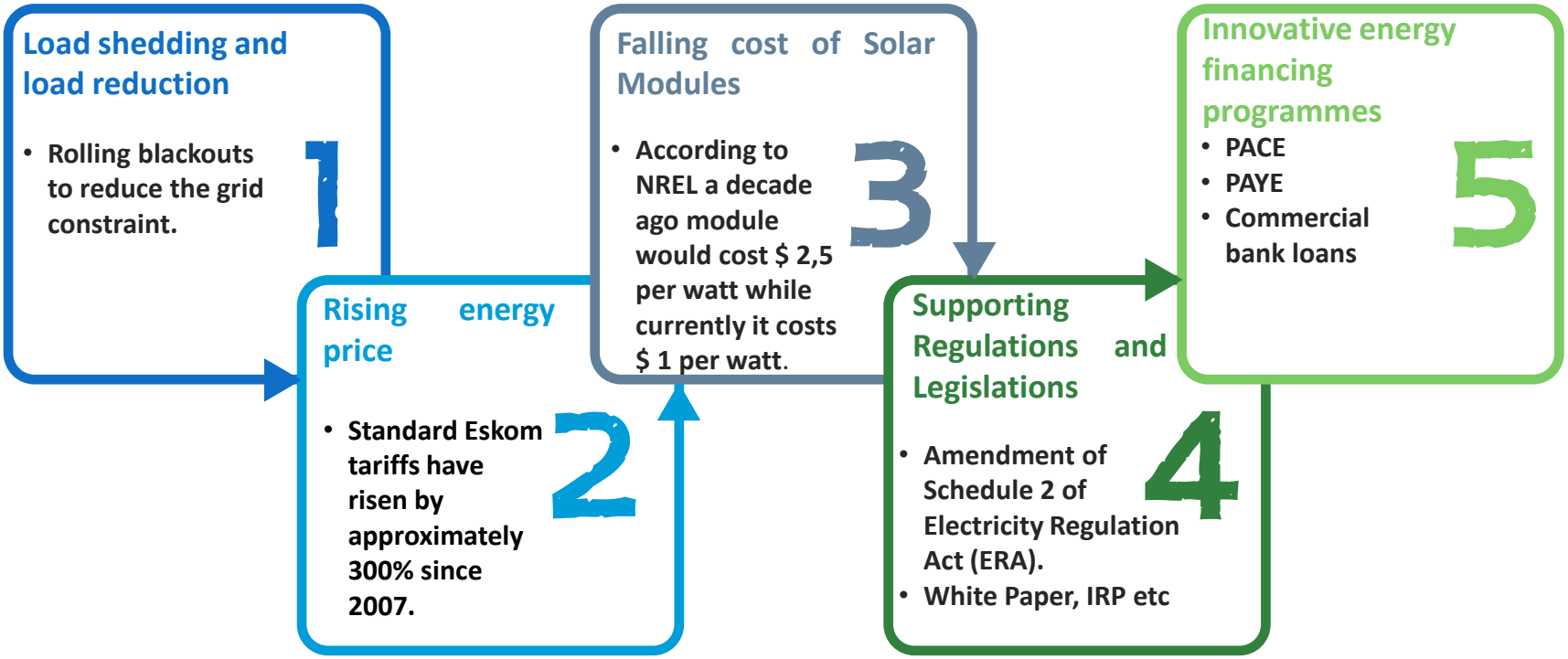
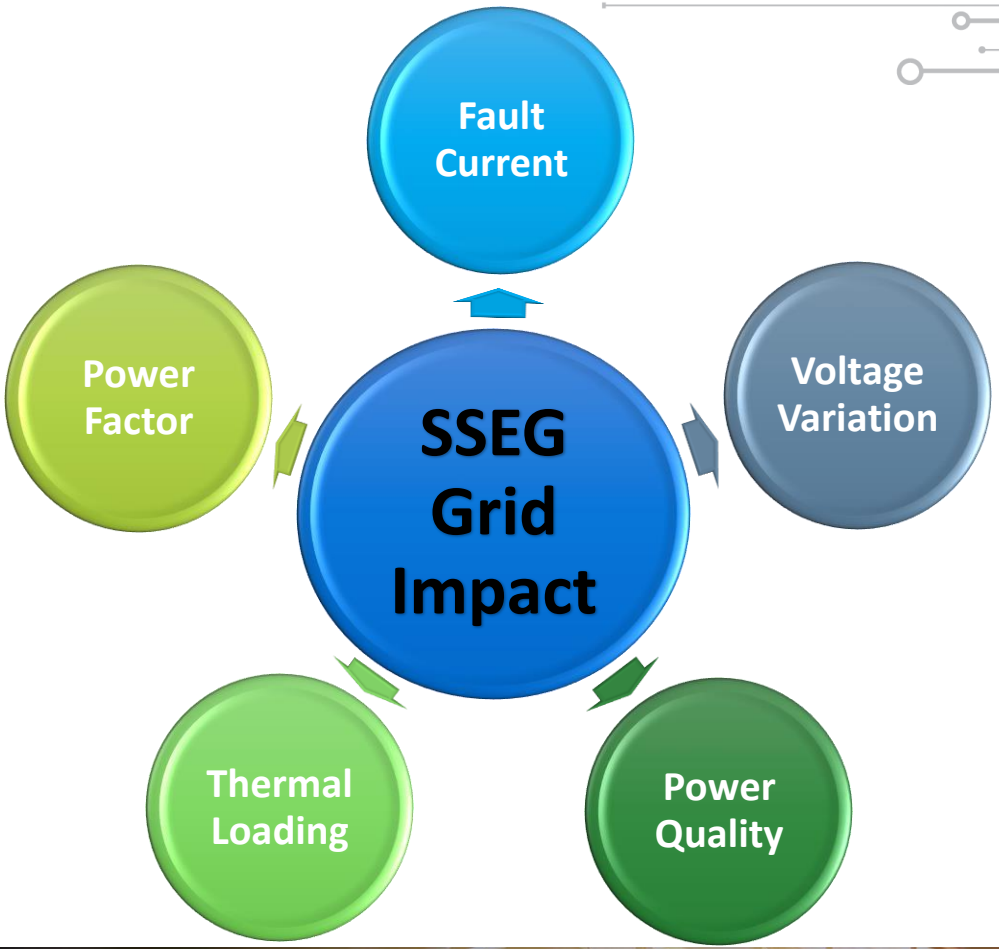
Background

