



## EXECUTIVE EXCHANGE ON DEVELOPING AN ANCILLARY SERVICE MARKET

### Overview of Mozambique Electricity Sector: Opportunities and Challenges



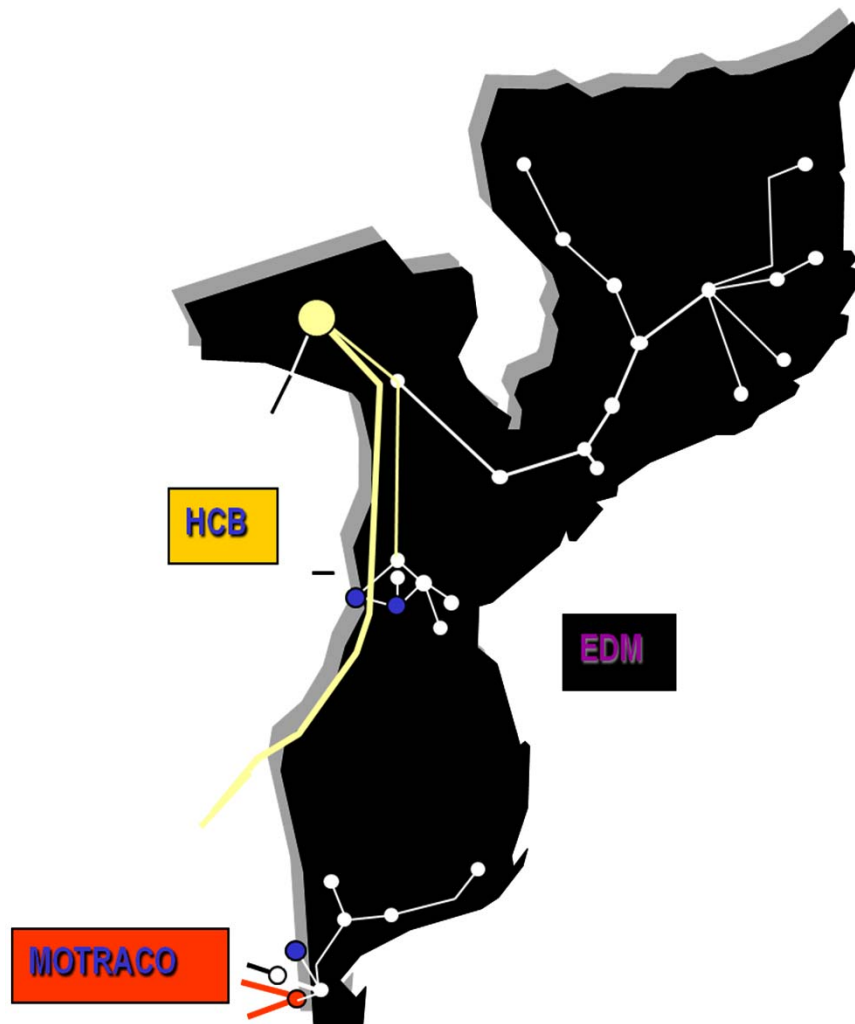
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  - ❑ **Generation;**
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# Overview of Mozambique Electricity Sector

## Key Players in the Electricity Sector Industry



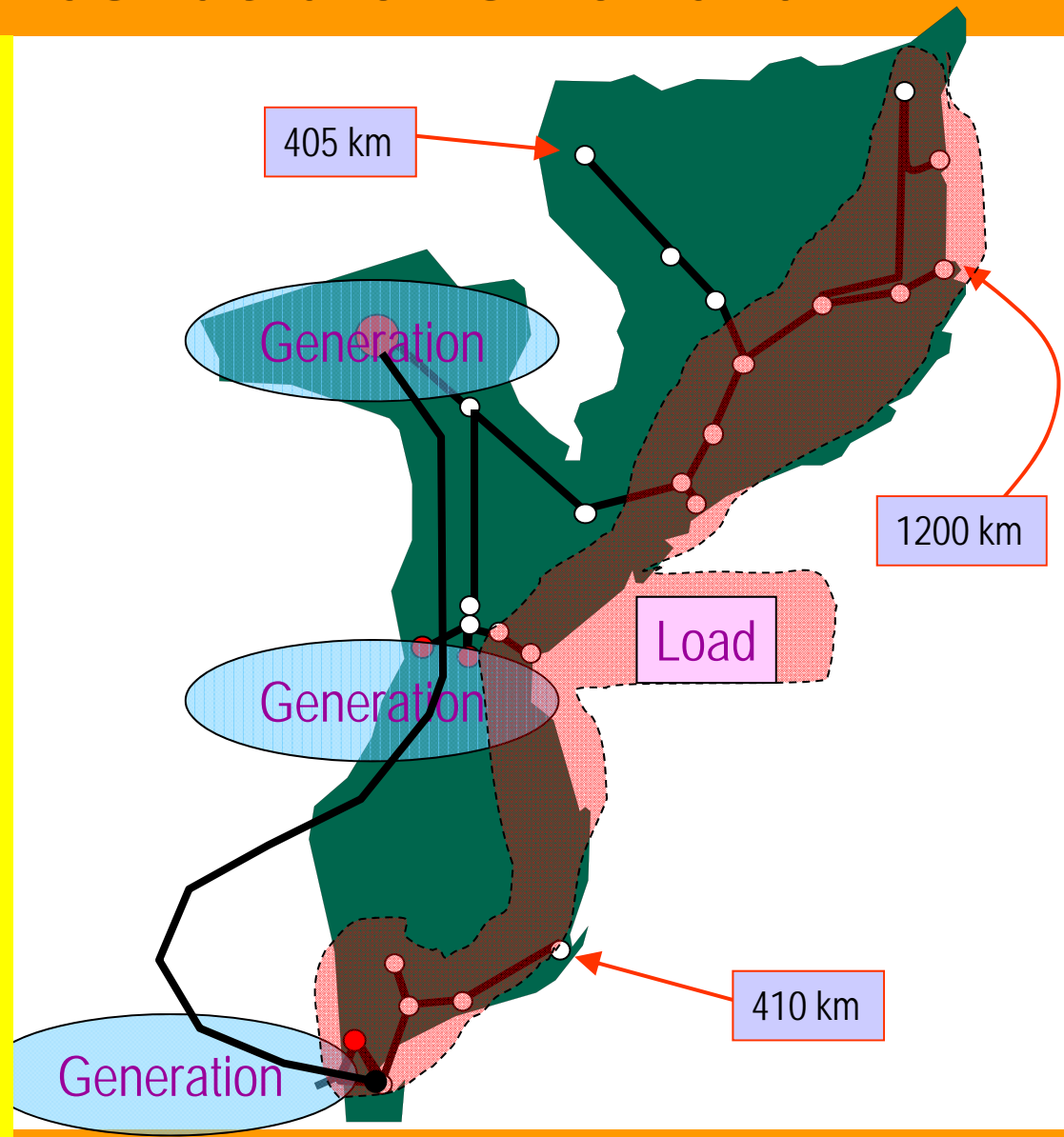
- **Government of Mozambique/Ministry of Energy:** Police making and overall supervision of the electricity sector;
- **CNELEC/National Regulatory/advisory Board**
- **FUNAE:** Mainly involved with off-grid electrification
- **Electricidade de Moçambique (EDM):** 100% owned by the State, with the responsibility to generate., transport, distribute and commercialize electricity throughout the country.
- **Hidroelétrica de Cahora Bassa (HCB):** an IPP owned by Moçambique Government (92,5%) and REN / Portugal (7,5%).
- **Moz Transmission Company (MOTRACO):** an ITC, Owned by EDM, ESKOM and SEB , 33.33% each, responsible to supply electricity to MOZAL aluminium smelter in Moz and wheeling of power to EDM in Moz and SEC in Swaz.



