



# Southern African Power Pool (SAPP) Experiences in regional power integration

Presentation by  
Eng. Stephen Dihwa  
SAPP Coordination Centre Executive Director



13 -15 May 2024

# Presentation Outline



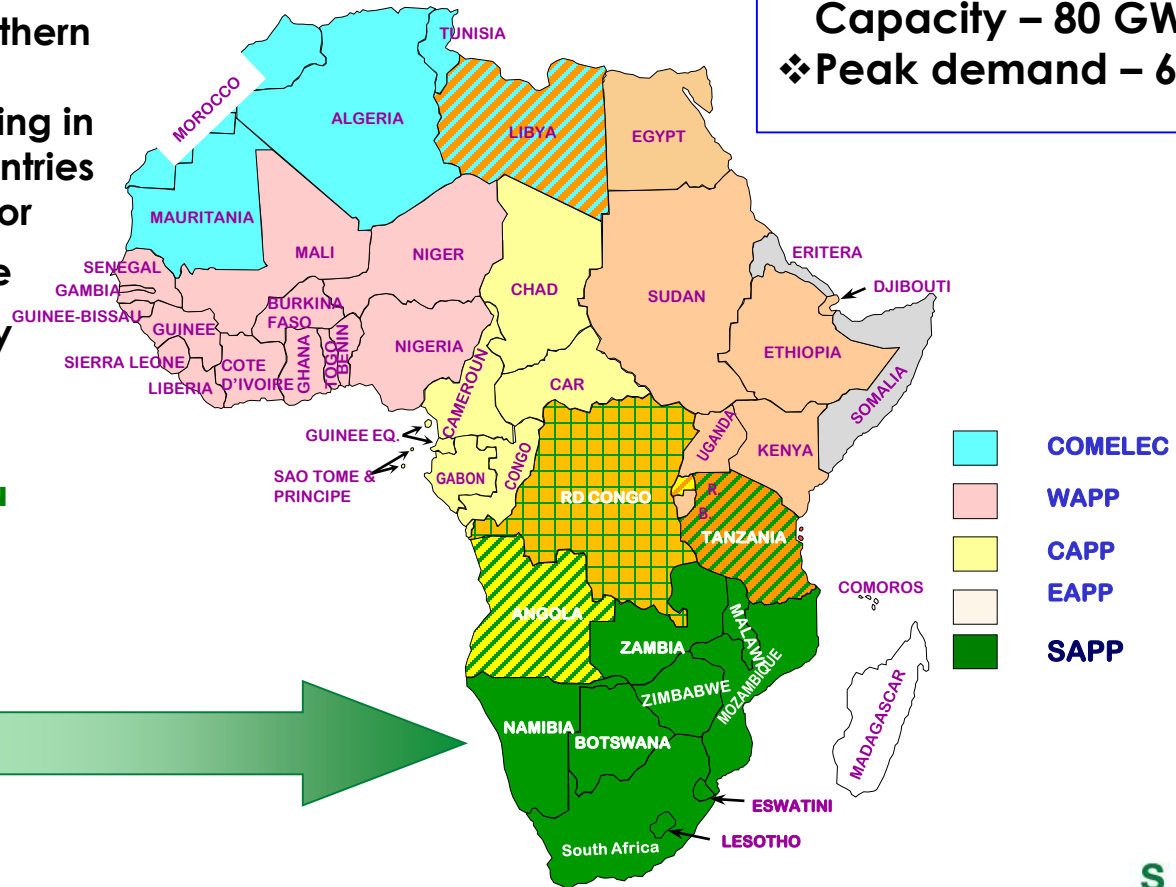
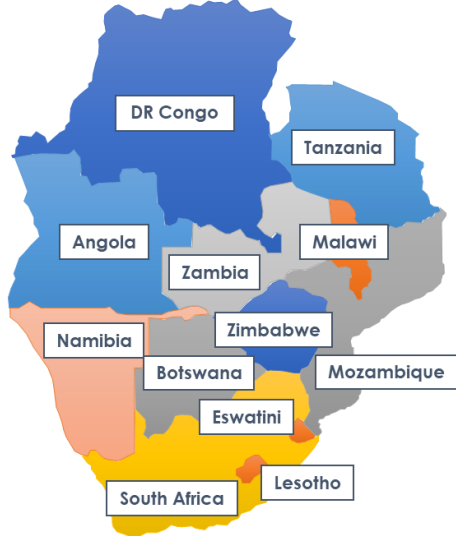
1. Introduction
2. SAPP Interconnections
3. History of SAPP  
Developments
4. SAPP Electricity Markets
5. Transmission Wheeling
6. SAPP Outlook

# Introduction

- ❑ SAPP is a sub-regional organisation under the Southern African Development Community (SADC) operating in the 12 mainland SADC countries focused on the power sector
- ❑ Based in Harare, Zimbabwe
- ❑ Members are the electricity utilities

❖ 350 Million people  
 ❖ Installed Generation Capacity – 80 GW  
 ❖ Peak demand – 60 GW

## SAPP COUNTRIES OF OPERATION



Southern African Power Pool

# Creation and objectives

- ❑ SAPP was created in **1995** through the signing of an **IGMOU** by the **SADC Ministers responsible for Energy**
- ❑ **Key objectives:**
  - Optimise the use of available energy resources in the region and allow countries to assist one another during emergencies.
  - Cooperate and coordinate planning and operation of the electrical power system.
  - Facilitate electricity trading.
  - Promote regional cooperation in power projects
  - Increase access to electricity in a reliable, affordable and sustainable manner.

# SAPP Governance Documents

## ❑ Inter-Governmental MOU (IGMOU)

- **Established SAPP at political level**
- **Signed by SADC Energy Ministers in 1995 and**
- ***Revised in 2006 to open membership to private players***

## ❑ Inter-Utility MOU (IUMOU)

- **Operationalised SAPP**
- **Signed by the SAPP Members (Power Utilities)**
- ***Revised in 2023 – changes in membership categories***

## ❑ Agreement Between Operating Members (ABOM)

- **Sets requirements for interconnected operations**
- **Signed by Operating Members (Interconnected Utilities)**
- ***Revised in 2021***

# SAPP Governance Documents (Continued)

## □ Operating Guidelines (OG)

- **Technical Guidelines for system operations**

## □ Market Guidelines and Market Book of Rules

- **Govern operations of electricity trading**
- **States Market Conduct Rules**

## □ Coordination Centre Constitution

- **Governs operations of the Coordination Centre**
- ***Revised in 2023***

# SAPP Governance Structure

**Executive Committee**

**Management Committee**

- Utility Senior Management:**
- ❑ Oversees the Sub-Committees and the Coordination Centre Board
  - ❑ Determines fees and payments to be made by Members

