

African Utility Week

Swaziland's access to electricity success story

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www.african-utility-week.com

THE CSIR IS A MULTIDISCIPLINARY RESEARCH COUNCIL

The CSIR's Executive Authority is the South African Minister of Science and Technology

Mandate: Directed R&D for socio-economic growth

In numbers:



1945 - 2017



2 668

Total staff



350

SET base with PhD



490

Publication
equivalents



~ \$200 m

Total operating income



1 980

Total in SET base



WHAT IS DIFFERENT TODAY COMPARED TO A FEW YEARS AGO?

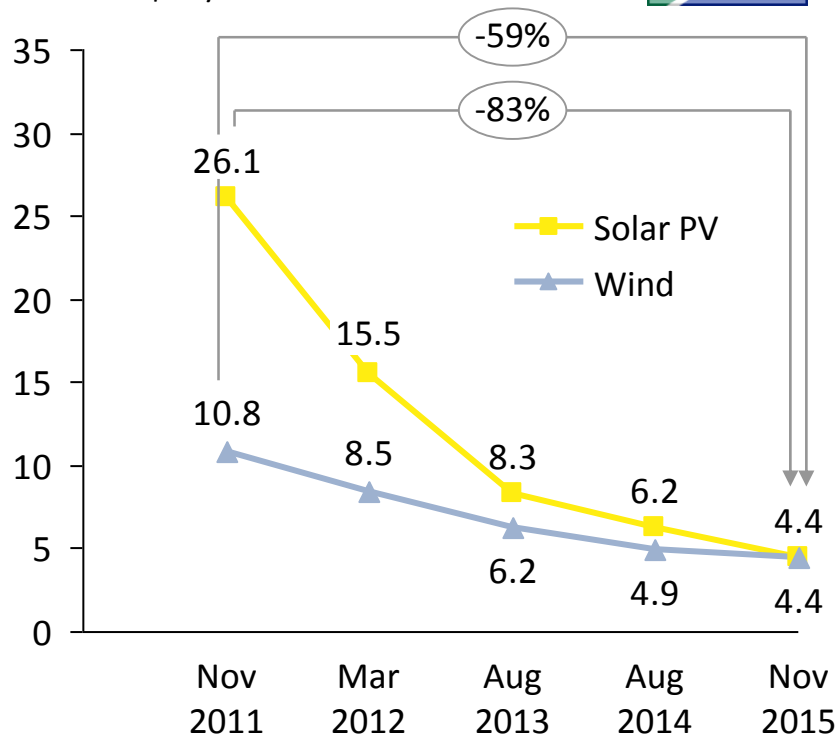
- **Renewables are now cost competitive to alternative new-build options in large parts of Africa**
 - ❑ Renewables became cost competitive to conventionals during the last decade (PV: last 2-3 years)
 - ❑ Subsidy-driven market creation in first-mover renewables regions (US, Europe, Japan) led to technology improvements and mass manufacturing
- **In matured markets, renewables are a substitution in a volume-wise stagnating energy system**
 - ❑ Renewables compete with an existing, steady-state energy system → fuel savers for the existing fleet
 - ❑ Major incumbents with business models based on “large, central” suffer in terms of market share
- **In emerging markets, this is different: renewables can be at the core of the energy-system expansion**
 - ❑ Renewables compete with alternative new-built options / future scenarios for the energy structure
 - ❑ More than just fuel savers, they change the entire paradigm on which energy systems were traditionally planned, designed, built and operated (large, central → small, distributed)

