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Maximizing energy system, Cooperation between city policy and the private sector

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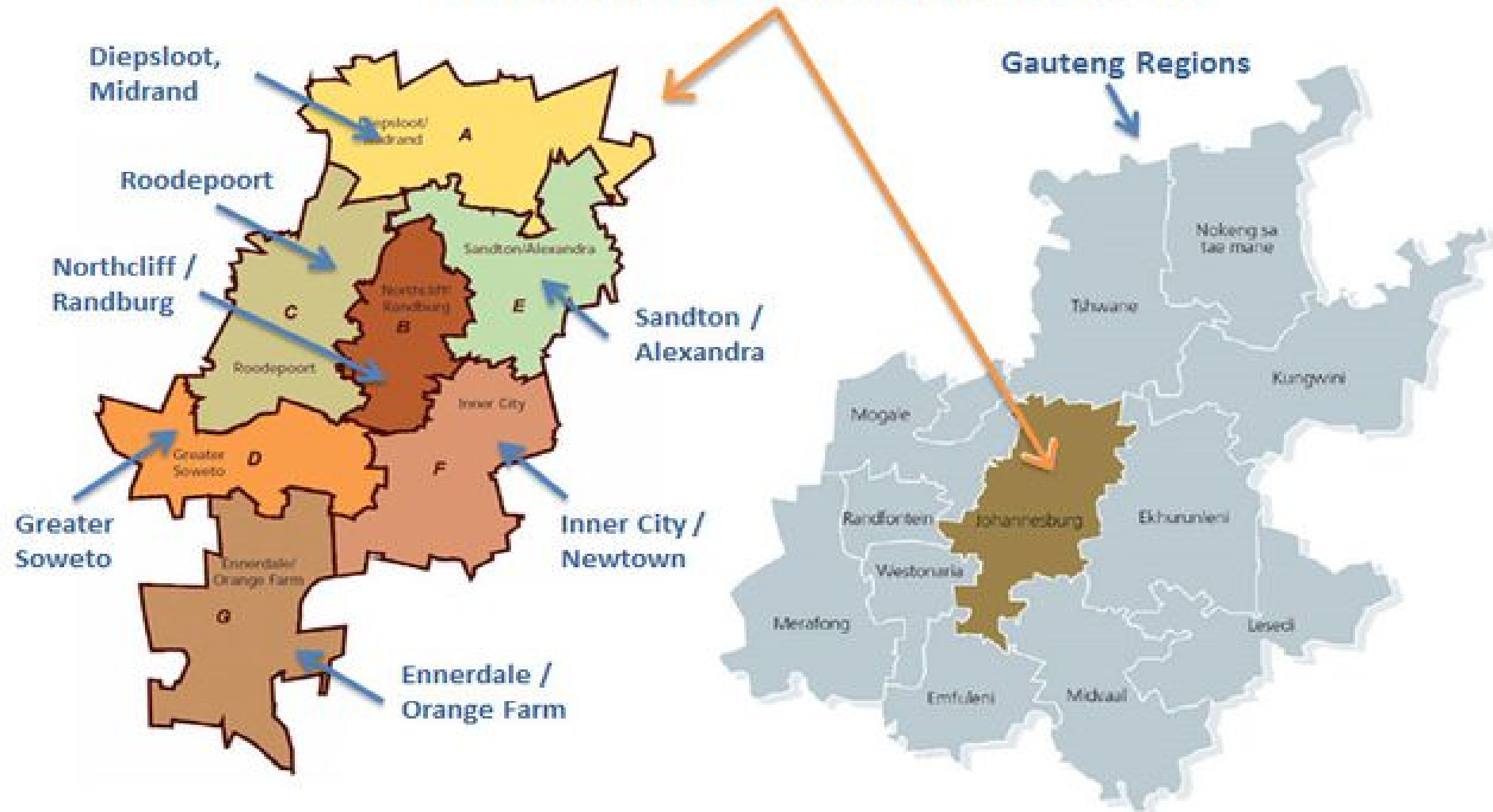


