

## Maintaining Power System Security Under Extreme Operating Conditions

What mechanisms can assist maintaining power system security under extreme low demand and/or low inertia conditions?

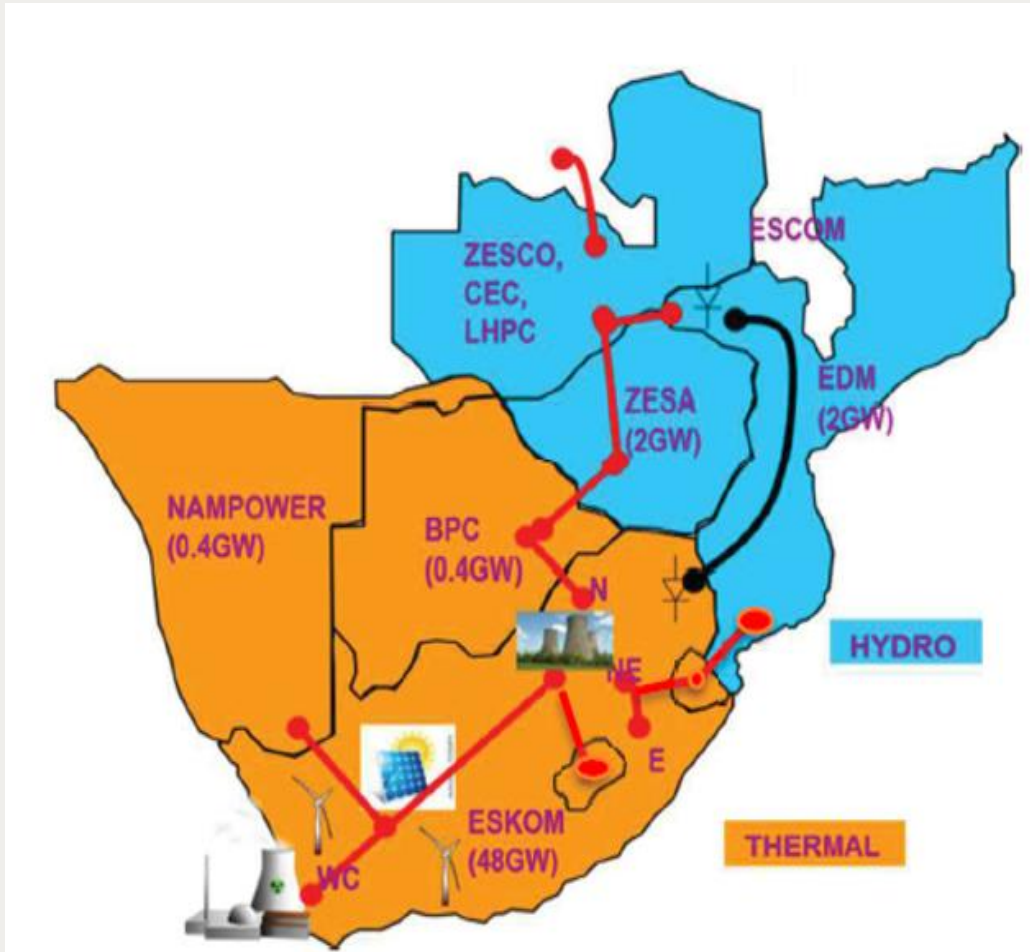
SC C2

Preferential Subject 2, Q2.10

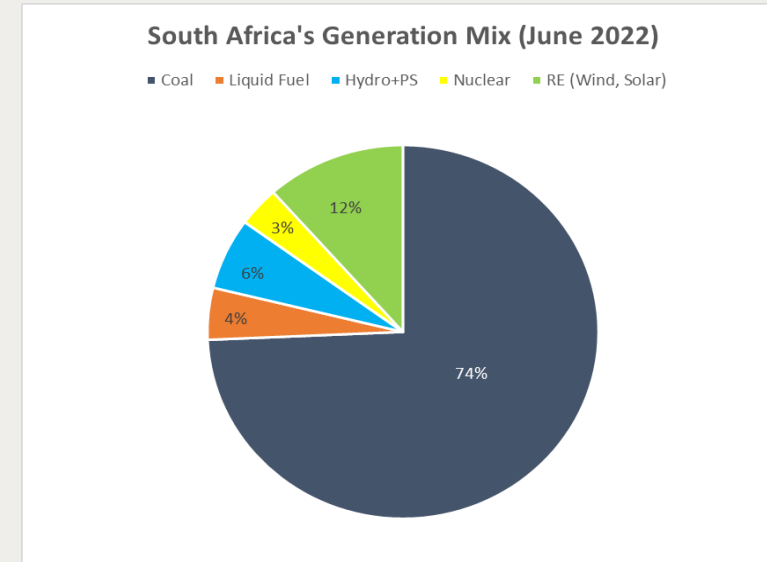
Marathon Ntusi, South Africa



# Overview of Southern African Power System



Group Discussion Meeting



- South Africa is currently experiencing **severe generation shortages** due to ageing of its predominant **coal** fleet.
- **Operating reserve provision** is mostly **deficient** throughout the day.
- The country's **integrated resource plan** indicates a significant penetration of renewables energy and a subsequent decommissioning of synchronous generators by **2030**.
- South Africa is part of the **Southern African Power Pool (SAPP)**

# Maintaining Power System Security Under Extreme Operating Conditions

Power system security will be maintained through **planning** and **operational** interventions

## Planning interventions

- a) Ensure long term integrated **energy plan** is **flexible** as far as possible
- b) Ensuring that contracted primary, secondary and tertiary **reserves** meets minimum **reliability requirements** for compliance with **South African Grid Code**
- c) Increase **utilisation** of **demand response** for **frequency control**
- d) Contracting **reserves** from non-conventional/ inverter based sources e.g. BESS, Wind
- e) Increased **participation** in newly formed **balancing market** will enable South Africa to access cheaper hydro-based balancing power from Northern SAPP countries

Group Discussion Meeting

# Maintaining Power System Security Under Extreme Operating Conditions

## RSA Frequency Control Framework

Frequency Hz	Automatic Reserve/ Scheme	
> 51.0	<b>Generators may be tripped</b>	
50.50	<b>Continuous Operating Range</b>	<b>Mandatory</b> Governing (all online gens)
50.25		Primary/ Secondary <b>Reserve</b>
50.15		Secondary <b>Reserve</b>
49.85		Secondary <b>Reserve</b>
49.75		Primary/ Secondary <b>Reserve</b>
49.65		<b>Demand</b> Response
49.50		Pumped Storage U/F <b>Auto-start</b>
49.40		Pumped Storage & Gas U/F <b>Auto-start</b>
49.30		Pumped Storage <b>Emergency</b> Trip
49.20		Under Frequency <b>Load Shedding</b>
< 49.0	<b>Generators may be tripped</b>	

## Operational interventions

- a) Optimisation of **automatic under-frequency scheme** settings at **pumped storage** and **gas** generators for different modes of operation i.e. Pump mode or Synchronous Condensor Operation (SCO) mode
- b) Strict enforcement of **compliance** to **Grid Code** for **mandatory frequency response** e.g. when frequency > 50.50Hz all online generators shall reduce generation
- c) Optimally tuning of **SAPP protection devises** to ensure that **inter-area oscillatory** mode of **0.3Hz** gets sufficiently **damped** if triggered
- d) **Real-time monitoring** of damping to ensure a secure interconnected power system

Group Discussion Meeting