ACTUAL TARIFFS: NEW WIND/SOLAR PV 40% CHEAPER THAN NEW COAL IN RSA

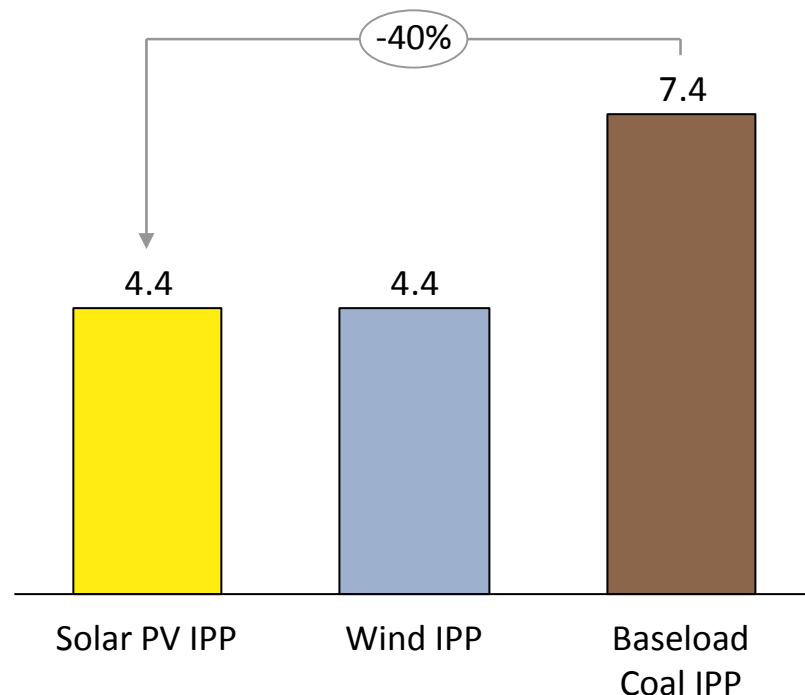
Significant reductions in actual tariffs ...

... have made new solar PV & wind power 40% cheaper than new coal in South Africa today