- Johannesburg is a city of some 5 million people
- Produces 17% of SA economic value and employs 11% of its labour force
- It is at the core of an extended, virtually continuous urban region of 12.3 million people (23% of SA's total population)



Johannesburg is situated within the Gauteng City-region – a polycentric city-region with a population estimated at 12.3 million people in 2011

JOHANNESBURG ADMINISTRATIVE REGIONS

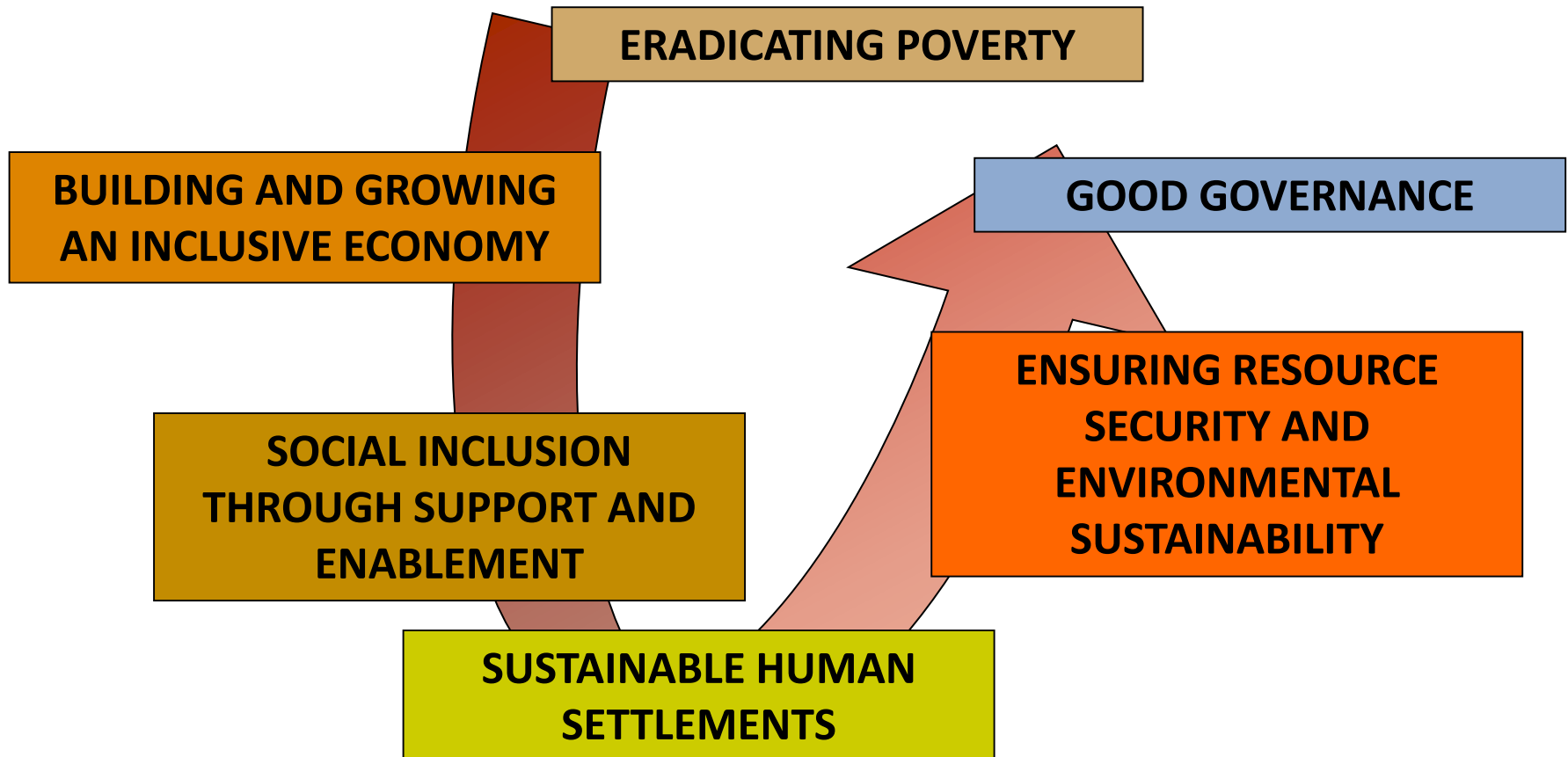


JOHANNESBURG IN CONTEXT

- Remains South Africa's economic powerhouse – concentration of large industries and businesses
- Joburg is the main driver of national growth – historically performing at 50% higher than national growth rates
- Covers 1 600 square kilometers of surface area
- Average density of 3039.5 people per square kilometers
- Average households growth rate for the City in the last 10 years was 36.3%.
- The current households growth rate is expected to be around 2.1%
- Between 2015 and 2021, the number of households are expected to increase by 14.5%

Our strategic intention...

Collectively, the principles of the GDS reaffirm the City of Johannesburg's commitment to the objects and duties of local government outlined in the Constitution. Our 6 principles help us think through the complex challenges facing us, and state our approach to solving them