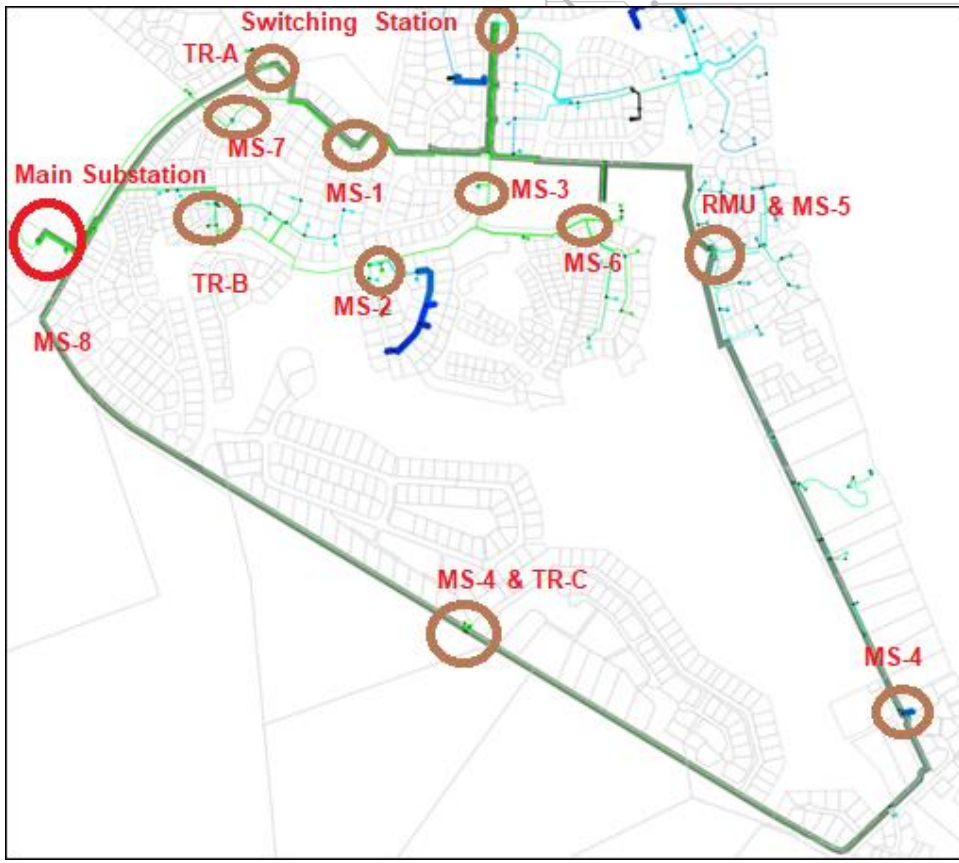

Load shedding and load reduction
• Rolling blackouts to reduce the grid constraint.
1
Rising energy price
• Standard Eskom tariffs have risen by approximately 300% since 2007.
2
Falling cost of Solar Modules
• According to NREL a decade ago module would cost $ 2,5 per watt while currently it costs $ 1 per watt.
3
Supporting Regulations and Legislations
• Amendment of Schedule 2 of Electricity Regulation Act (ERA).
• White Paper, IRP etc
4
Innovative energy financing programmes
• PACE
• PAYE
• Commercial bank loans
5