# Overview of Mozambique Electricity Sector

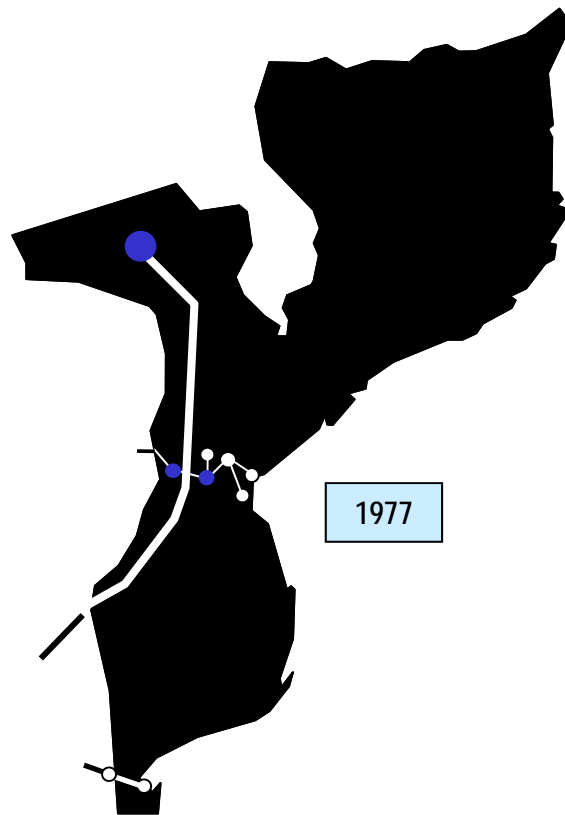
## Electrical Infrastructure Vs Demand

- Large country: generation sources distant from load centers
- HCB is the main source of generation
- Power transmission is mainly ensured through three high voltage corridors
- Supply to Southern Region/Maputo via South Africa through an HVDC line
- Cahora Bassa power plant is the main source



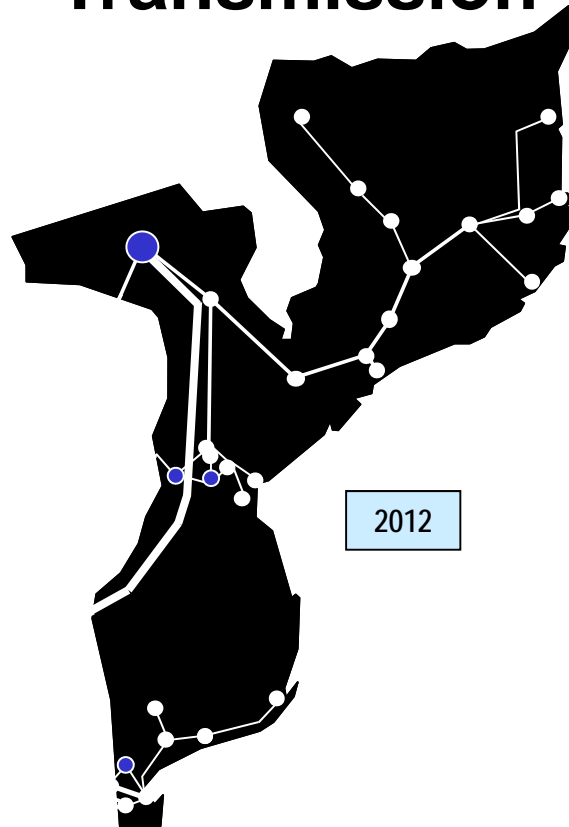
# Overview of Mozambique Electricity Sector