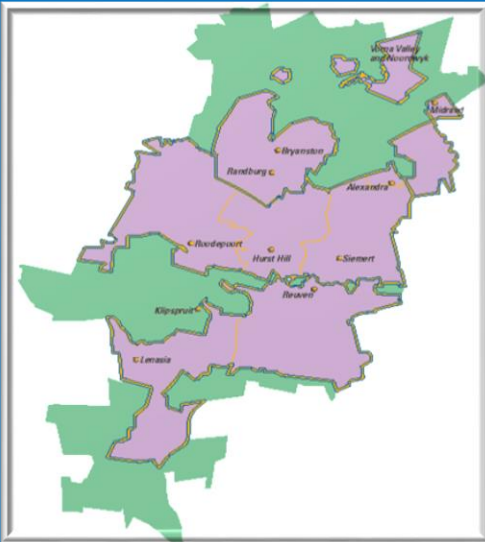




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City Power at a Glance



Vision: World Class Electricity Utility

MOE: City of Johannesburg is the single shareholder of City Power

Number of customers: Over 460,000 - LPU: 1%, Prepaid: 62%, Conventional Business/Domestic: 37%

Revenue: R13.2bn

Employees: Over 1,700

Only utility in Africa with three ISO accreditations (9000, 14001 and 18001)



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City Power at a Glance

We are in the business of buying electricity and selling it to customers



Eskom and/or
Independent Power
Producers (IPP)

City Power





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City Power at a Glance



(41) with **6** major intake points from Eskom

Current capacity demand of **3.5 GW**

Predicted future demand to reach **6 GW** in 2030

R8.5b invested in infrastructure in the past 10 years

R40b required in the next 20 years



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Power Industry Liberalization

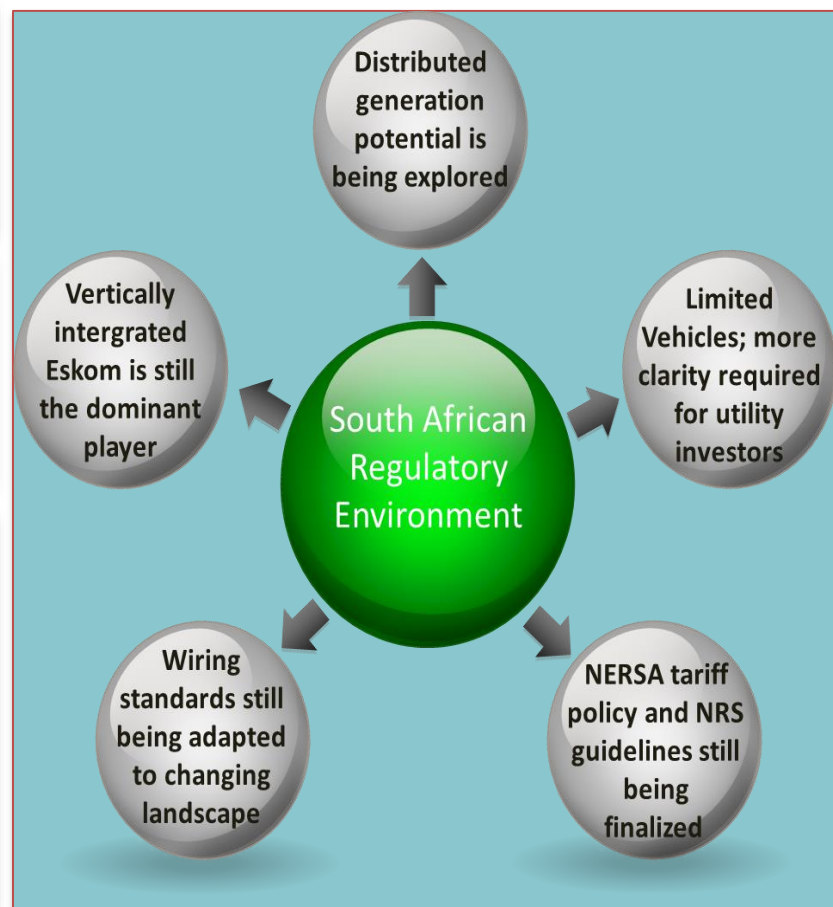
Regulatory environment within South Africa has been lagging behind developments in the distribution industry