Technical impact of SSEG on the grid



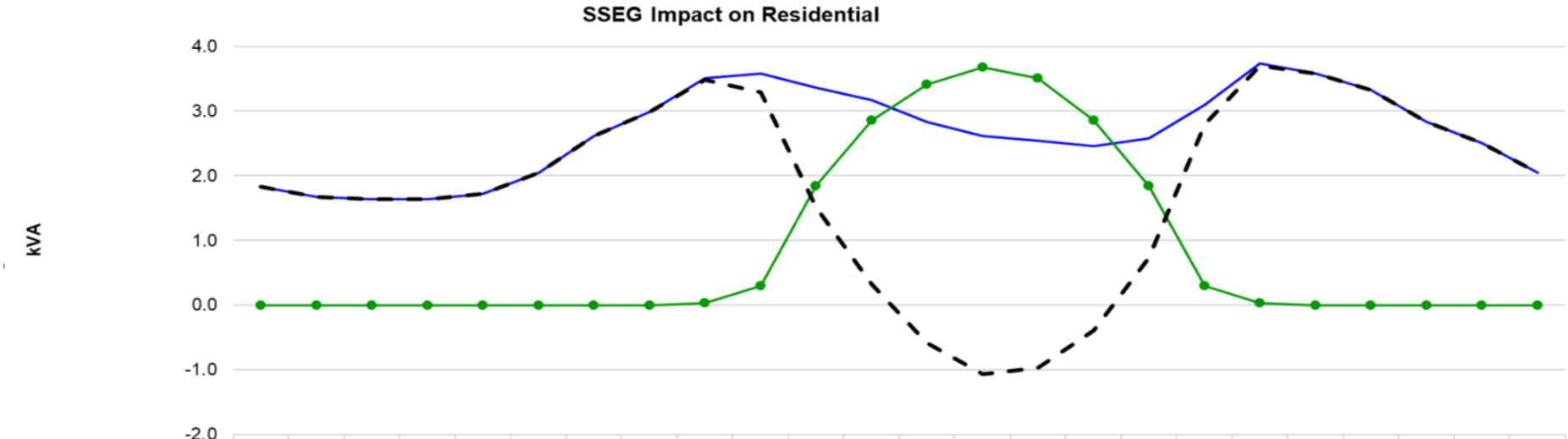
Network Supply Area

- 66/11kV Intake Substation supplied by Eskom.
- Focus on network supplying an affluent neighborhood.
- 11kV feeder supplies various MS,Transformer RMU and a Switching station.
- Over 353 consumers connected to the 11kV feeder.
- Peak demand for the substation is at 19:00.



Technical Analysis

1. PV generation profile for the area was assessed vs the typical residential load profile
2. The peak demand is not impacted by the PV installations**



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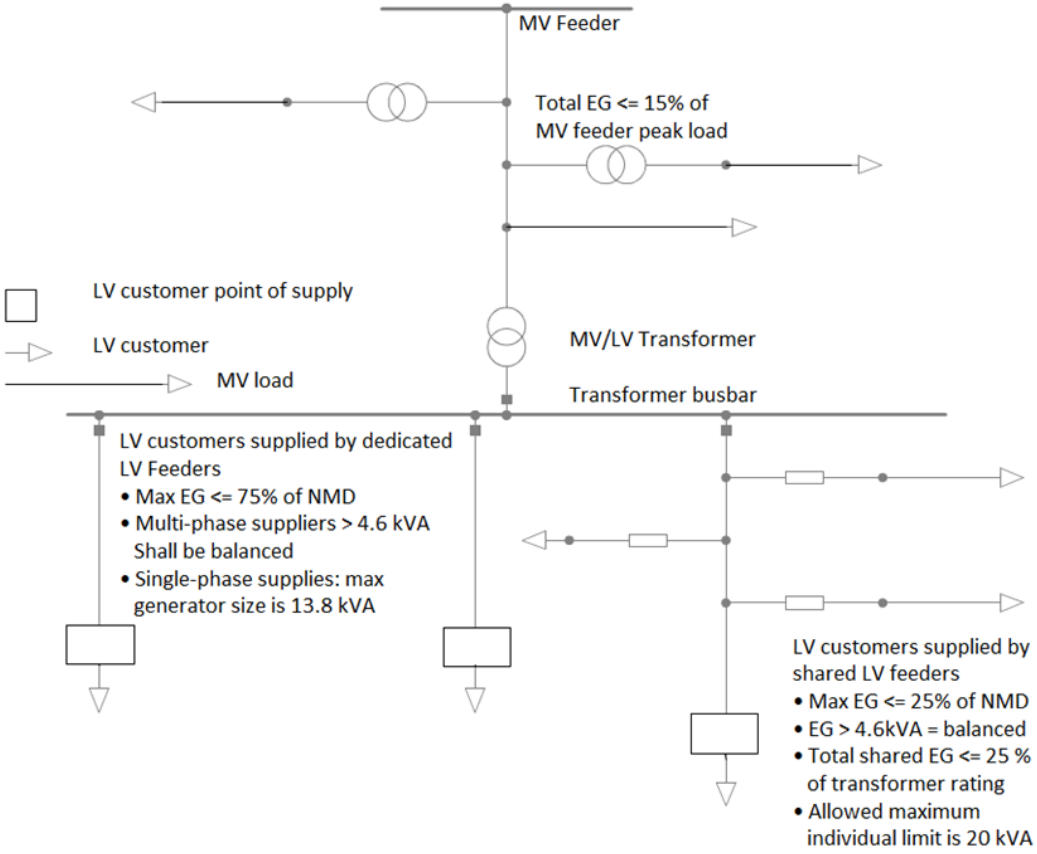
Res Profile	1.83	1.68	1.64	1.64	1.72	2.05	2.61	2.98	3.51	3.58	3.36	3.17	2.83	2.61	2.54	2.46	2.57	3.10	3.73	3.58	3.32	2.83	2.50	2.05
PV Profile	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.03	0.30	1.84	2.85	3.41	3.68	3.50	2.85	1.84	0.30	0.03	0.00	0.00	0.00	0.00	0.00
Combined Profile	1.83	1.68	1.64	1.64	1.72	2.05	2.61	2.98	3.48	3.28	1.52	0.32	-0.58	-1.07	-0.97	-0.39	0.73	2.80	3.70	3.58	3.32	2.83	2.50	2.05

Technical Analysis



1. MD of the feeder is 1300kVA
2. Residential Solar PV System size is 3,68 kVA.
3. **15%** SSEG Penetration has 195kVA of generation (53 installations)
4. **100%** SSEG Penetration has 1300kVA of generation (353 installations)
5. **200%** SSEG Penetration has 2600kVA of generation (707 installations).