- Utility CEOs:**
- ❖ Governing authority
  - ❖ Admit new members

**Planning Sub-Committee**

**Operating Sub-Committee**

**Coordination Centre Board**

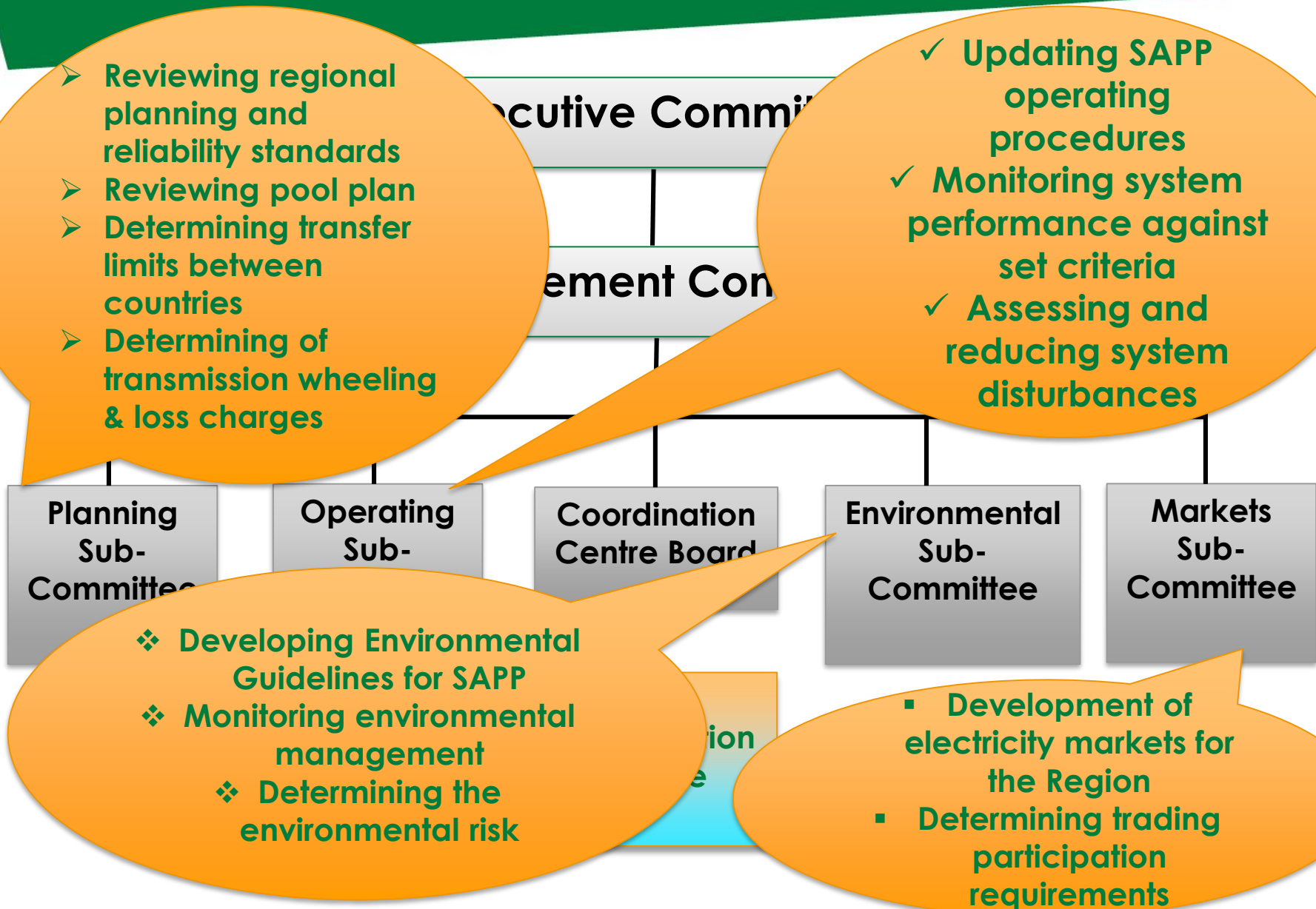
**Environmental Sub-Committee**

**Markets Sub-Committee**

**SAPP Coordination Centre**



# Roles of Sub-Committees





# Governance Structure to SADC

**Summit**

**Integrated Council  
of Ministers**

**SADC Committee of Senior Energy  
Officials => Energy Ministers**

**SADC Directorate of Infrastructure**

**SAPP Executive Committee**

# Governance Arrangements – Hosting of CC

- ❑ **Location of the Coordination Centre (CC)**
  - A bidding process was set up to determine the host of the CC
  - The bid was won by the Zimbabwe utility, ZESA
  - The CC was therefore setup in Harare, Zimbabwe
- ❑ **Establishment of the Coordination Centre**
  - A former CEO of the New York Power Pool was seconded to setup SAPP under financial support from USAID in 2000
  - An understudy from the region was recruited in June 2000 and 5 support staff by March 2001
  - Early guiding documents particularly for planning and operations were established based on North American Reliability Council (NERC) documentation
  - Markets documents were established on the basis of the NordPool arrangements

# Governance Arrangements – Committees and Sub-Committees

## ❑ Executive Committee

- Chairing is rotated among the interconnected National Power Utility CEOs for terms up to 2 years at a time
- Another utility is elected to be Deputy Chair who then takes over to chair
- 2 meetings are held annually, one to approve the budget and the other coupled with the Annual General Meeting
- The CC provides Secretariat services

## ❑ Management Committee and Sub-Committees

- Chairing is rotated among the interconnected National Power Utility members for terms up to 2 years at a time
- Another utility is elected to be Deputy Chair who then takes over to chair
- 2 meetings are held annually each coming up with recommendations to the Executive Committee and Management Committee respectively
- The CC provides Secretariat services

## ❑ Coordination Centre Board

- Chairing is rotated among the members for terms up to 2 years at a time
- Another utility is elected to be Deputy Chair who then takes over to chair
- Meetings are held quarterly with 2 of them coinciding with the Sub-Committee meetings
- The CC provides Secretariat services

# Duties and Responsibilities of SAPP Coordination Centre

## ❑ Duties and responsibilities are defined in the Constitution as:

- Act as the secretariat for the SAPP;
- Represent the SAPP in the various industry fora;
- Coordinate the planning and operations of the electricity business in the SADC region;
- Act as the Market Operator for cross border competitive electricity trading in SADC;
- Coordinate regional cooperation in power projects development;
- Promote environmental sustainability of the SAPP;
- Promote research and development of new plant and methods for use in the SAPP electricity supply industry;
- Implement and enforce SAPP rules and regulations
- Act as the centre of communication on matters of common interest and concern.