Eskom is the dominant player and still a vertically integrated utility; municipal distributors are dependent on Eskom; regulatory environment mirrors this model

Concept of distributed generation explored by municipal distributors as a partial solution to country's energy crisis and part of the future energy mix is still evolving

Key Changes being advocated:

- Decentralized future energy mix
- Evolution of grid standards and guidelines
- Enabling municipal distributors to adopt own and private generation into the energy mix
- Simplifying the private generation licensing process



- Simplifying the private generation licensing process
- Enabling municipal distributors to adopt own and private generation into the energy mix



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City Power Policy Overview

Aimed at facilitating, permitting and regulating Own and Private Distributed Generation within the licensed area of supply



Different off-take possibilities – whole plant generation, excess generation only or a combination of both; Different dispatch modes - self-dispatched or dispatched



City Power's Distributed Generation Categories

Customer
Generation
< 1MW

Customer
Generation
> 1MW

Dedicated
Independent
Power
Producer
(IPP)

Municipal
Owned
Entity (MOE)
Generation

City Power
Own
Generation



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Distributed Generation Catering for...

Category	Description	Examples
Customer Generation < 1 MW (Self-dispatch)	<i>Residential and commercial customer installations of small scale embedded generation</i>	<ul style="list-style-type: none"> PV installations at residential and commercial establishments Application received for 1000kWp PV at Clear water mall – plus many others
Customer Generation > 1 MW (Dispatch / Self-dispatch)	<i>Existing CP large power users installing own generators; searching for off- taker of excess power</i>	<ul style="list-style-type: none"> MTN quad generation facility @ 5.8MW ABSA co-generation facility @ 18MW of which 2MW grid connected At least 45MW identified within City Limits
IPP (> 1 MW) (Dispatch / Self-dispatch)	<i>Any independent producer interested in selling power to City Power</i>	<ul style="list-style-type: none"> Co/tri/quad gen plants, fuel cells, PV farms etc.
MOE generation (Dispatch)	<i>Other City subsidiaries exploring utilization of its resources to produce power</i>	<ul style="list-style-type: none"> JW's hydro conduit PickitUp's waste to energy City Theatre's gas generation
City Power Own Generation (Dispatch / Self-dispatch)	<i>City Power's own generating resources under the direct control of city power</i>	<ul style="list-style-type: none"> CP's gas turbine generating sites PV in unused lands of CoJ and leased rooftops Battery Storage Plant



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Power System Topology

City Power electricity grid is largely interconnected with pockets of settlements where the distribution infrastructure is limited

Those areas where the distribution infrastructure has capacity constraints, it may be augmented with PV with an element of storage

Thembelihile and Lawley Informal Settlement

- Grid tied micro system supply the dwelling loads directly
- Grid connected PV hybrid system with battery storage
- Surplus energy if any to be exported to grid