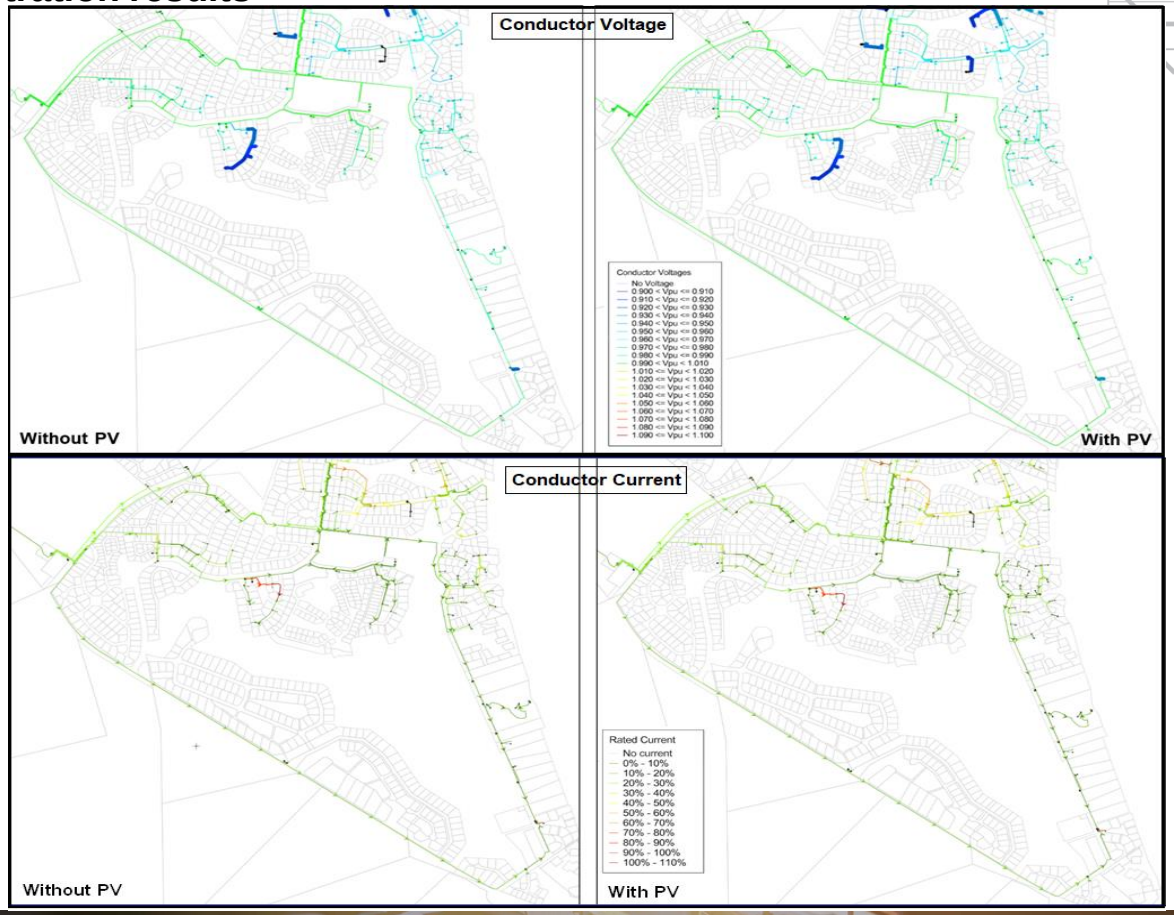
Technical Analysis

15 % Solar Penetration results

Conductor	Nominal Voltage [V]	PV Installation	Loading [%]	Voltage [p.u.]	Voltage Change [%]
Supply to Main Substation	66000	Without PV	21%	1.00	0.0%
Supply to Main Substation	66000	With PV	20%	1.00	
From Switching Station	11000	Without PV	8%	0.99	0.0%
From Switching Station	11000	With PV	6%	0.99	
To RMU	400	Without PV	8%	0.93	0.9%
To RMU	400	With PV	6%	0.94	