## Electrification Development: Generation & Transmission



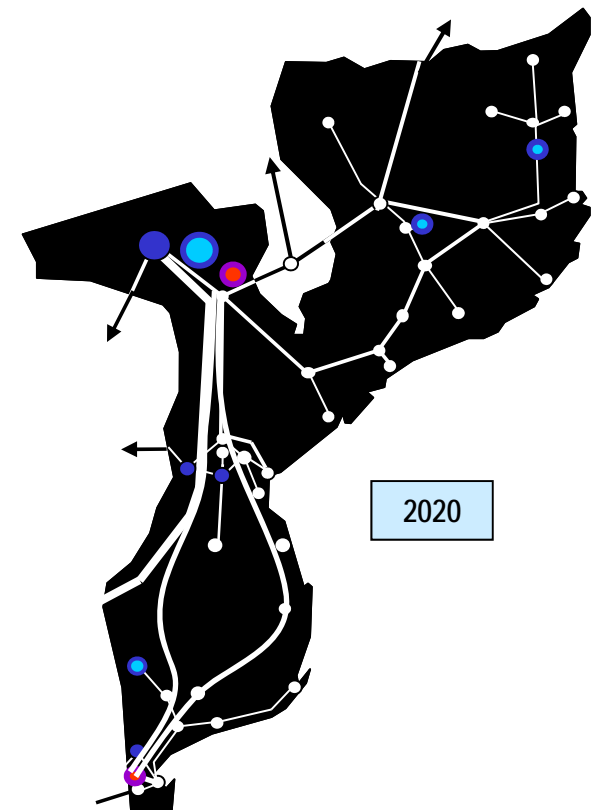
1977

No NTG/RNT



2012

All provincial capitals  
connected to the  
NTG/NRT



2020

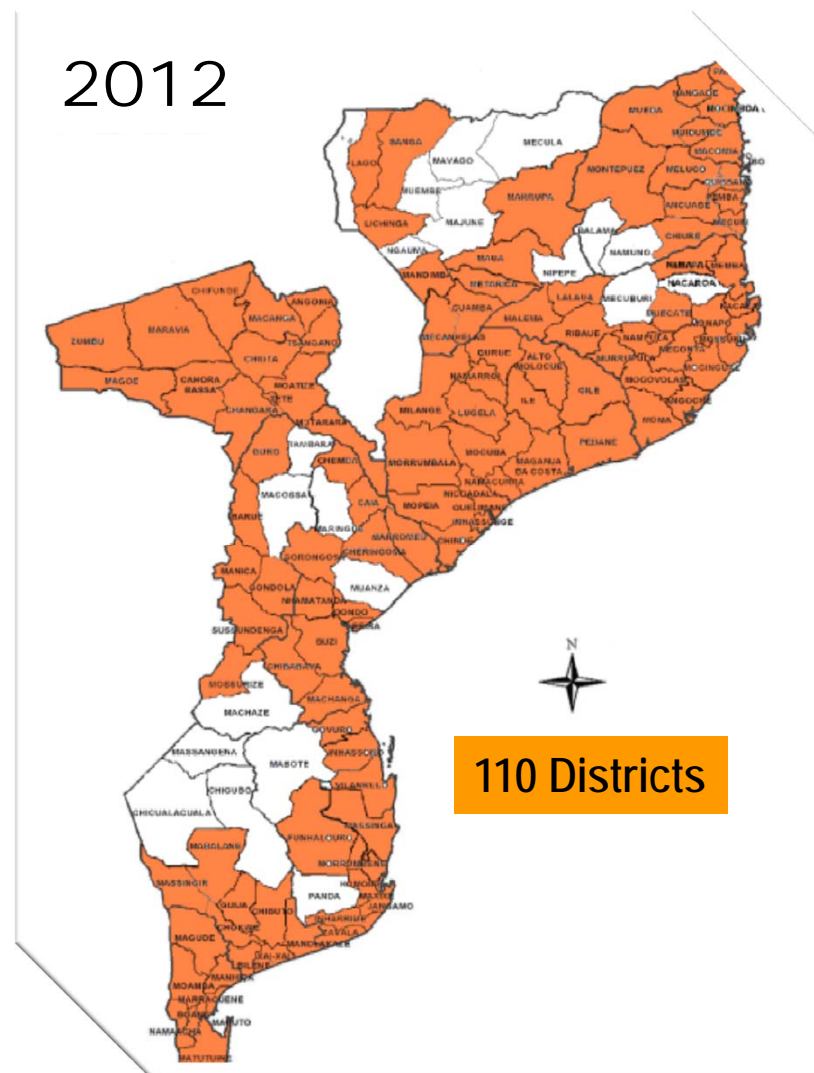
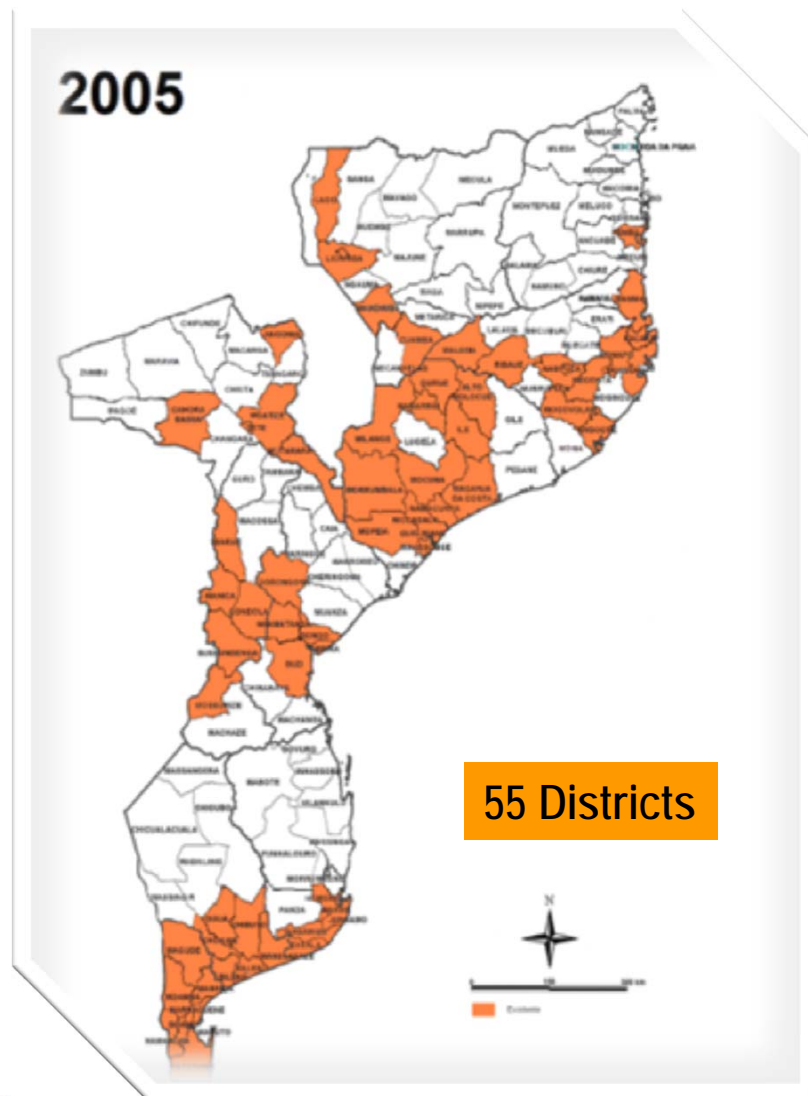
New power stations  
and new lines to be  
built as part of  
National Grid