# Funding of SAPP Coordination Centre

- **SAPP activities are funded as follows:**
- **SAPP Operational Budget:** Members pay an Annual Subscription that is calculated according to an agreed formula stated in the IUMOU and this is supplemented by Market Administration fees.
- **SAPP Capital Budget:** The total capital cost is shared equally amongst all SAPP Members except for Markets related Capex which is funded from accumulated Market Administrative fees.
- **Projects & Technical Assistance:** These are normally funded by DFIs and include funds for project preparation, development, capacity building, study tours and implementation of a competitive electricity market, etc.
- Partners include **Norad, Sida, USAID, World Bank, DBSA, AFD, DANIDA, AfDB, DFID, KfW, USAID/Power Africa** etc.
- **Congestion Management Fee:** This is reserved for contributing to investments in transmission infrastructure

# DFI Support to SAPP

- SAPP has received support from DFIs over the years the main support being coordinated by the World Bank
- The Power Market Project initiated in 2001 funded by the World Bank, USAID, NORAD and SIDA resulted in the establishment of the electricity trading platform
- The Advancing of Regional Transformative Energy Projects (AREP) administered by the World Bank but including SIDA funds covered the establishment of a Project Advisory Unit (PAU) to coordinate project preparation and will be closing this month
- The World Bank is working on a successor program the Regional Energy Transmission, Trade and Decarbonization Project (RETRADE) which will include infrastructure funding and technical assistance to SAPP

# Current SAPP Membership

No.	Full Name of Power Utility	Type	Abbreviation	Country
<b>National Power Utilities – One per country</b>				
1	Botswana Power Corporation	NPU	BPC	Botswana
2	Electricidade de Mozambique	NPU	EDM	Mozambique
3	Eswatini Electricity Company	NPU	EEC	Eswatini
4	<a href="#">Electricity Supply Corporation of Malawi</a>	NPU	<a href="#">ESCOM</a>	<a href="#">Malawi</a>
5	Eskom	NPU	Eskom	South Africa
6	Lesotho Electricity Corporation	NPU	LEC	Lesotho
7	Nam Power	NPU	Nam Power	Namibia
8	<a href="#">Rede Nacional de Transporte de Electricidade</a>	NPU	<a href="#">RNT</a>	<a href="#">Angola</a>
9	Societe Nationale d'Electricite	NPU	SNEL	DRC
10	<a href="#">Tanzania Electricity Supply Company Ltd</a>	NPU	<a href="#">TANESCO</a>	<a href="#">Tanzania</a>
11	ZESCO Limited	NPU	ZESCO	Zambia
12	Zimbabwe Electricity Supply Authority	NPU	ZESA	Zimbabwe
<b>Operating Member – Capacity greater than 300 MW</b>				
13	Copperbelt Energy Cooperation	ITC	CEC	Zambia
14	Hidroelectrica de Cahora Bassa	IPP	HCB	Mozambique
15	Lunsemfwa Hydro Power Company	IPP	LHPC	Zambia
16	Mozambique Transmission Company	ITC	MOTRACO	Mozambique
17	Ndola Energy Corporation	IPP	Ndola	Zambia
<b>Market Participant – Capacity greater than 5 MW but less than 300 MW</b>				
18	GreenCo Power Services Ltd	IPP	GreenCo	Zambia
19	Maamba Collieries Limited	IPP	Maamba	Zambia
20	Nyangani Renewable Energy (Pvt) Ltd	IPP	NRE	Zimbabwe
21	Solarcentury	IPP	SCT	Namibia
22	Enterprise Power DRC	IPP	ENP	DRC