Actual average tariffs
in \$-ct/kWh



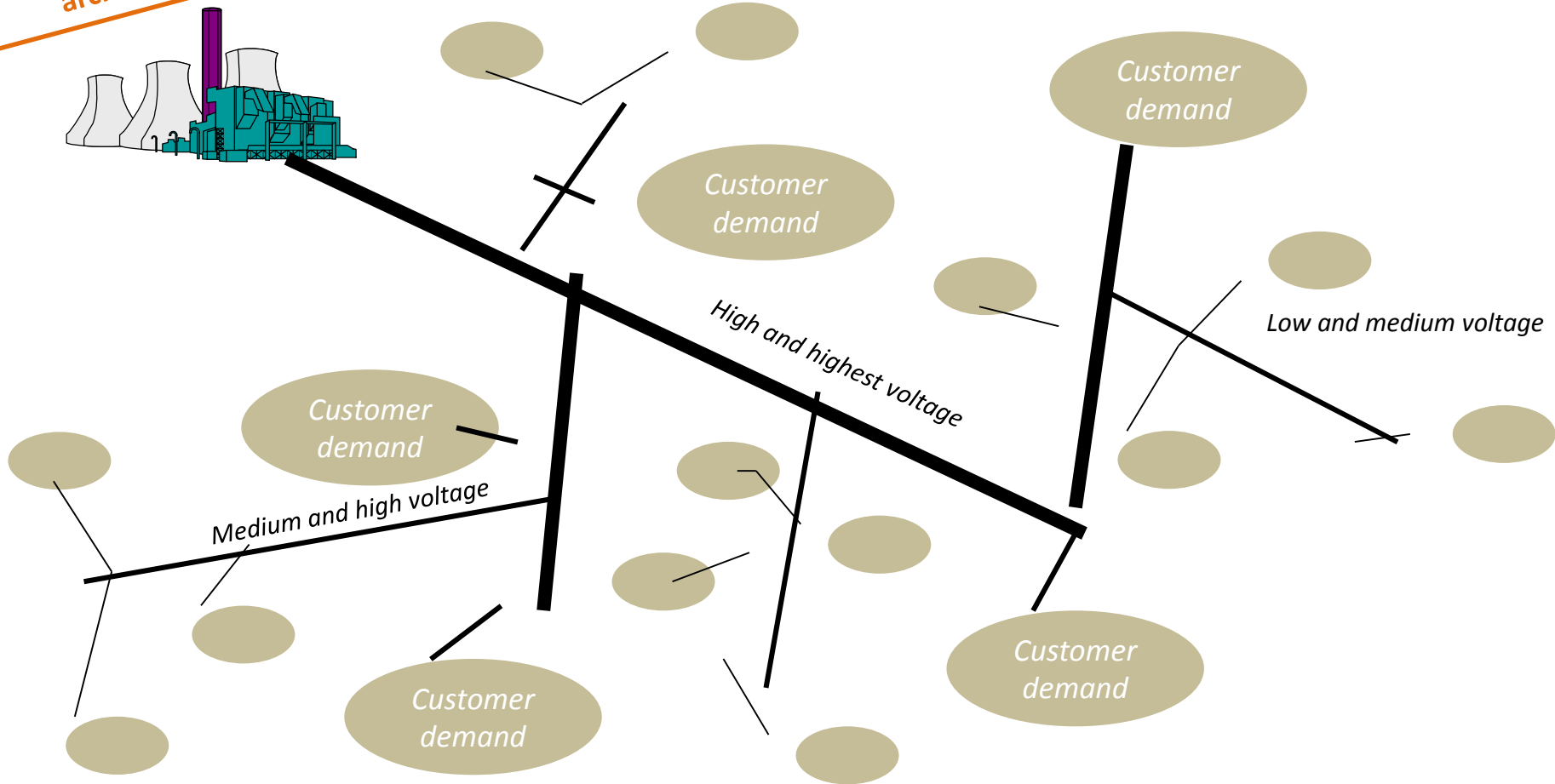
Actual average tariffs
in \$-ct/kWh



Notes: Exchange rate of 14 USD/ZAR assumed Sources: <http://www.energy.gov.za/files/renewable-energy-status-report/Market-Overview-and-Current-Levels-of-Renewable-Energy-Deployment-NERSA.pdf>; <http://www.saippa.org.za/Portals