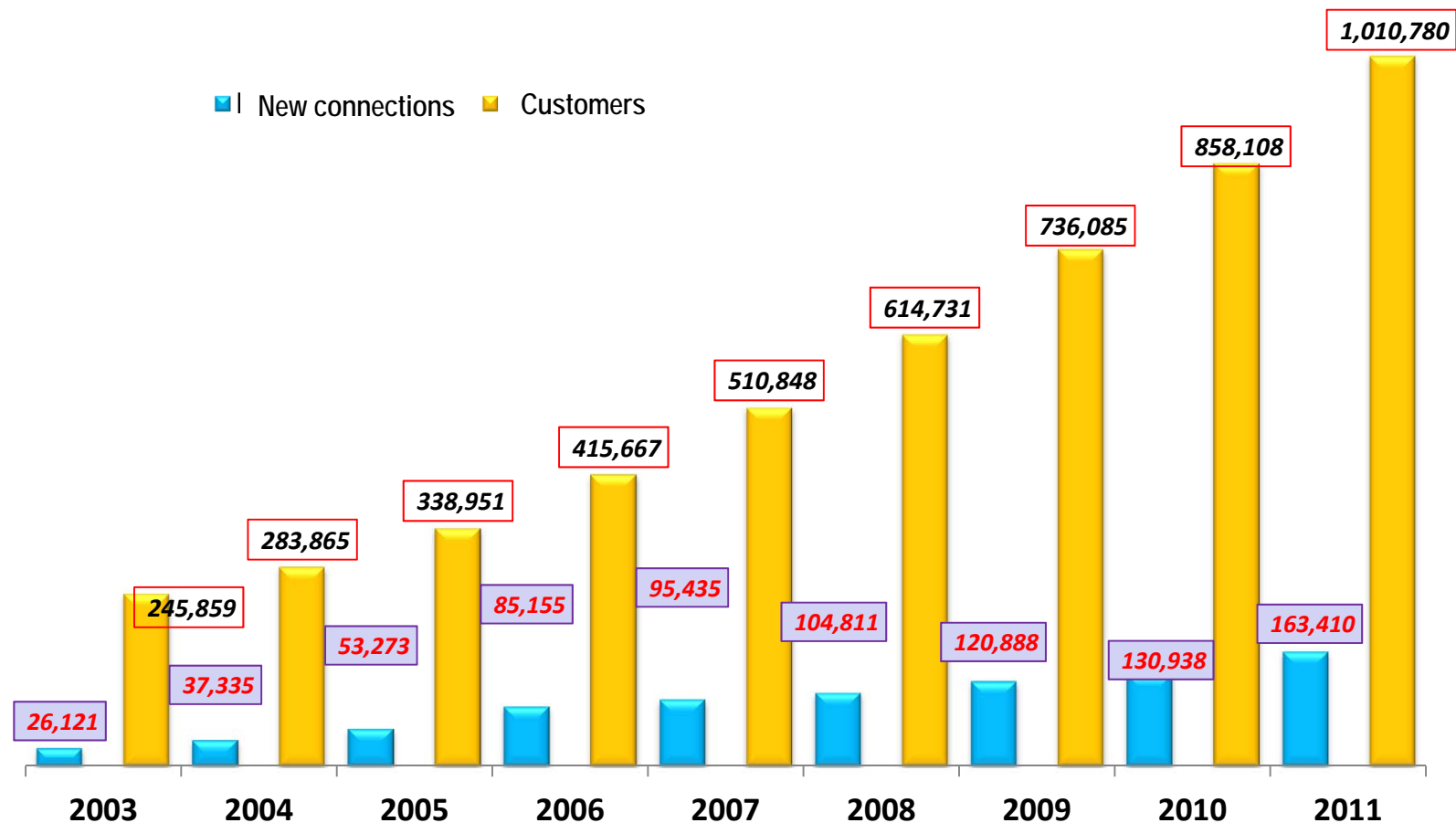
# Overview of Mozambique Electricity Sector