Technical Analysis

15 % Solar Penetration results



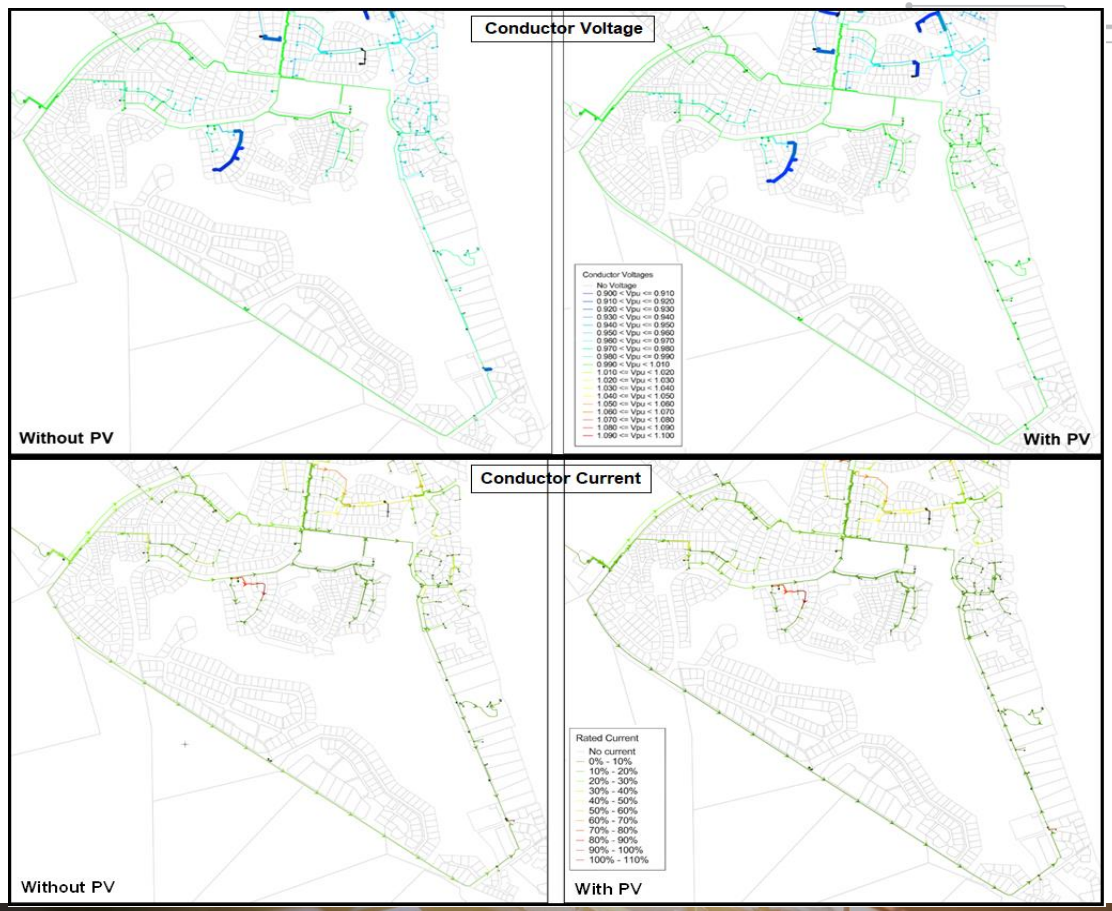
Technical Analysis

100 % Solar Penetration results

Conductor	Nominal Voltage [V]	PV Installation	Loading [%]	Voltage [p.u.]	Voltage Change [%]
Supply to Main Substation	66000	Without PV	21%	1.00	0.1%
Supply to Main Substation	66000	With PV	16%	1.00	
From Switching Station	11000	Without PV	8%	0.99	0.2%
From Switching Station	11000	With PV	6%	1.00	
To RMU	400	Without PV	8%	0.93	5.6%
To RMU	400	With PV	6%	0.99	

Technical Analysis

100 % Solar Penetration results



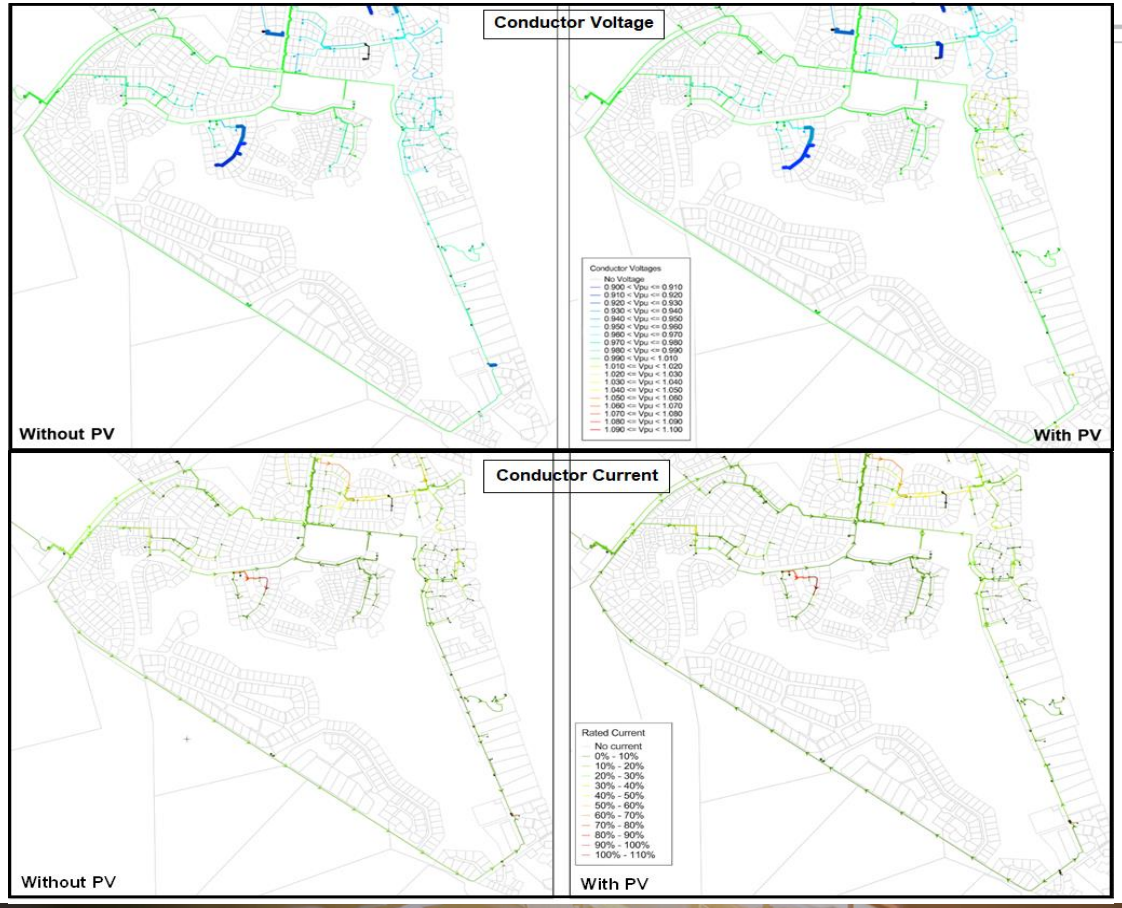
Technical Analysis

200 % Solar Penetration results

Conductor	Nominal Voltage [V]	PV Installation	Loading [%]	Voltage [p.u.]	Voltage Change [%]
Supply to Main Substation	66000	Without PV	21%	1.00	0.1%
Supply to Main Substation	66000	With PV	12%	1.00	
From Switching Station	11000	Without PV	8%	0.99	0.3%
From Switching Station	11000	With PV	18%	1.00	
To RMU	400	Without PV	8%	0.93	10.1%
To RMU	400	With PV	18%	1.03	