**NPU:** National Power Utility **ITC:** Independent Transmission Company **IPP:** Independent Power Producer

# History of SAPP Interconnections

## History of selected major Cross-border Transmission Interconnectors in SAPP

**1950s: 220 kV DRC – Zambia**

**1960s: 330 kV Zambia – Zimbabwe (2 lines)**

**1970s: 533 kV HVDC Mozambique – South Africa**

**1990s: 400kV South Africa – Botswana – Zimbabwe**

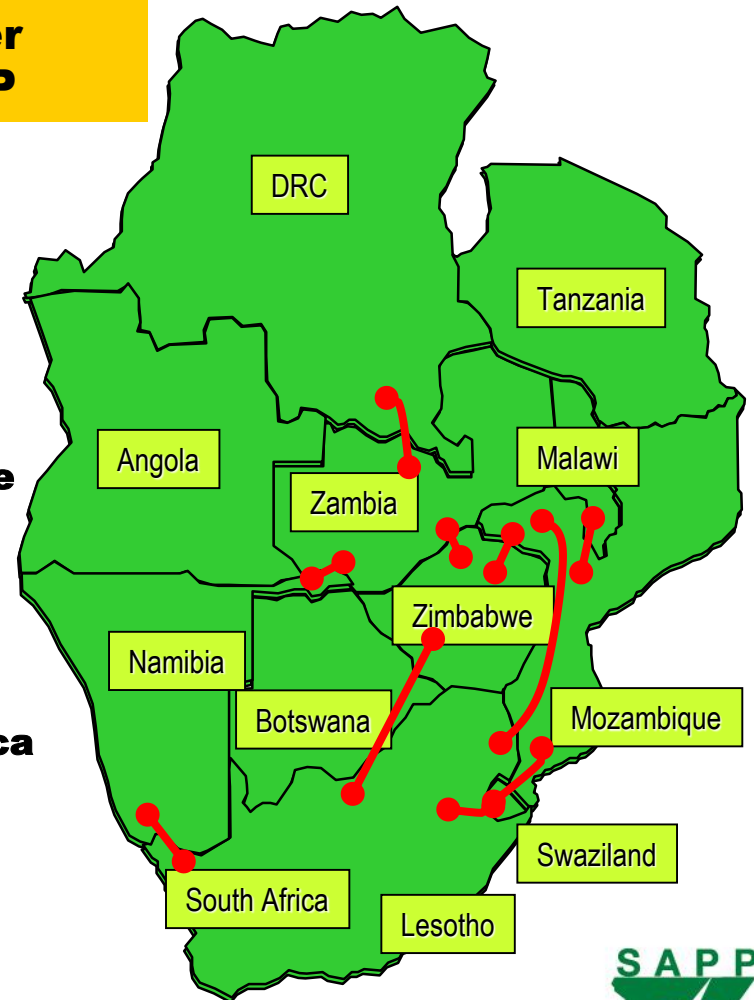
**1990s: 330 kV Mozambique – Zimbabwe**

**2000s: 400 kV Mozambique – Eswatini – South Africa (MOTRACO)**

**2000s: HVDC + HVAC Namibia – Zambia**

**Ongoing: 400 kV Malawi – Mozambique**

**Ongoing: 400 kV Namibia – South Africa**



Southern African Power Pool



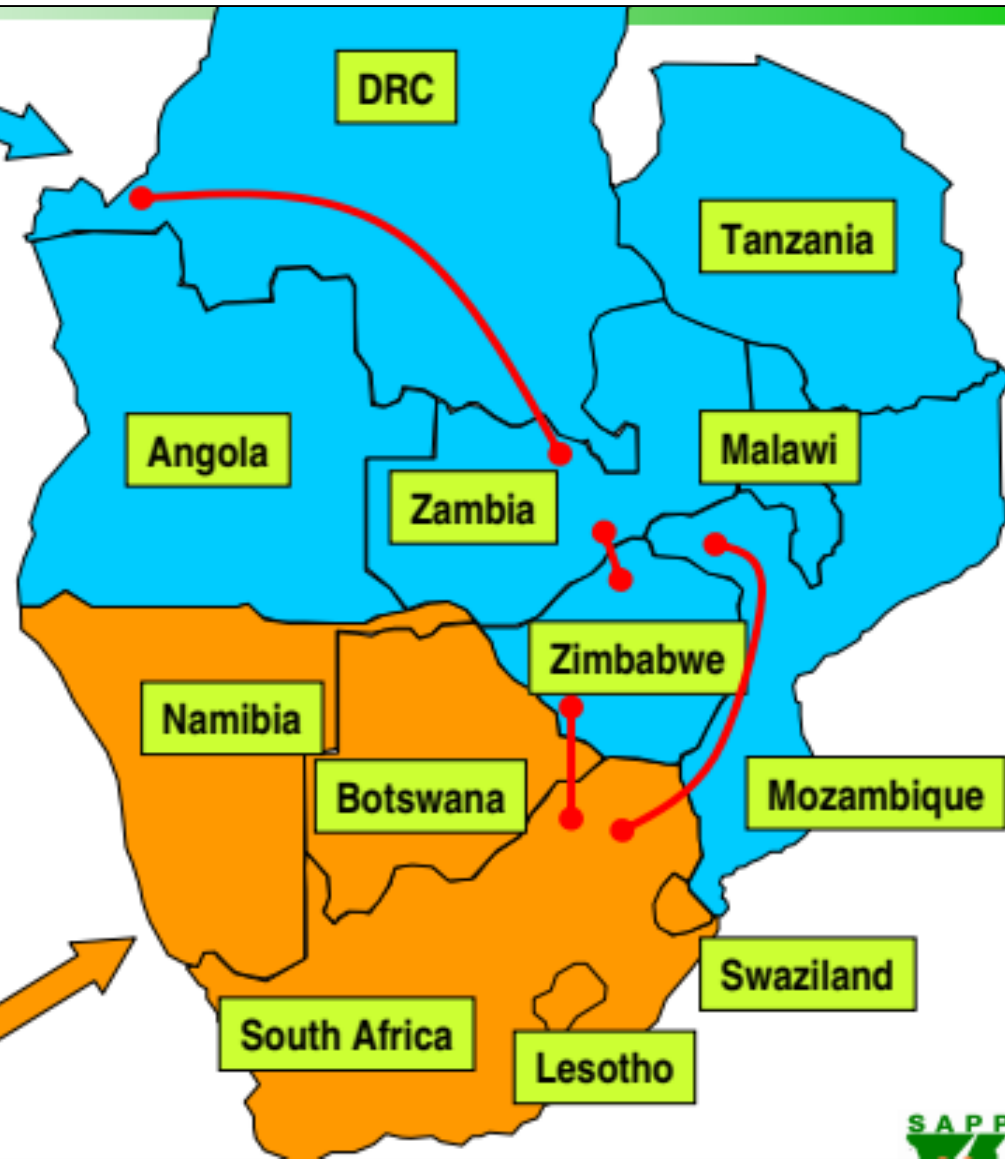
# Interconnection of North & South of the region.....

Hydro Northern Network

Two networks linked by weak lines at **220kV** & **132kV** via Botswana

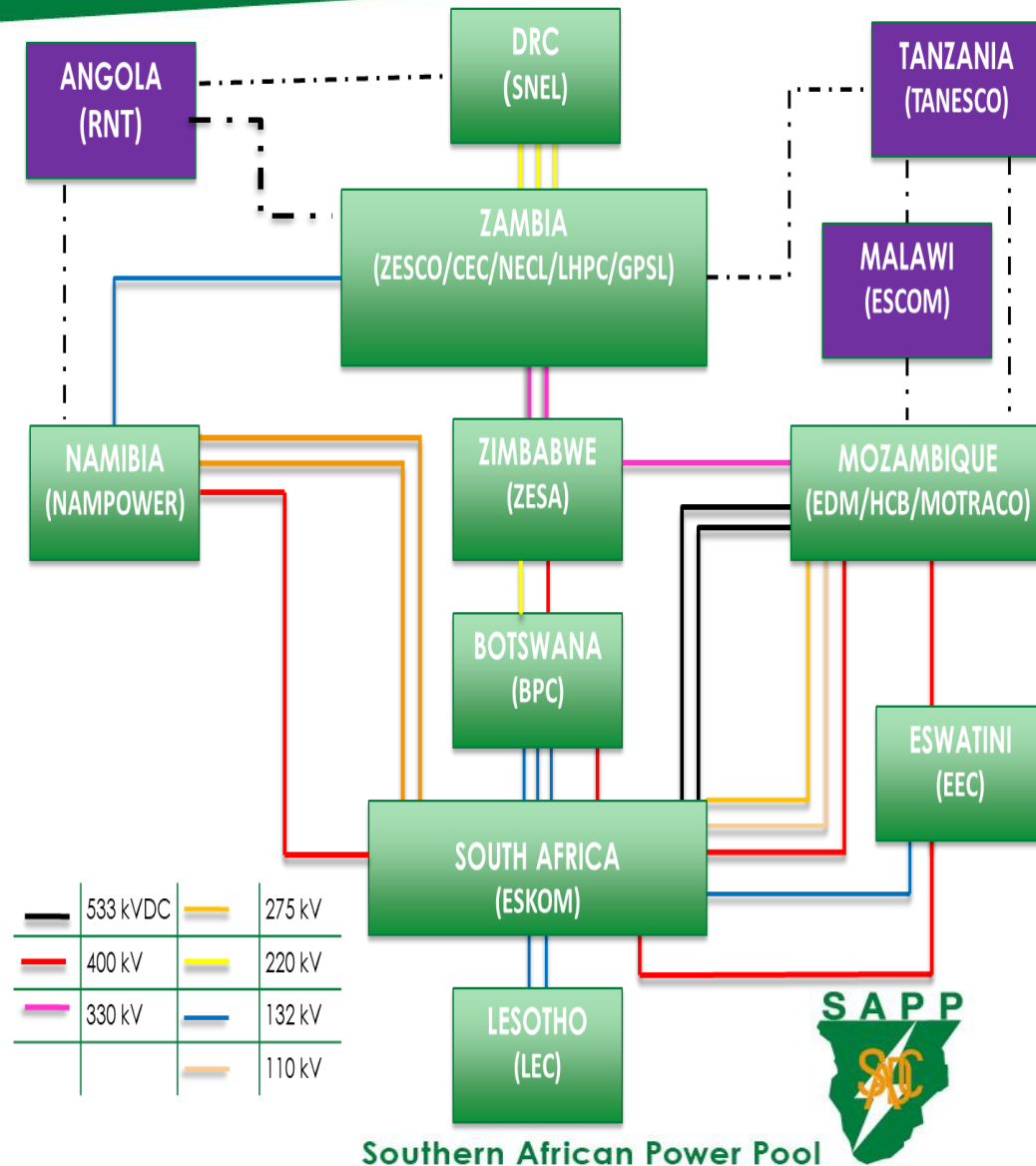
In **1995** the **400kV** was constructed from Zimbabwe to South Africa via Botswana.