## Electrification Developments: Areas Covered



# Overview of Mozambique Electricity Sector

## New connections and Customers

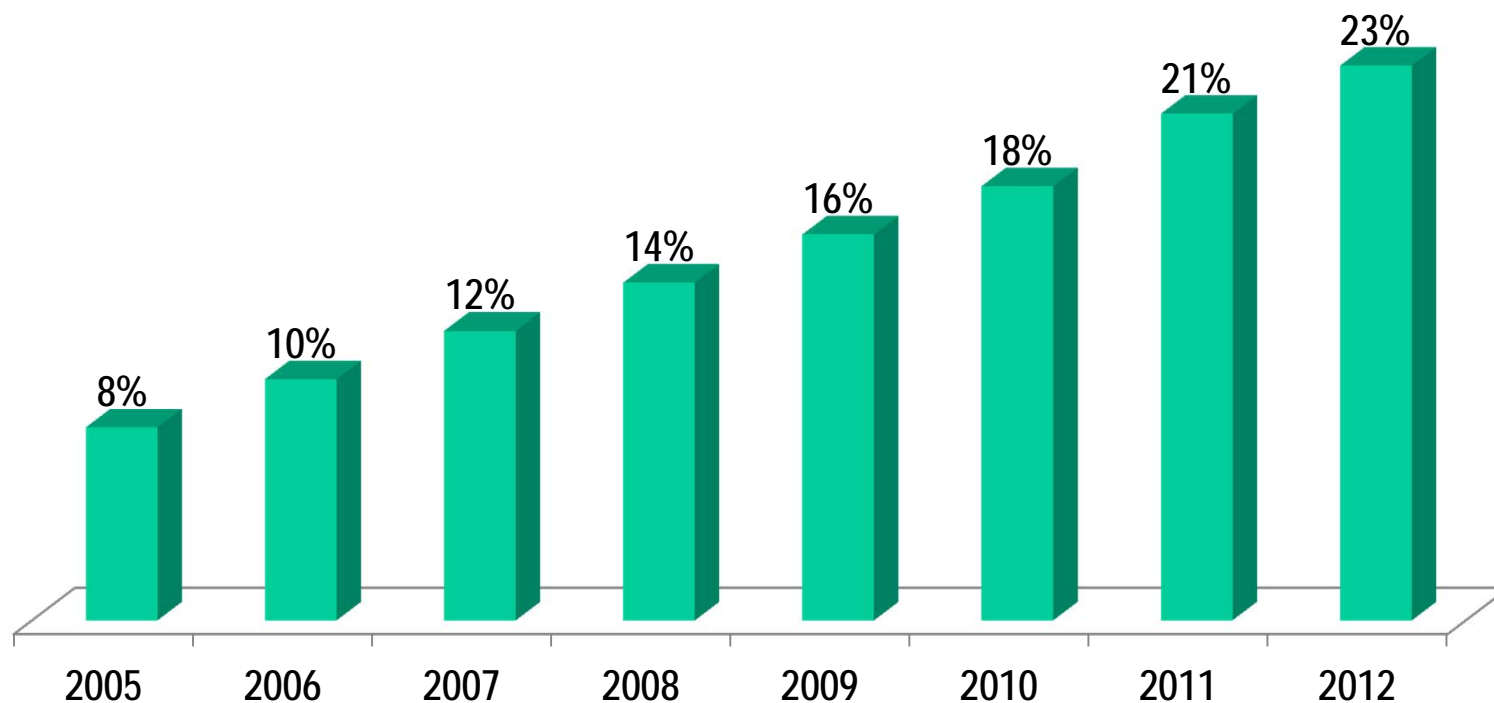


Average new connections per year in the last 5 years: 120 000



# Overview of Mozambique Electricity Sector

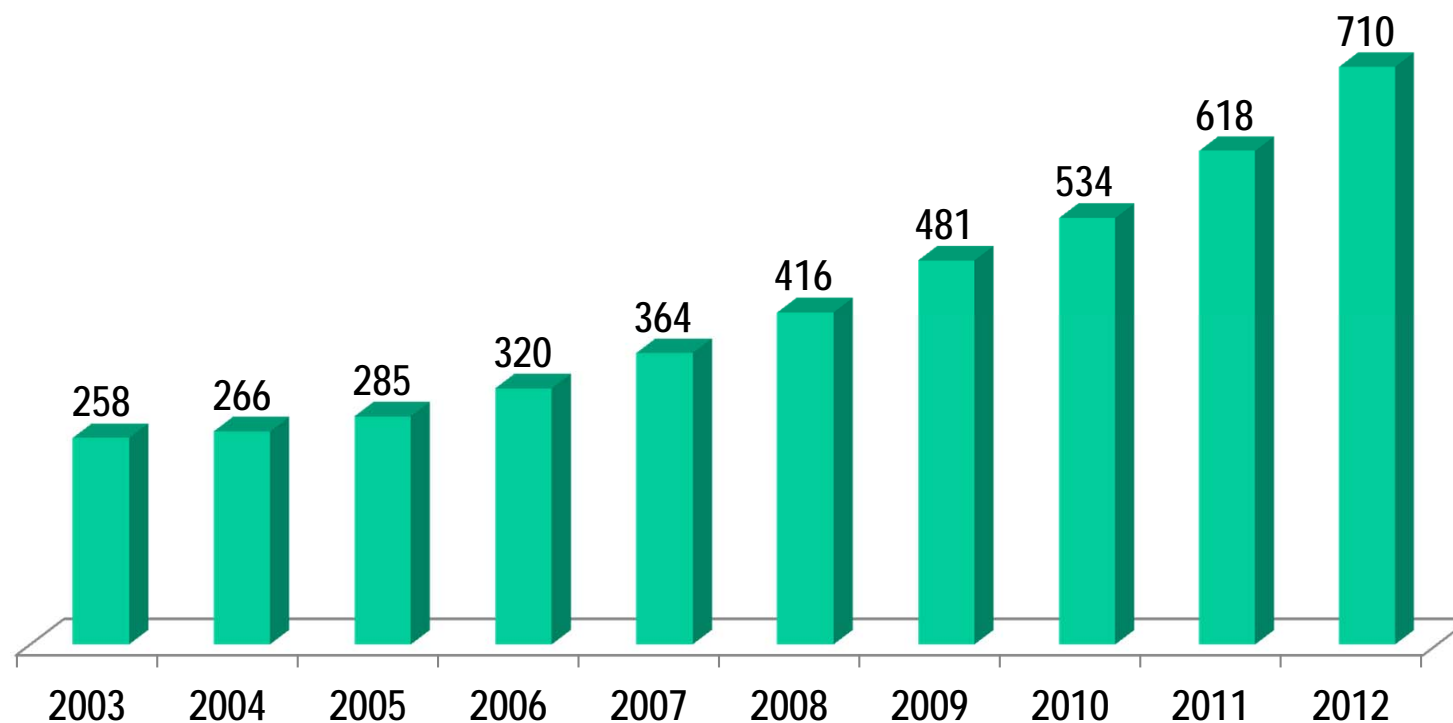
## Electricity Access





# Overview of Mozambique Electricity Sector

Maximum Demand (Excluding MOZAL) [MW]