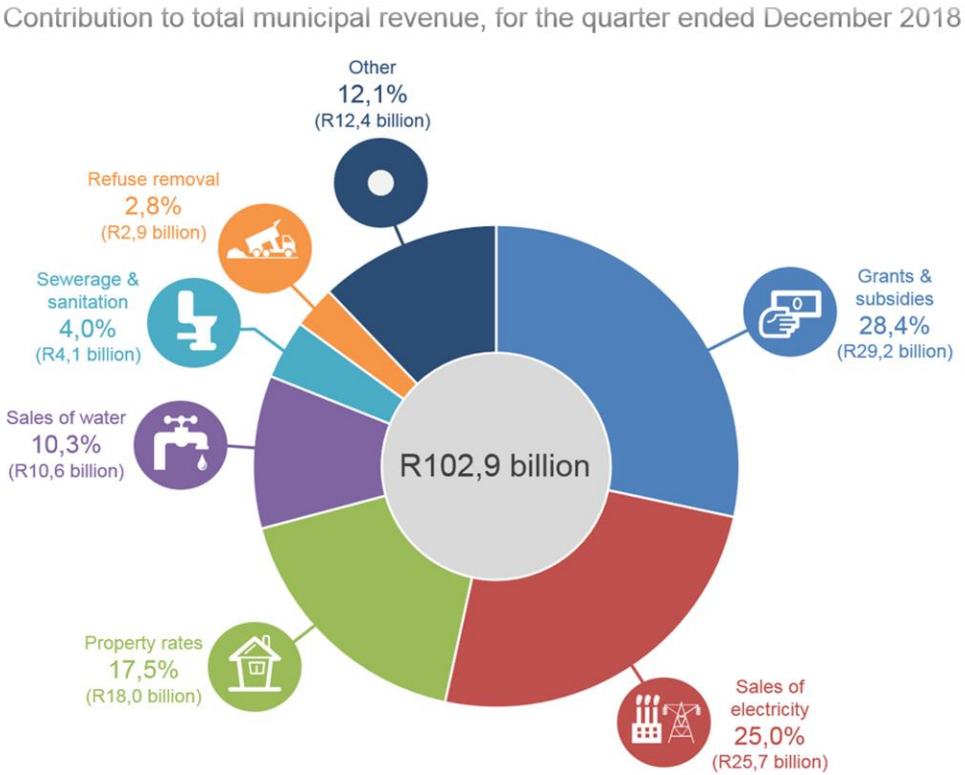
Technical Analysis

200% Solar Penetration results



Revenue Analysis

Where do municipalities get their money from?



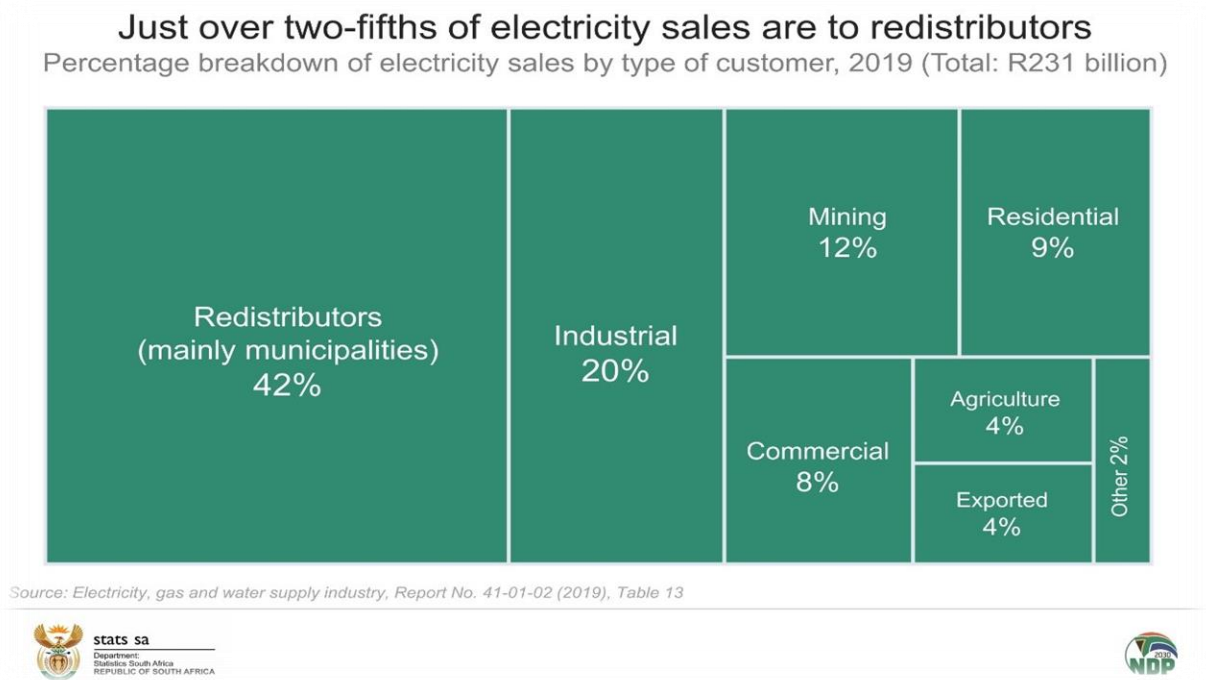
Exchange transactions which include:

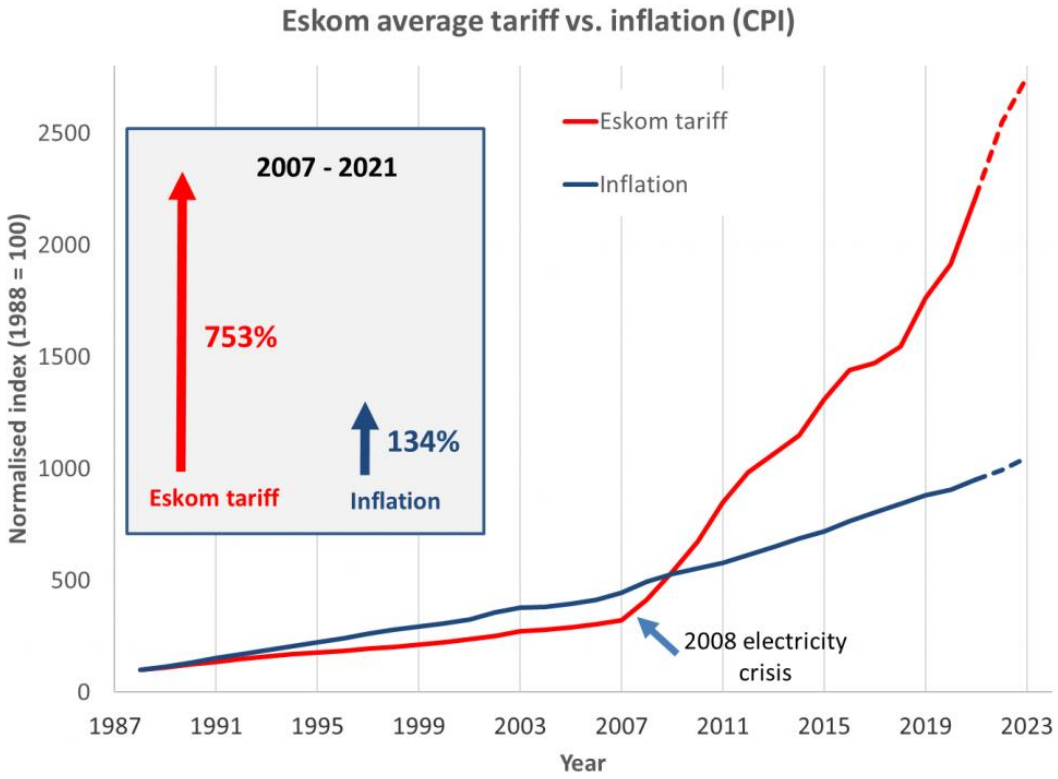
- Service charges (electricity, water etc.)
- Rental facilities
- Interest earned-external investments

Non-exchange transactions:

- Conditional grants, allocations, and statutory funds
- Equitable share
- Fines, license fees, taxes etc.…

According to StatsSA in a September 2021 article regarding energy usage in South Africa, redistributors of electricity were the biggest customers of electricity in 2019





Overall average increases in Eskom tariffs

Eskom's average tariff charges have seen an exponential growth between 2003 and 2019

Source: Power Optimal-*"2021 update: Eskom tariff increases vs inflation since 1988 (with projections to 2023)"*