/24/Documents/2016/Coal%20IPP%20factsheet.pdf>; http://www.ee.co.za/wp-content/uploads/2016/10/New_Power_Generators_RSA-CSIR-14Oct2016.pdf; StatsSA on CPI; CSIR analysis

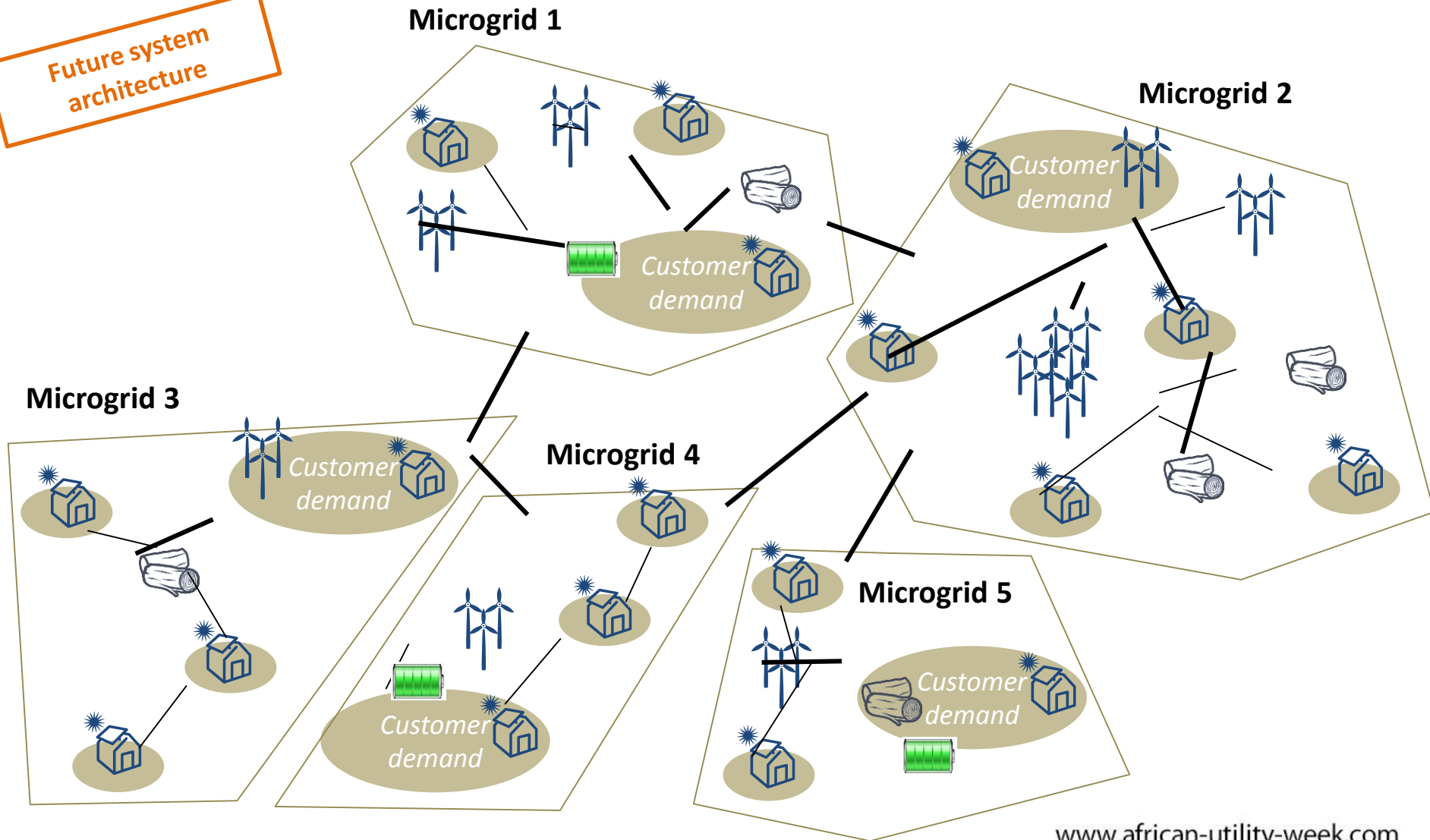
HISTORICALLY, DEMAND WAS SUPPLIED BY LARGE, CENTRAL POWER GENERATORS WITH A HIGH-VOLTAGE BACKBONE AND AN EVER FINER-GETTING GRID