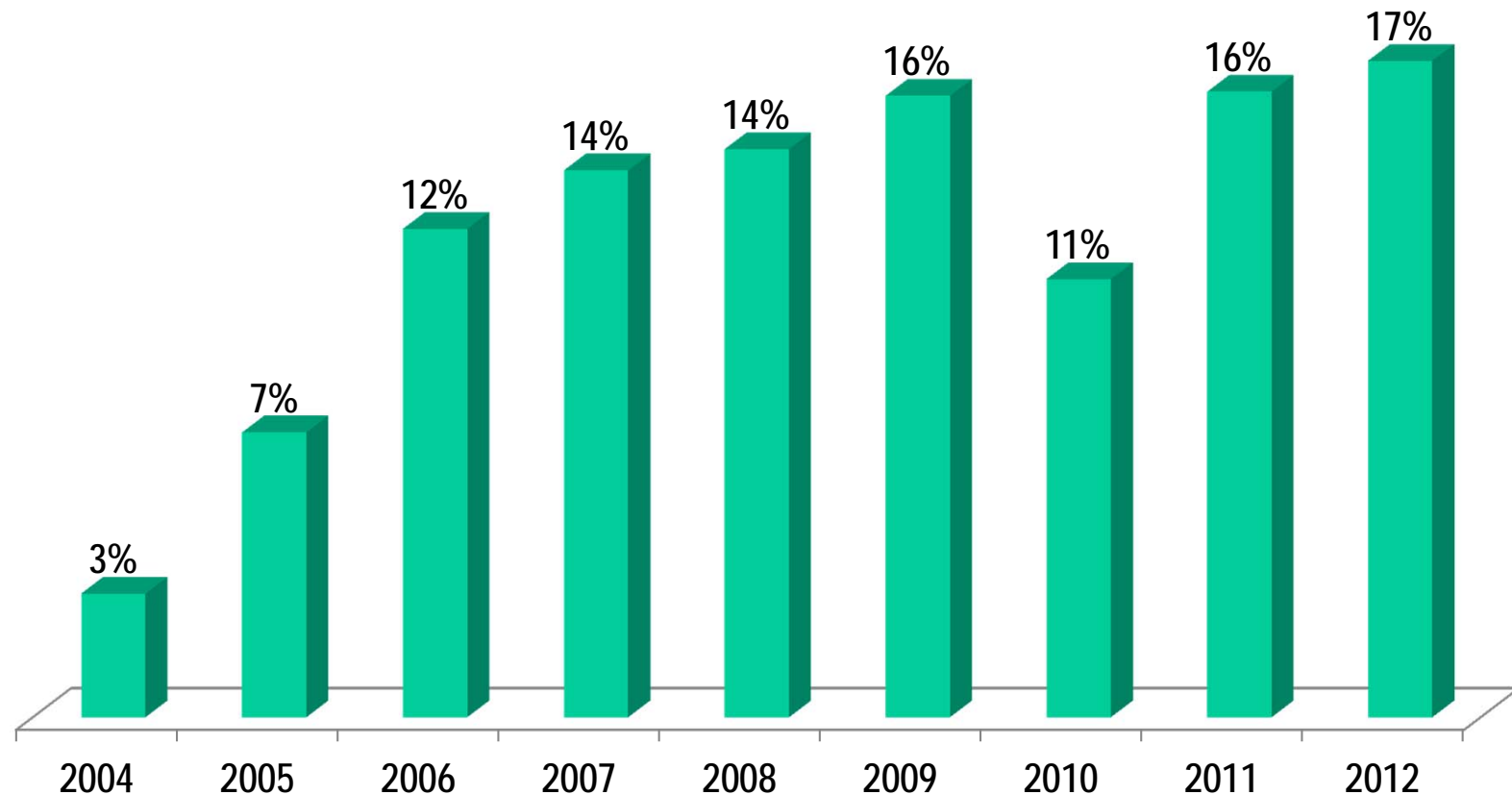


The average load growth during the last 3 years was 80 MW per year



# Overview of Mozambique Electricity Sector

## Mozambique Load Growth

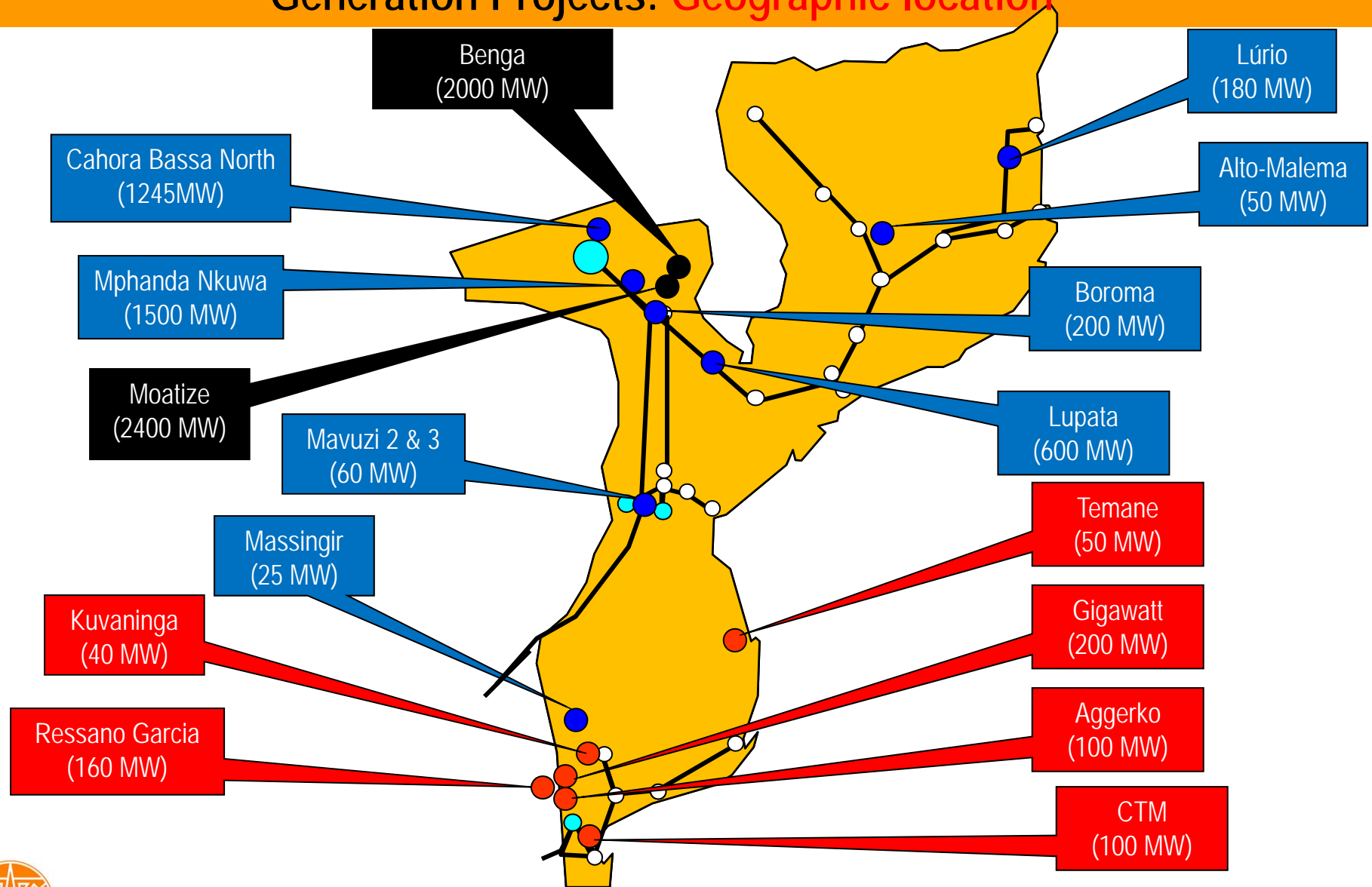


The average load growth is 14% being the highest in the SAPP Region (where the average is 3%)



# Overview of Mozambique Electricity Sector

## Generation Projects: Geographic location



# Overview of Mozambique Electricity Sector

## Generation Projects: **Planned Commissioning date**

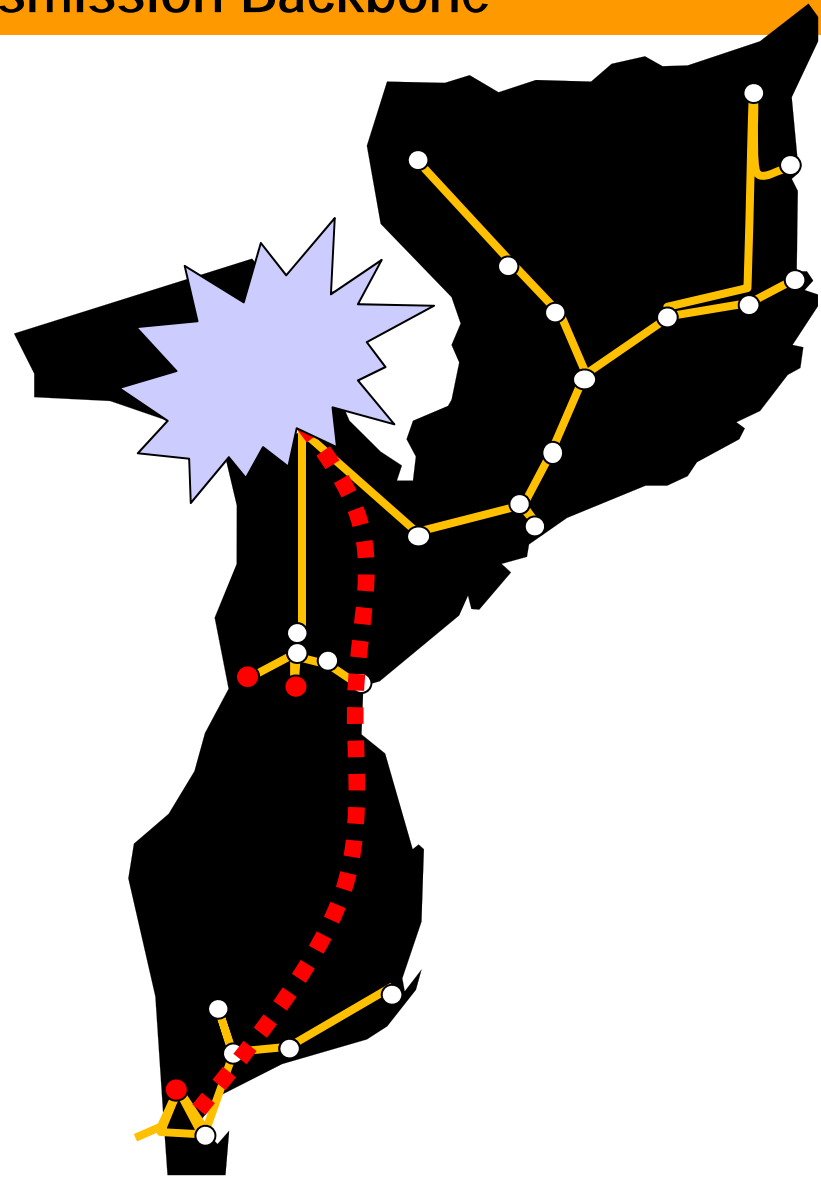
	Commissioning date						
Power Station	2013	2014	2015	2016	2017	2018	2019
Ressano Garcia							
Gigawatt							
Kuvaninga							
Mavuzi e Chicamba							
CTM (JICA)							
Moatize							
Benga							
Lúrio							
Alto Malema							
Boroma							
Lupata							
Mphanda Nkuwa							
HCB Norte							