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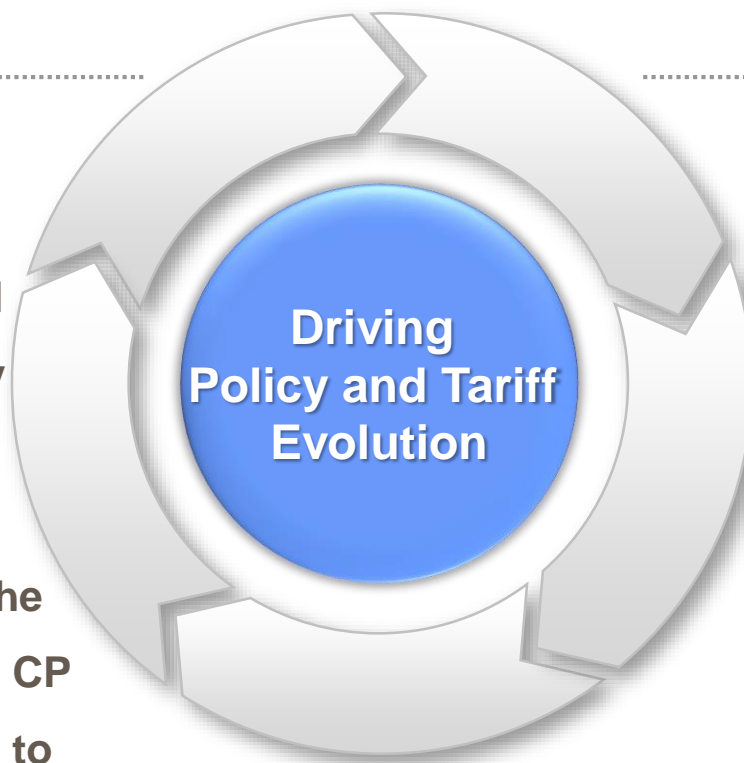
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Cooperation between City Policy and Private Sector

Customer generation is viewed as future IPP partners; micro-sized and distributed within the City

The more the distributed generation penetration, the more the revenue impact; CP revenue model and tariffs to be gradually (decoupled) transformed to increase fixed to variable charges



Utility service offering is to still provide grid for energy balancing and back-up services

Net metering cannot be supported without losing revenue; however City Power offers avoided Eskom costs for the surplus that generators produce



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Evolving Business Model

City Power working towards removing the restrictions of Municipal Finance Regulations (MFMA) – long term PPAs with purchasing prices < Eskom price;

Eskom's tariffs are increasing while alternate technology costs are decreasing; the cross over is likely to happen within the next decade