Today's system architecture



HIGHER RELIABILITY & LOWER COSTS ARE ACHIEVED BY INTERCONNECTING

Future system architecture



CHALLENGES IN SOUTH AFRICA

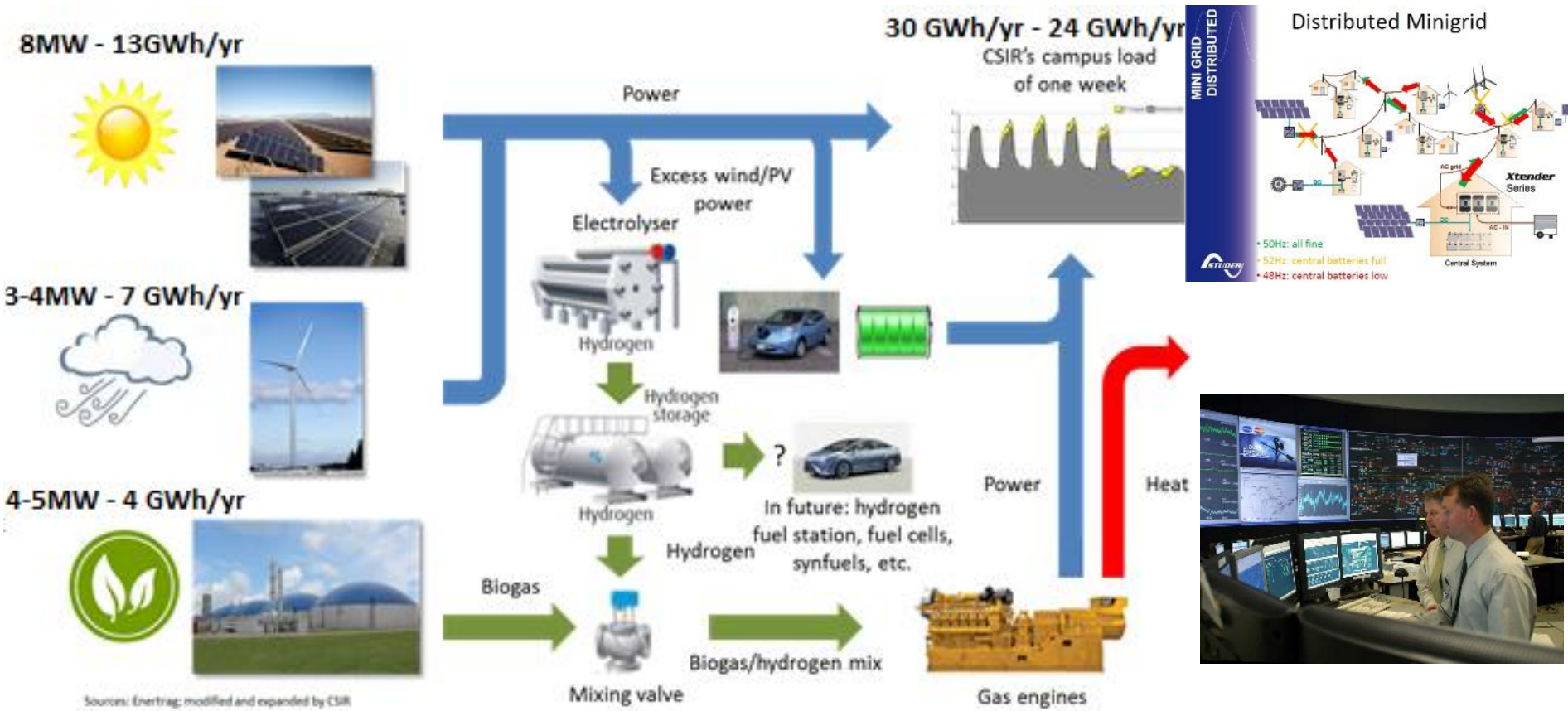
Challenges

- Rural electrification rate of 77% (approx. 3m people without electricity)
- Informal settlements in urban areas
- High grid connection cost
- Grid congestion
- Micro grids perceived as high risk by investors

Micro grids as a solution

- Grid tied micro grids could ease grid congestion
- Majority would be solar powered (clean and cheap)
- Community development

CSIR ENERGY-AUTONOMOUS CAMPUS IN PRETORIA: REAL-WORLD IMPLEMENTATION OF A LEAST-COST, RENEWABLES-BASED MICROGRID



Sources: Enertrag; modified and expanded by CSIR

REAL WORLD PLATFORM FOR RESEARCHERS

CSIR's Energy-Autonomous Campus

Platform for CSIR researchers and partners (companies and universities) to optimally design, implement and operate microgrids and to demonstrate new energy technologies in a real-world environment

Typical Services and Solutions on the Energy-Autonomous Campus

- Installation and operational guidelines for renewable power
- Procurement guidelines for renewable plants
- Smart and Micro Grid design and operation guidelines
- Installation and operational guidelines for battery storage systems in micro grids
- Test bench for new renewable technologies

Additional CSIR Energy Systems research work

- Development of Integrated Resource Plans for cities, regions, countries
- Development of operational guidelines and procedures for high-RE power systems

CASE STUDY: THE KINGDOM OF ESWATINI



1968 - 2018



1.3 m

Population



~ \$3.5 bn

GDP



75%

Acces to electricity



LIMITED SECURITY OF SUPPLY

SWAZILAND's Peak Demand: **223MW**

❑ Capacity = 69MW

❑ Hydro = 60MW

- SEC Internal supply = 20%

- Imports = 80%

❑ Load shedding due to Eskom

❑ High Import Costs – EDM and ESKOM

PLAN:

INCREASE GENERATION CAPACITY TO
SELF SUFFICIENCY



SIGNIFICANT GOVERNMENT FUNDING

Micro Projects

Community based small sized,
self-help developments

90 % grant subsidy

RDF

Deliver rural electrification
projects in various communities

100 % grant

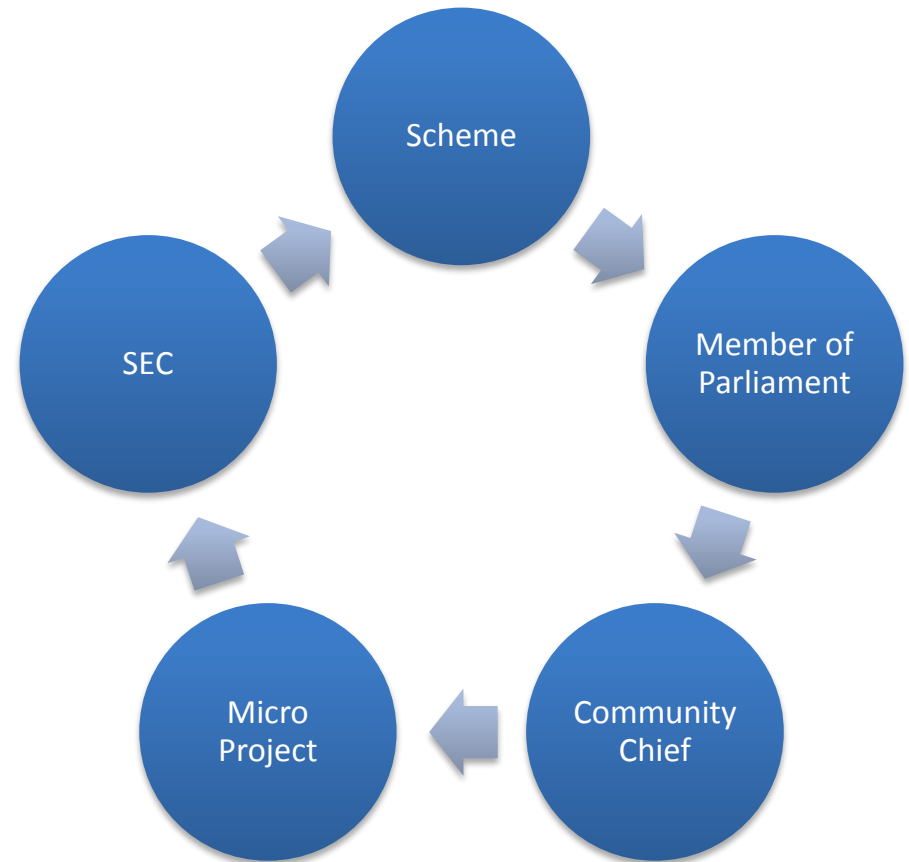
MNRE

Deliver rural electrification
projects in various communities

100% grant

COMMUNITY BASED PROCESS

- MPs drive the process
- Community Chief endorses scheme
- A minimum of 10 member per scheme
- The utility implements project



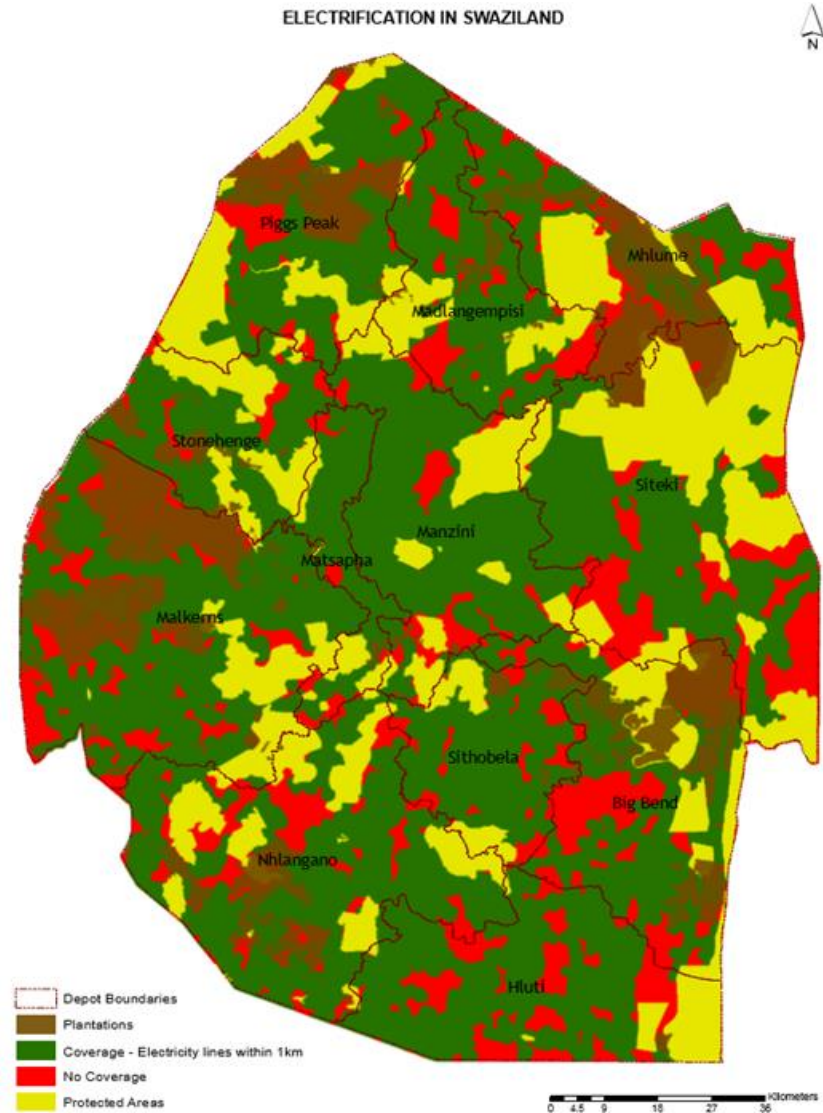
75% ACCESS TO ELECTRICITY IN 2018

Ongoing Activities

- Substations and Transmission lines
- Installation of underground cables.
- Installation of ABC
- Installation of fire walls and combi units