# Overview of Mozambique Electricity Sector

## Mozambique Transmission Backbone

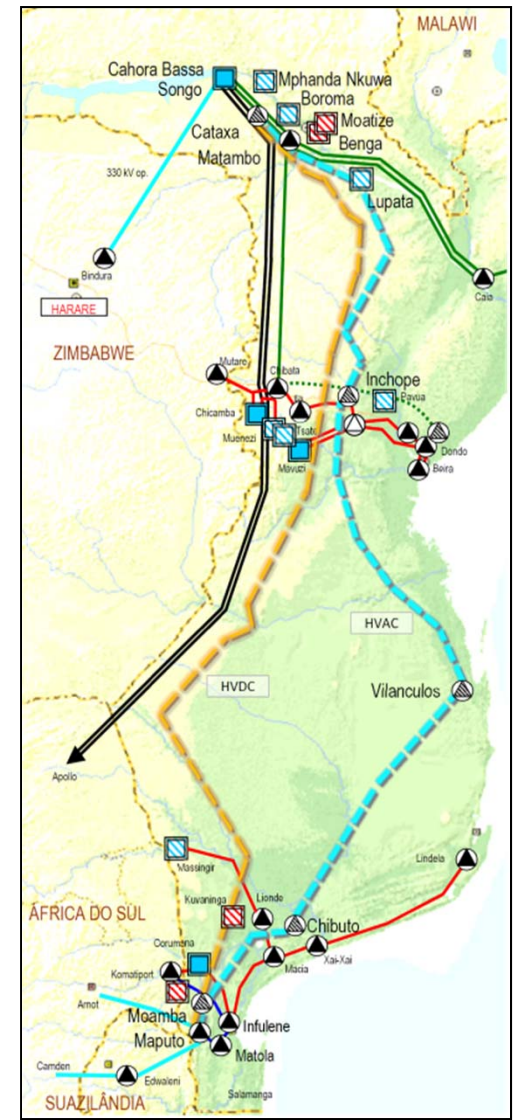
- Aims to evacuate the power to be generated in the Central/Tete Region a Transmission Backbone is required
- The system to be strong enough to evacuate around 9200 MW potential generation;
- The Backbone shall be implemented in synchronized way with the generation projects



# Overview of Mozambique Electricity Sector

## Mozambique Transmission Backbone

- Phase 1 includes combined HVAC & HVDC solution
- HVAC solution with a 1,340 km 400 kV AC line for up to 900 MW continuous transfer and 50% series compensation of AC line
- HVDC solution (Phase 1) includes a 1,275 km  $\pm 500$  kV DC bipolar transmission line and converter stations with 2,650 MW capacity
- Implementation of HVDC solution to comprise two stages:
  - **Stage 1:**  $\pm 500$  kV DC line with 1,325 MW converter capacity (sufficient for realisation of Mphanda Nkuwa)
  - **Stage 2:** Additional 1,325 MW converter capacity





# Overview of Mozambique Electricity Sector

## Mozambique Transmission Backbone

Summary CESUL Phase 1: 400 kV 900 MW HVAC Transmission and ± 500 kV 2,650 MW HVDC Transmission (‘000)		USD
Total HVAC Phase 1		950 782
Total HVDC Stage 1 of Phase 1		848 663
Total HVAC + HVDC Stage 1 of Phase 1		1 799 445
Total HVDC Stage 2 of Phase 1		319 200
Total CESUL Phase 1 (incl. Owner's Costs & Physical Contingencies, but excl. Price Contingencies)		2 118 645



# Overview of Mozambique Electricity Sector

## Mozambique Transmission Backbone: Status

- EDM coordinates next stage of STE development, in close cooperation with partners
- Joint Development Agreement (JDA) to be concluded by April 2013
- ESIA and Relocation Planning Framework (RPF) study finalised
- ESIA approved obtain by MICOA
- STE is now a legal entity (initially with EDM as 100% shareholder)
- EDM, supported by World Bank, is preparing initial staffing plan for STE SPV, with dedicated resources

### EDM's STE Partners



# Overview of Mozambique Electricity Sector

## Natural Resources: Coal

- The Moatize coal basin in Tete province represents the world's largest untapped coal reserve with an estimated resource of 6bn tonnes.
- 2 large scale projects already in operations (Vale and Rio Tinto);
- Additional projects to come on line: Ncondezi, Jindal, Rio Tinto, Zambeze, Revuboe, etc
- Most of the projects also include a power station at some stage



The coal proven reserves can produce more than 8 000 MW, base load power for 30 years



# Overview of Mozambique Electricity Sector

## Natural Resources: Natural Gas

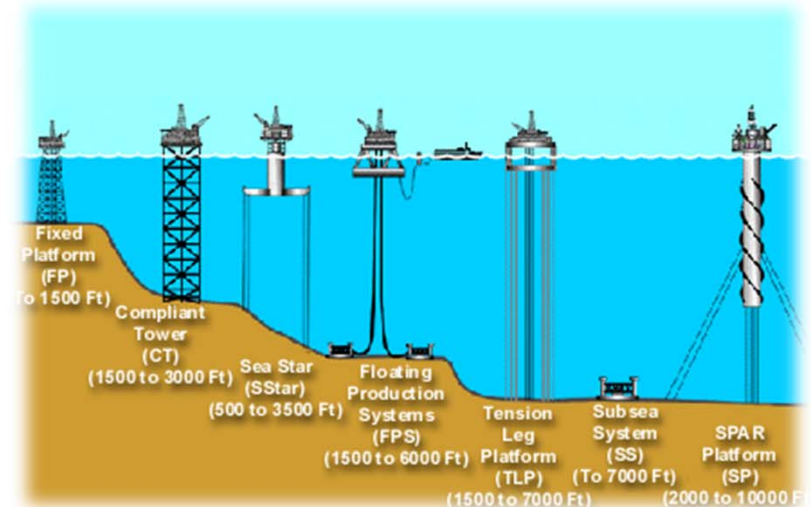
- Temane gas fields in exploration since 2004 by Sasol;
- 27 MGJ are allocated for power generation in Mozambique
- About 100 MGj is for export to South Africa
- Currently, EDM, SASOL, Investec, Aggreko, Gigawatt and MGC are developing generation power projects
- Around 350 MW will be Installed until 2014 at Ressano Garcia/Maputo Province



# Overview of Mozambique Electricity Sector

## Natural Resources: **Natural Gas**

- Additional gas reserves discovered in the Rovuma basin; First production expected for 2018/19.
- Such potential of natural gas identified is corresponding to 60 to 75 trillion cubic feet.
- The size of the natural gas discover will place Moz amongst the major exporters.
- Opportunity to develop medium to large scale power generation plants in the north of Mozambique (200 MW to 1000 MW) to serve the national economy and the SAPP region.