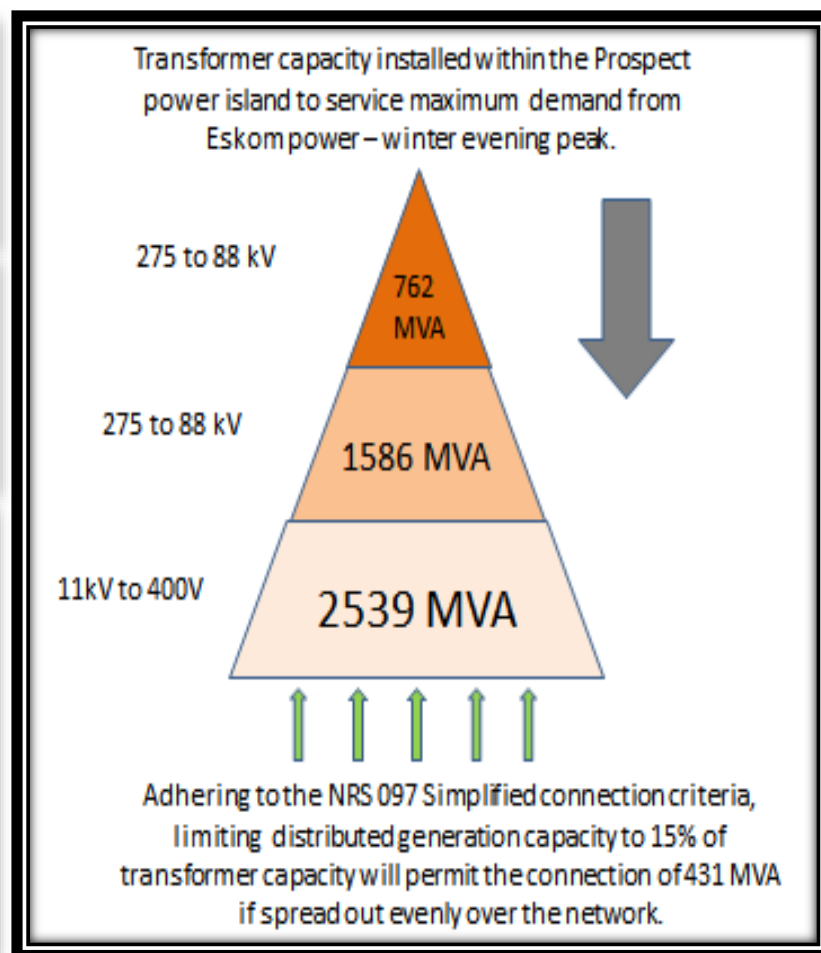
Eskom Vs Private generation

- Private distributed generation can be built faster
- Private generation pricing can be escalated by CPI only
- City Power has an abundance of load and can disperse significant distributed generation;
- Majority of private distributed generation is cleaner and can count as greener energy to fulfill the City of Joburg's environmental commitments

environmental commitments

count as greener energy to fulfill the City of Joburg's

- majority of private distributed generation is cleaner and can





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Load Profile Challenge

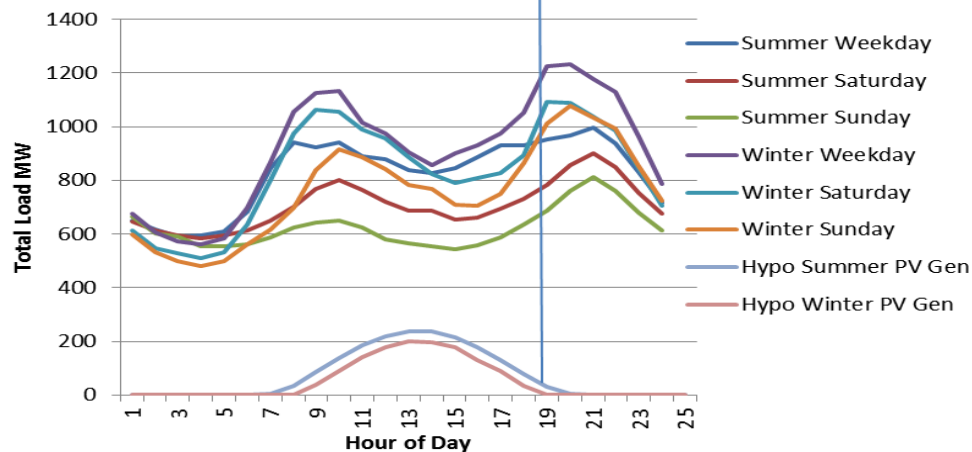
Dispatched vs Self dispatched

- Self-dispatched power does not eliminate morning and evening peaks
- Most PV installations are self dispatched unless an element of battery storage included
- Hybrid Photovoltaic Electricity System is the preferred option and meets customer needs
- Dispatched generation is mainly gas fired but is restricted by the limited availability of gas

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City Power is still liable for the morning and evening peak energy costs and excessive network demand charges

Jhb - Eskom Summer and Winter Eskom Load Profiles, PV generation subtracted





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Complimenting Self-dispatched Generation with Flexible Loads

Load Management is enabled by smart metering technology

On demand flexible loads can be created through load limiting and demand response programmes

Load profiles can be shaped by implementing dynamic pricing or time of use tariffs

Flexible load can be sold as an ancillary service in future to enable the emerging electricity trading market