Challenges

- Increased network – increase in operational costs.
- Some Areas not accessible
- Extreme Poverty
- Limited security of supply

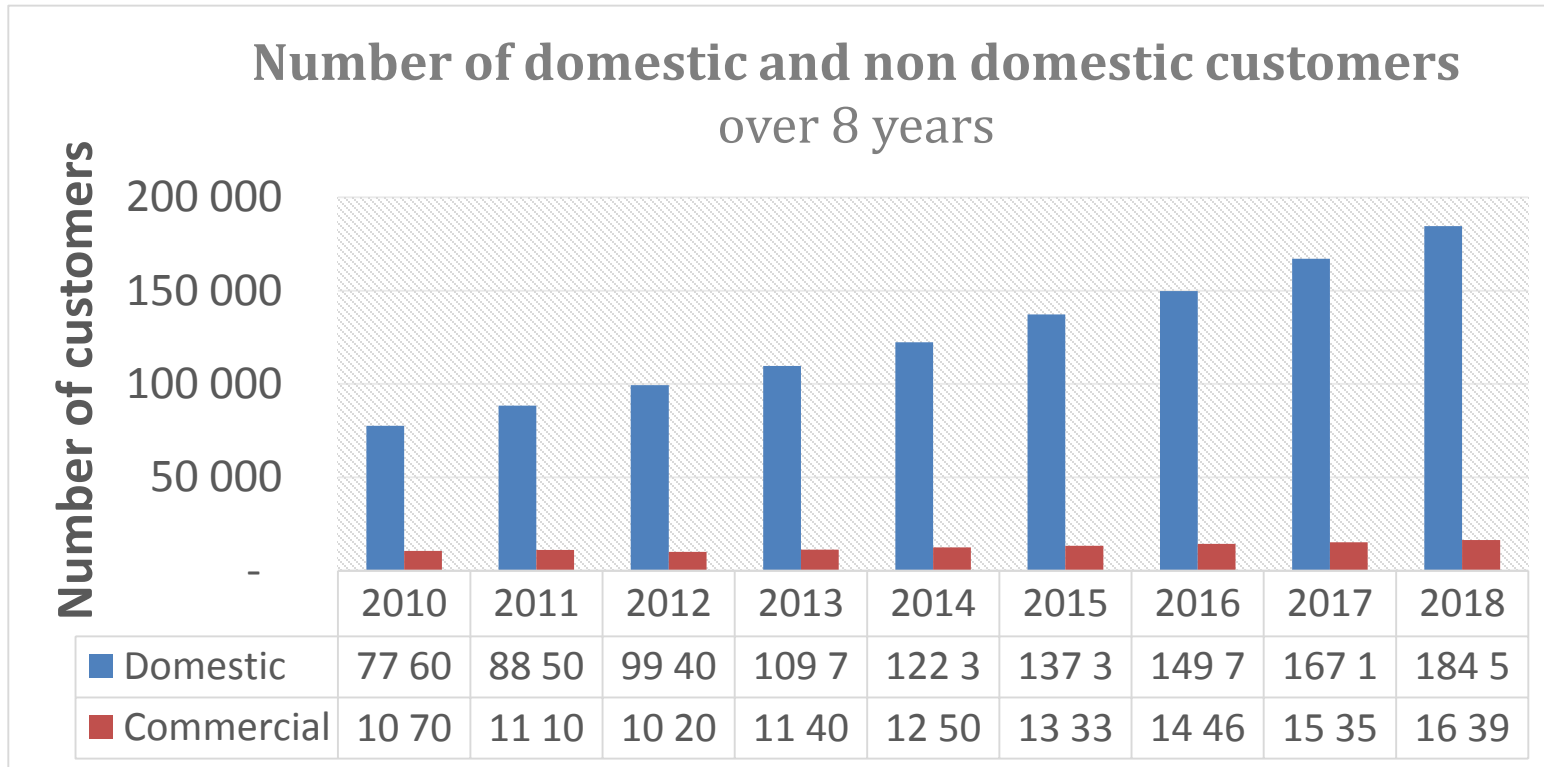


ALL DOMESTIC CUSTOMERS ON PREPAID

	Domestic	Non domestic
FY2010	77,600	10,700
FY2018	184,594	16,399
Increase (%)	138%	53%