Thermal Southern Network



# Status of Electrical Connectivity

- 9 Countries currently interconnected at Transmission level and 3 not yet connected to the SAPP grid
- **Malawi** being connected through the Mozambique – Malawi Interconnector
- **Tanzania** being connected through the Zambia – Tanzania Interconnector which will lead to interconnection of SAPP & EAPP as Tanzania is also being connected to Kenya
- **Angola** will be connected to Namibia, DRC and Zambia



# Rationale for Electricity Trading in SAPP

- ❑ **Three technical building blocks**
  - ✓ **Diverse generation mix**
  - ✓ **Strong transmission Interconnection**
  - ✓ **Some utilities have excess generation capacities, others are in deficit**
  
- ❑ **In addition, there is good**
  - ✓ **Political support through SADC**
  - ✓ **Regulatory support through RERA**

# Benefits of Regional Electricity Trading



**Demand and Supply balance** is achieved in a more **efficient** manner, pooling cheapest source of generation to meet demand



Enhanced **security of supply** & ability to **mitigate supply shocks**. Members assist each other in cases of emergencies



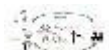
Optimised use of generation and access to cost-efficient sources across borders promoting efficiency and **economies of scale** on investment of power projects



**Generation mix is optimized** with stronger integration of low-carbon sources and improved system resilience to climate shocks. Minimize loadshedding



Increased potential for **private sector participation** across the system, leading to higher capital availability.



Full utilization of Regional Grid resulting in improved revenue



# SAPP Electricity Market Evolution

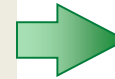
## PREVIOUSLY

- ❑ **Bilateral contracts**
- ❑ **Cooperative Markets:**
  - Short-Term Energy Market (STEM) – 2001
  - Post STEM – 2002
- ❑ **Competitive Markets:**
  - Day-Ahead Market (DAM) – 2009
  - Post Day Ahead Market – 2013



## CURRENT

- ❑ Bilateral contracts
- ❑ Day-Ahead Market (DAM) – 2009
- ❑ Forward Physical Markets (Month Ahead & Week Ahead) – 2016
- ❑ Intra Day Market (Hour Ahead) – 2016
- ❑ Balancing Market – April 2022



## FUTURE ADDITIONS

- ❖ Ancillary Services Market
- ❖ Financial Markets
- ❖ Renewable Energy Market

# Different Types of SAPP Market Products

1

## Auction Markets:

FPM-Monthly, FPM-Weekly, DAM

- Market price is set at the **interception between the sellers' willingness to produce and the buyers' willingness to consume.**
- Buyers and sellers need to **submit their bids and offers before a specific time.**
- All bids and offers are **cleared at the same time.**
- The **Market pricing algorithm determines the unconstrained market clearing price** and the constrained area market price for a defined market area.

2

## Continuous Markets:

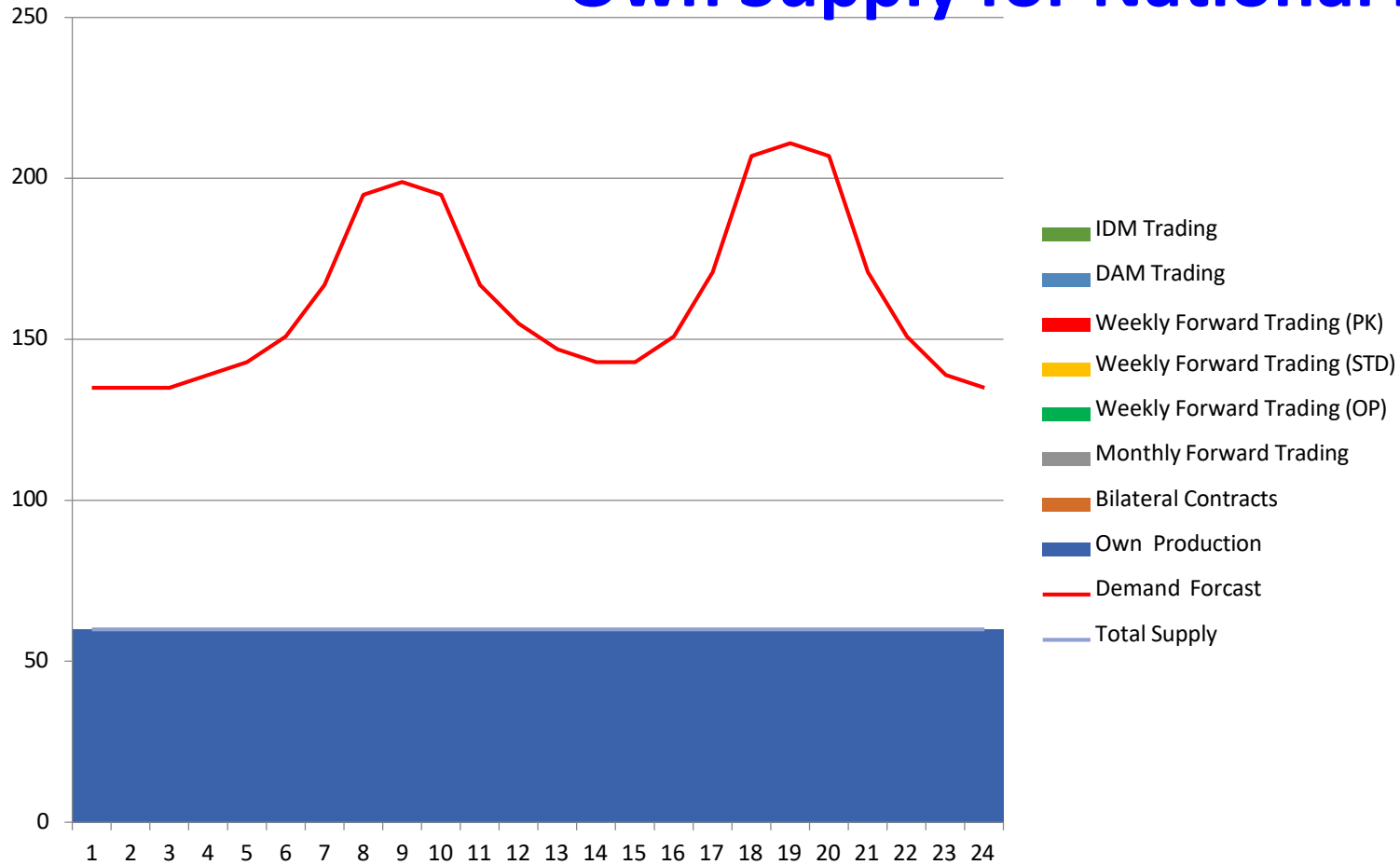
Intraday, Balancing

- ❖ Buyers and sellers need to submit their bids and offers before a specific time.
- ❖ The moment there is a willing buyer and willing seller (i.e. buyer willing to pay the seller price) a trade is concluded.
- ❖ **Intraday:** The trade is concluded at the seller's asking price.
- ❖ **Balancing:** Trade (currently) is concluded at the area market price.