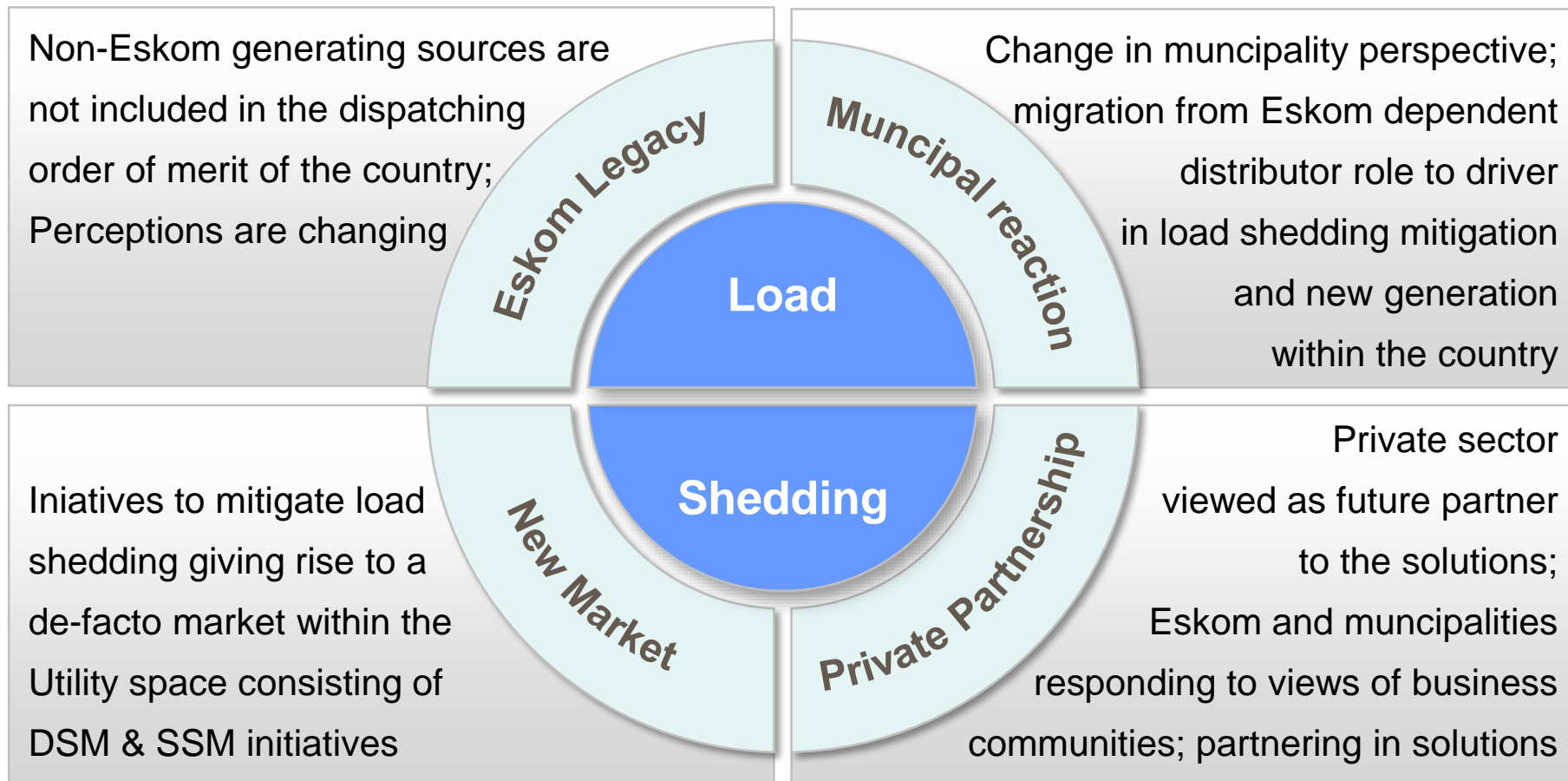




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Disruptions resulting from Load Shedding



Conclusion



- We have a legacy of regulation and out-dated policy and are at the forefront of driving change, as the energy landscape evolves
- We have the advantages of new technologies as well as the challenges of their disruptive effects to include in our evolutionary process
- We know that we are not alone – virtually all utilities across the globe face similar issues
- We look forward to exploring all viable solutions that are being implemented around the globe



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