- MPs election campaigns
- Increased budget for the programmes
- All domestic customers on prepaid
- Small geographical area
- Increased donor funding (Taiwan)

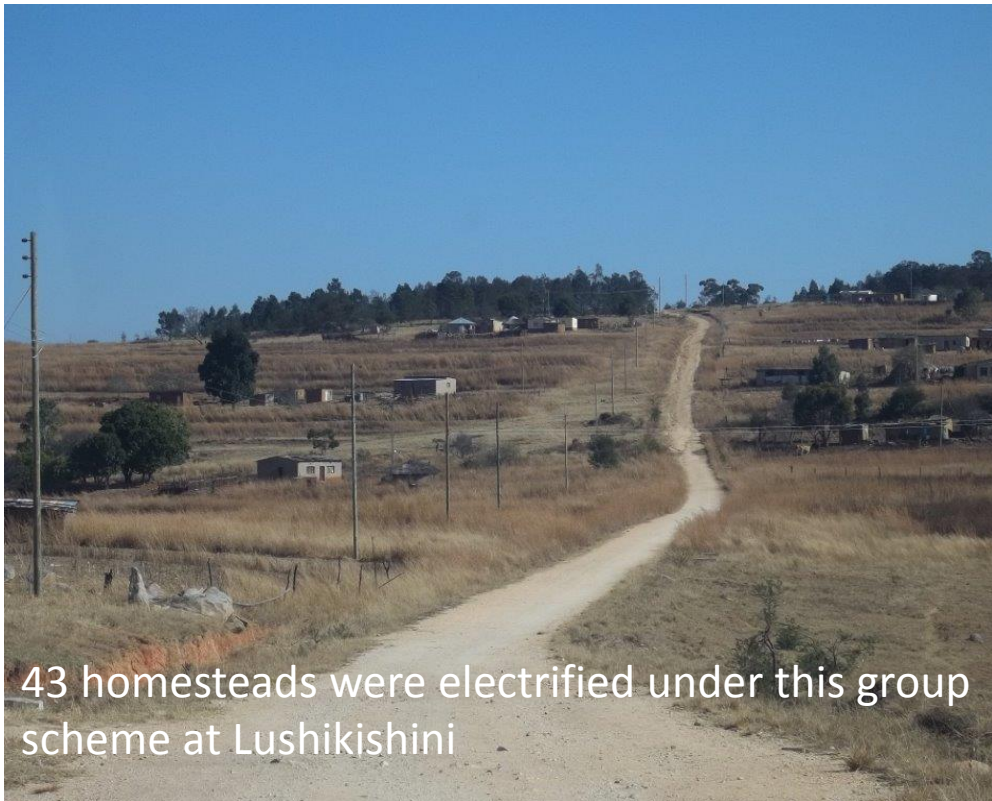
SIGNIFICANT PROGRESS IN LAST 8 YEARS



The SD Government continues to increase access to electricity to all Swazi households in line with the aspirations of Vision 2022

BETTER QUALITY OF LIFE

Rural electrification enhances the quality of life of the people in the rural communities in many respects



43 homesteads were electrified under this group scheme at Lushikishini



New Entfuntini High School is one of the beneficiaries

COMMITMENT FROM GOVERNMENT

“Government has continued to **promote** rural and regional development through the Regional Development Fund (RDF) and Tinkhundla Centres. In 2015/16, **Government** provided E80 million to the Fund, which was utilized to deliver **rural electrification projects** in various communities. In 2016/17, Government will increase the allocation to E88 million,” – ***Hon. SB Dlamini (Swaziland Prime Minister)***

The country set the target for access to modern clean energy solutions in Swaziland to 75% by 2018, 85% by 2020 and **universal access** attained by year **2025** proposed Rural Electrification Strategy and Action Plan for Swaziland. - ***SE4All in Africa***

QUESTIONS