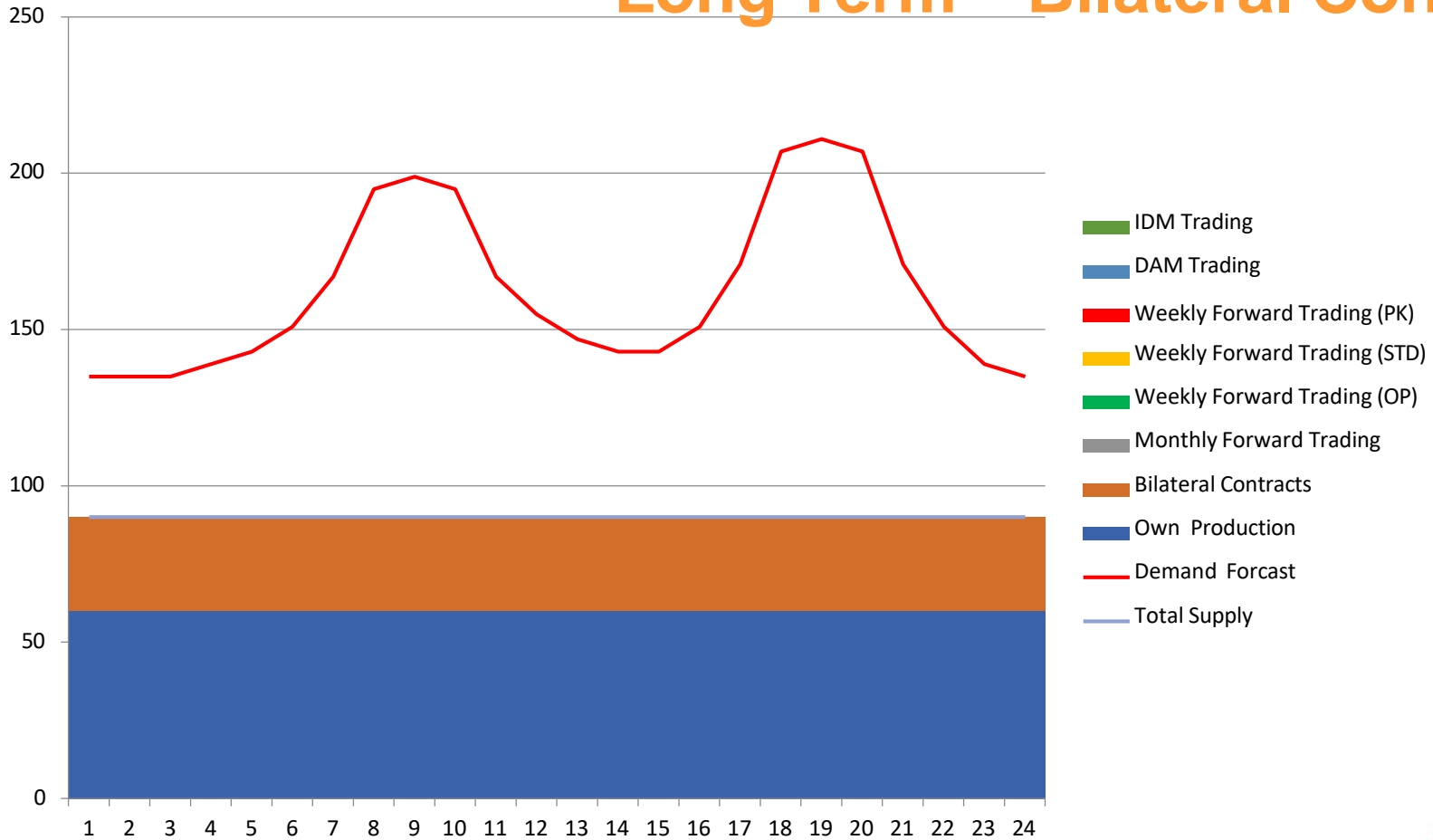
# Role of Different Markets in Supply

## Own Supply for National Needs



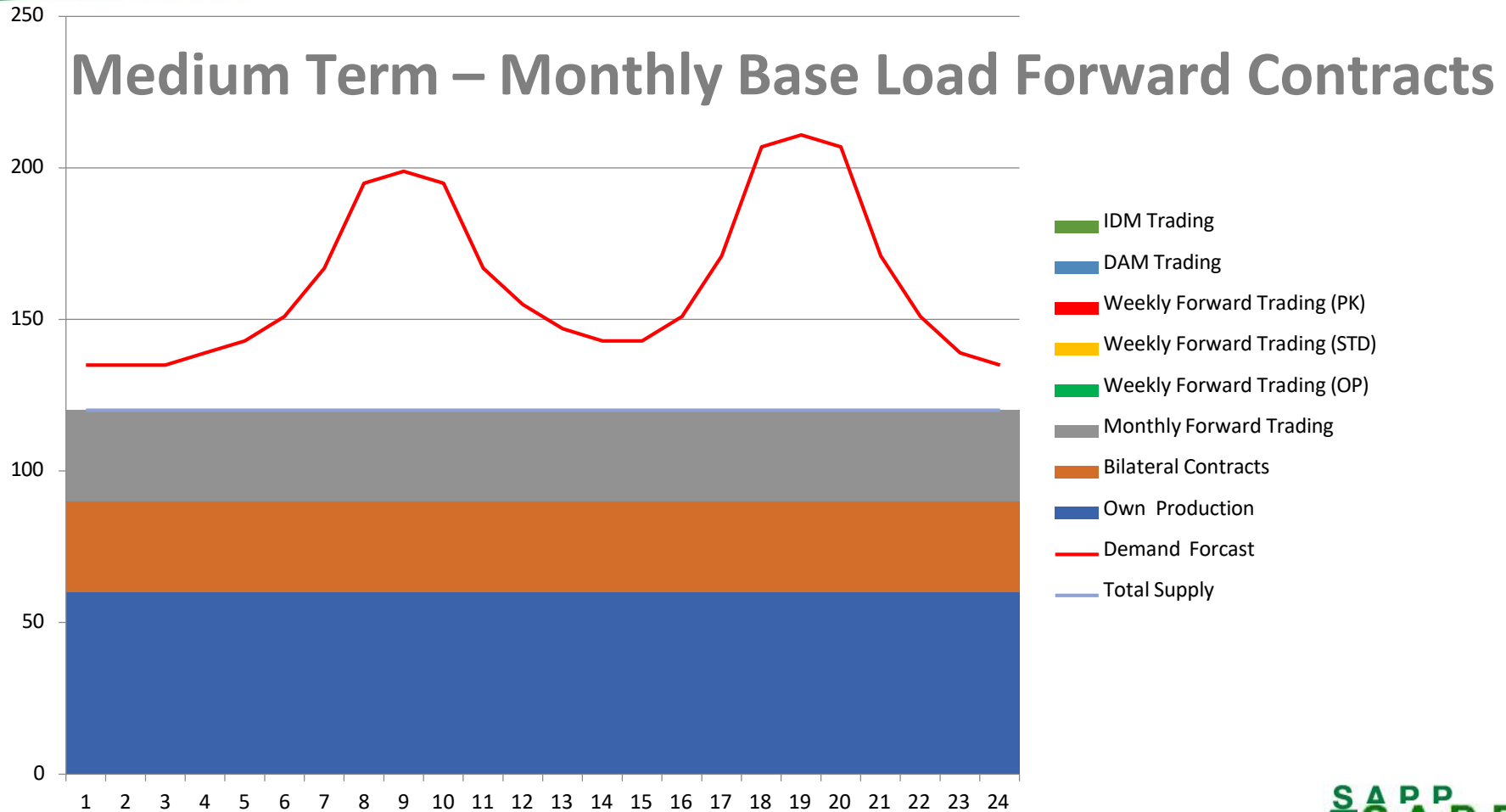