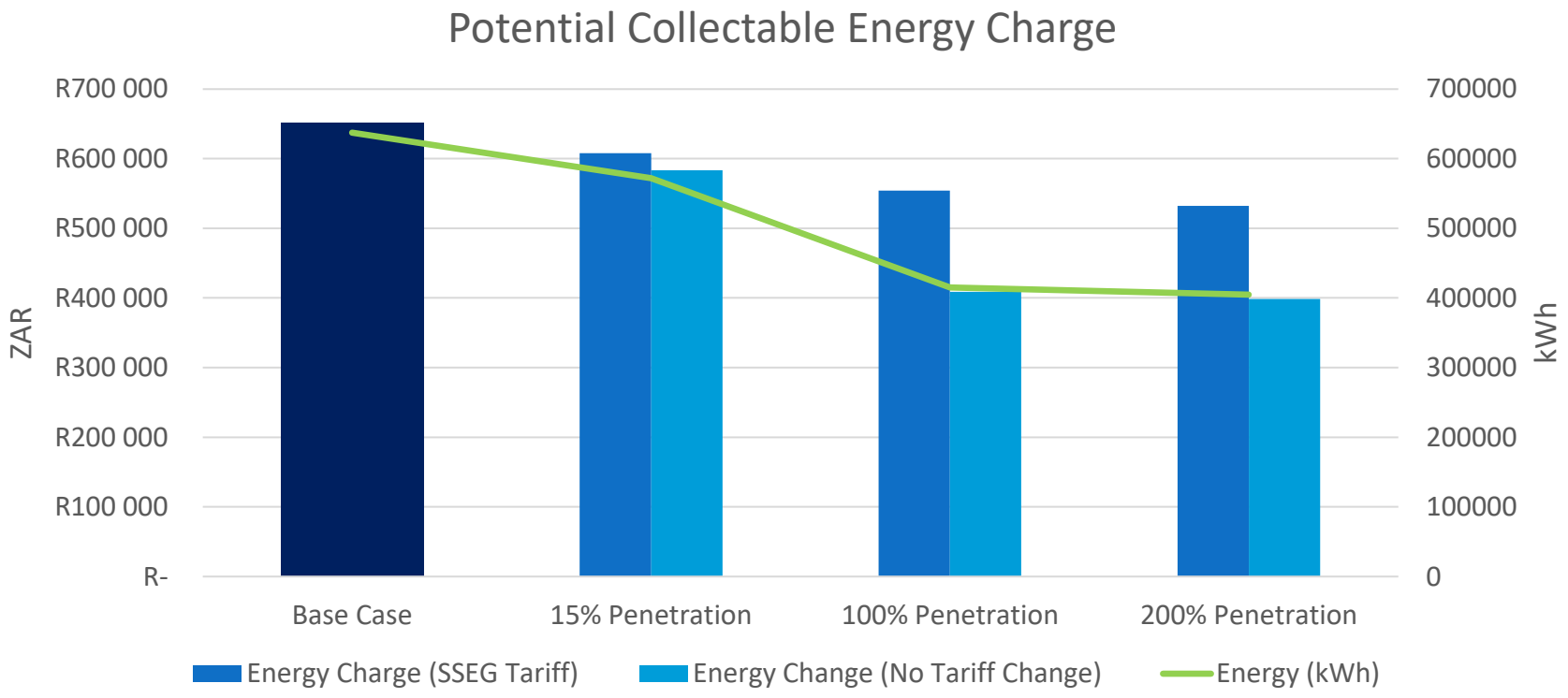
Analysis Roadmap

1. Link Billing Data to Cadastral
2. Geospatial view of billing data as stands
3. Identify sample supply area stands
4. Stands contain treasury data – input to model
5. Simulate PV penetration and record results

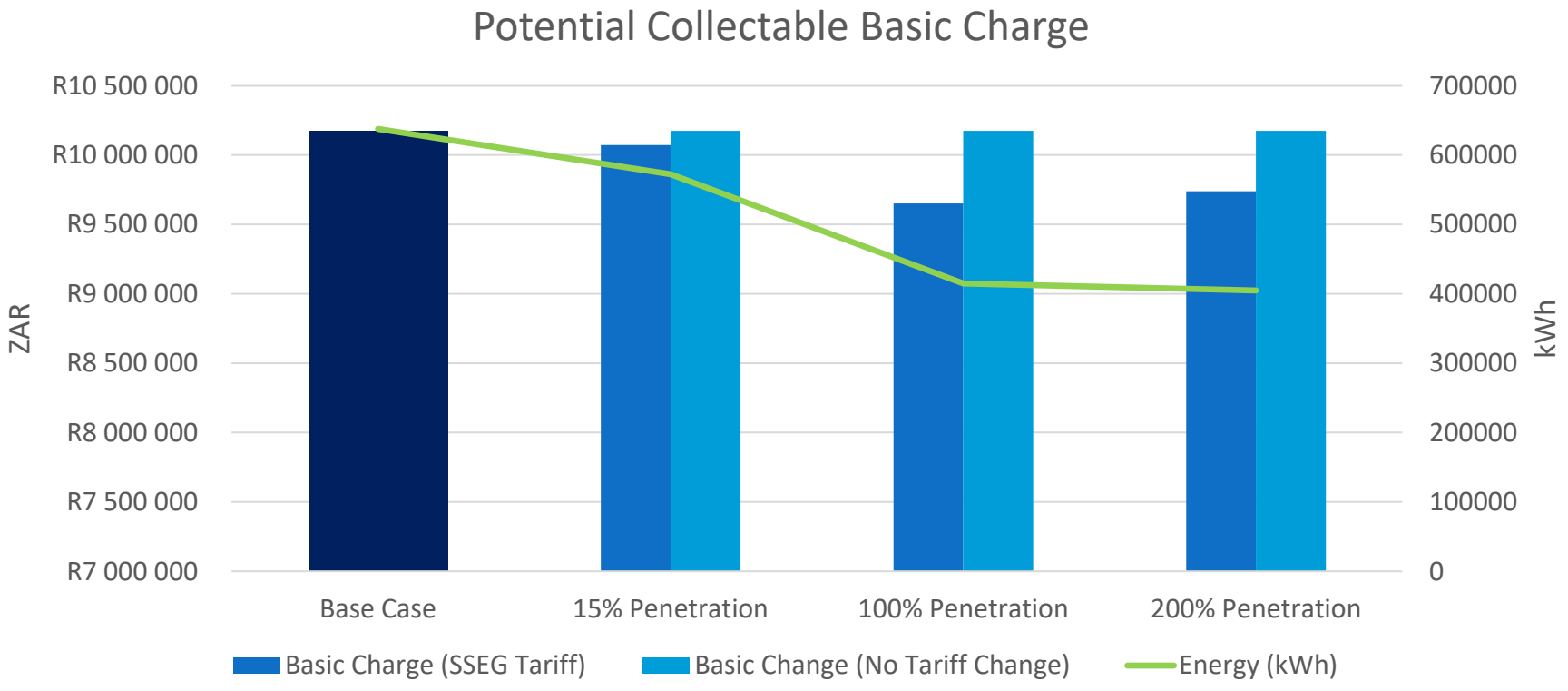
Revenue Analysis – Customers Assessed

Customer Class	Number of Customers
Domestic Prepaid	261
Domestic Conventional	1162
Commercial Prepaid	6
Commercial Conventional	55
Bulk User	36
Single Phase SSEG	0
Three Phase SSEG	0
Total Customers	1520

Revenue Analysis Results



Revenue Analysis Results



Concluding Remarks

This case study looked at both the technical and financial impacts of integrating SSEG systems into a typical local municipality:

- Installation of SSEG has an impact on both line loadings and voltage variation. Therefore, municipalities should conduct a grid impact study to better understand and manage the integration of SSEG.
- Municipalities should create comprehensive SSEG policy to support JET for both municipality and customer.
- The importance of a comprehensive cost of supply to determine cost-reflective tariffs to charge customers.
- The municipality should be aware of properties with SSEG installations to ensure the customer is charged correctly with a fair tariff to collect the revenue requirement.

A secure and optimal energy transition should always strike a balance between protecting municipal earnings and presenting a business case for the SSEG customer – Joshua Chanyandura

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Thank you

GLS Infrastructure planning

ETHEKWINI MUNICIPALITY