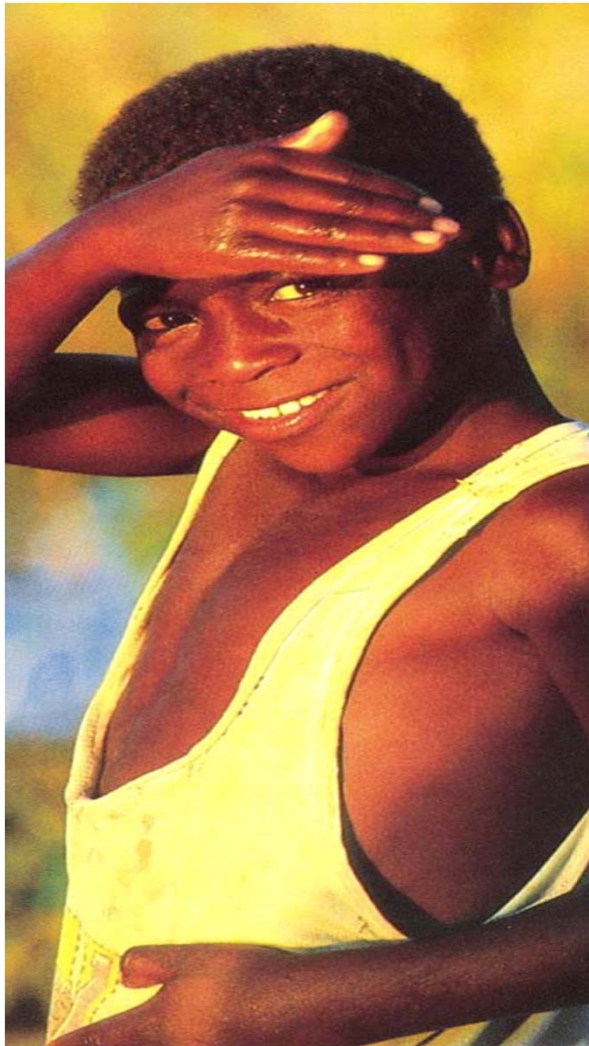
# Energy Outlook for Mozambique

## CONCLUSION

- Besides the progresses achieved so far adequate and massive electrical infrastructure is still required and fundamental to ensure continuous economic growth in Mozambique ;
- The country has vast and largely untapped energy/mineral resources that can be used to sustain the economic growth;
- There are enormous opportunities but also challenges. Next 3 to 4 years could determine next 10 to 20 years;





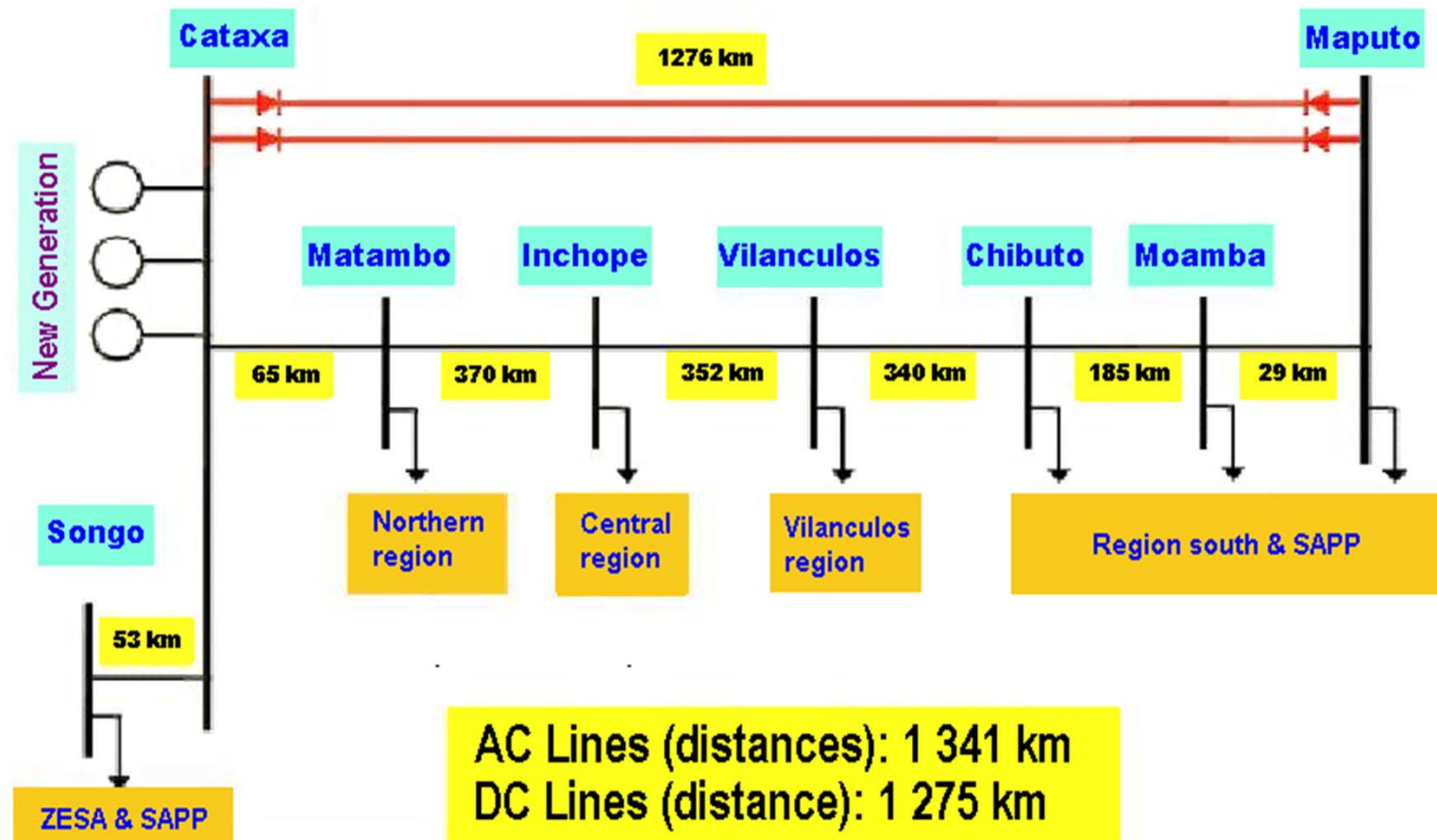


# MUITO OBRIGADO



# Overview of Mozambique Electricity Sector

## Mozambique Transmission Backbone



- HVAC operated at 400 kV (equipment designed for 550 kV) – 900 MW transfer capacity
- HVDC operated at  $\pm 500$  kV – 2,650 MW transfer capacity, implemented in two stages, each with 1,325 MW converter capacity