# Role of Different Markets in Supply

## Long Term – Bilateral Contracts

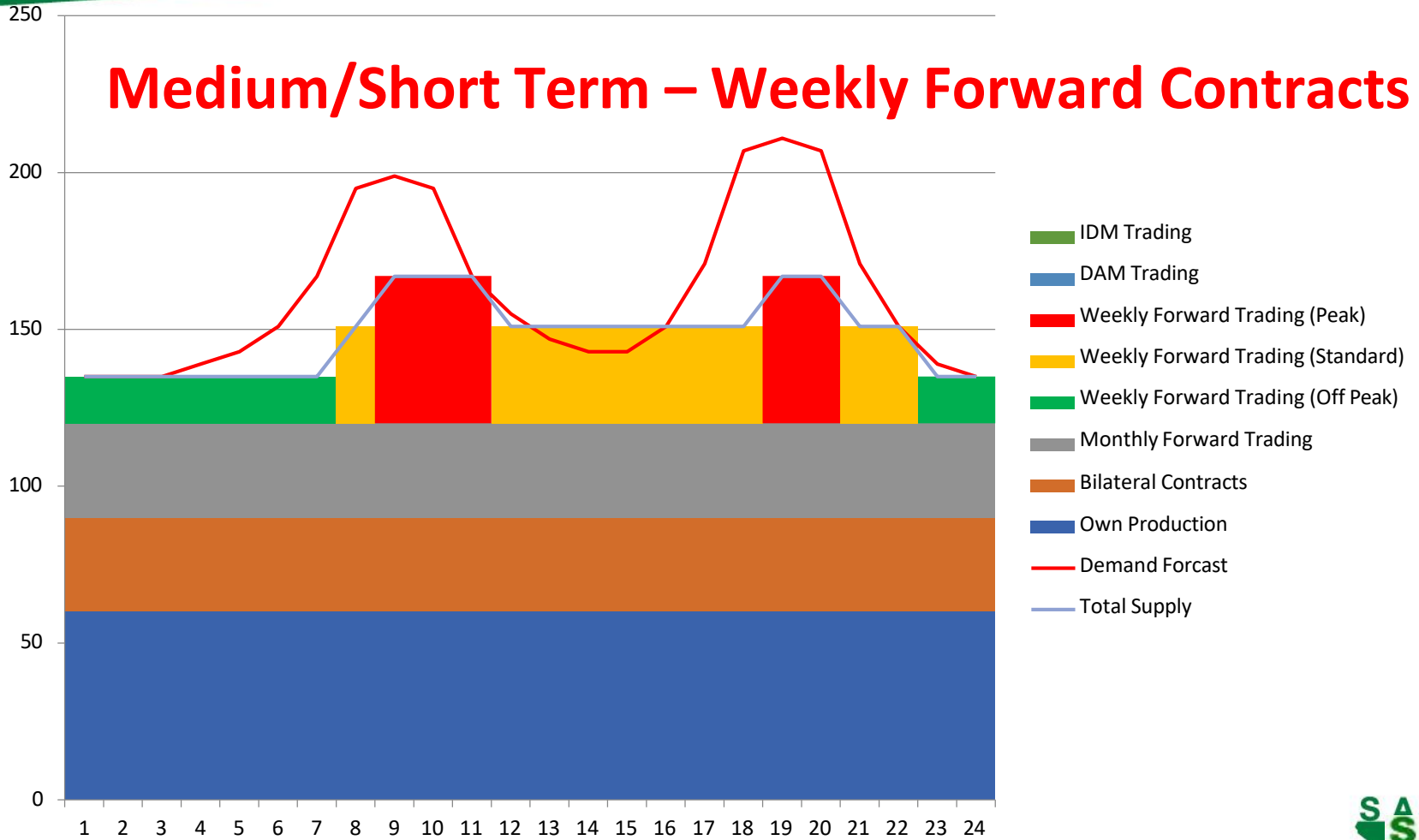




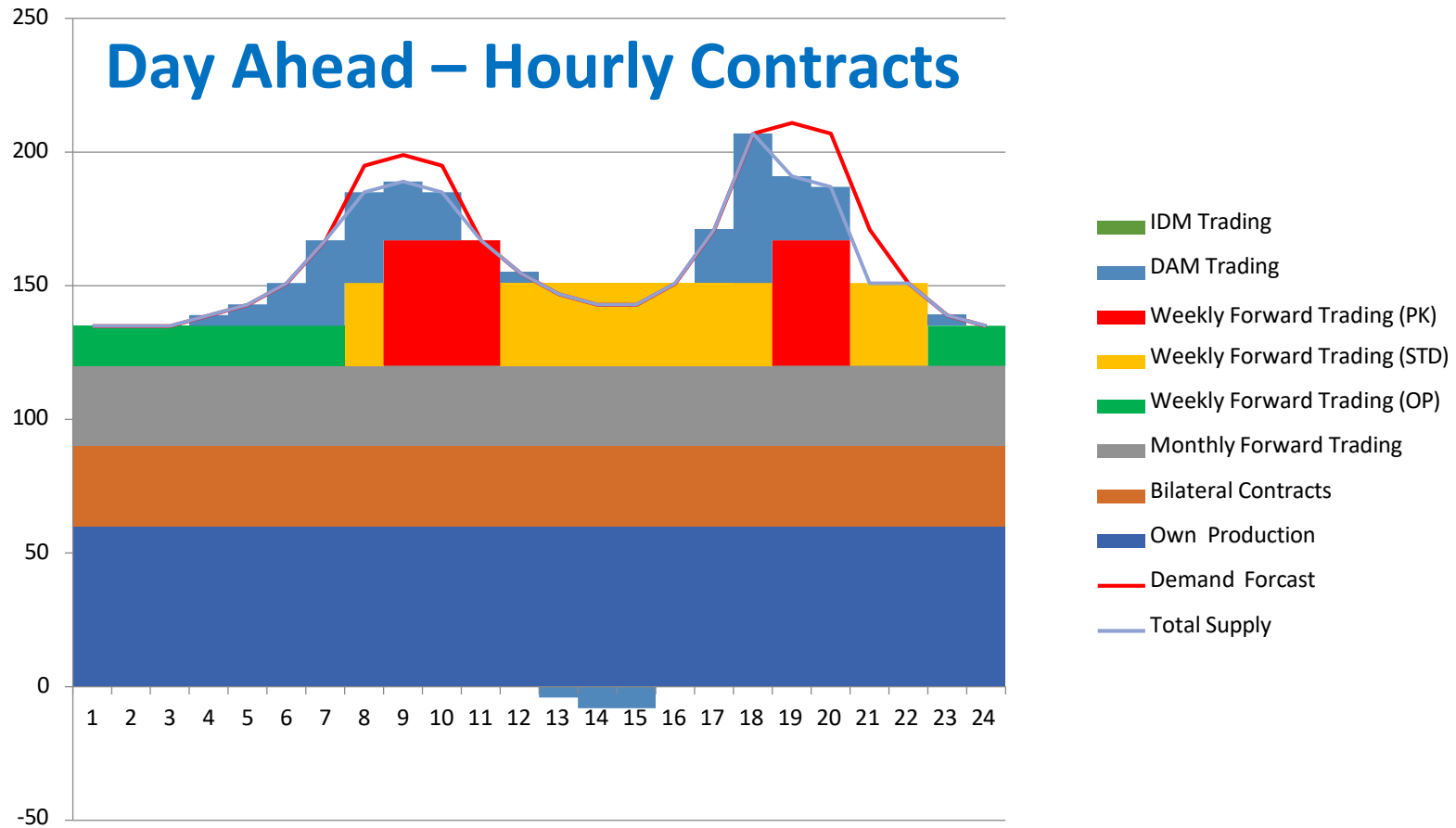
# Role of Different Markets in Supply



# Role of Different Markets in Supply

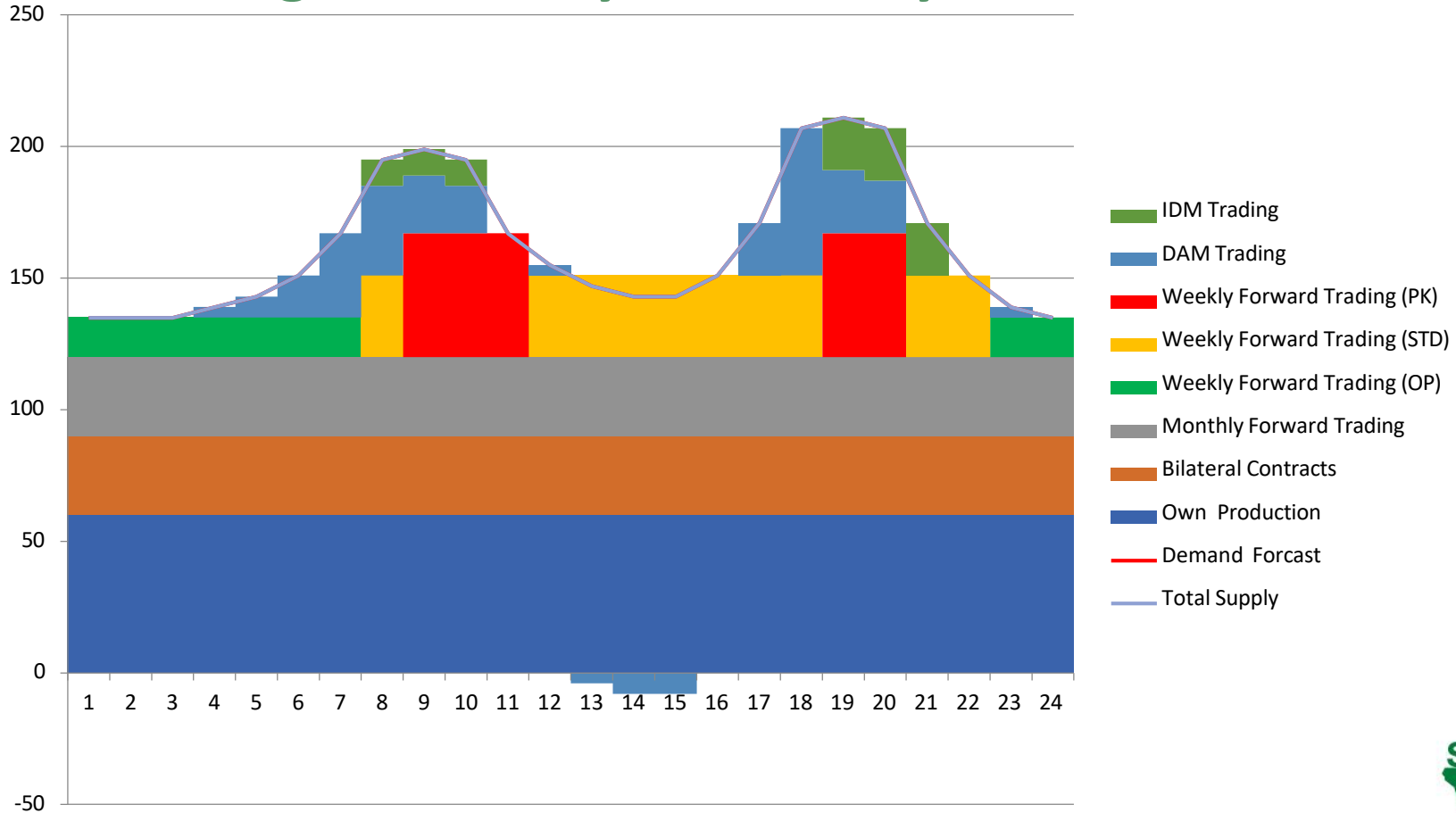


# Role of Different Markets in Supply

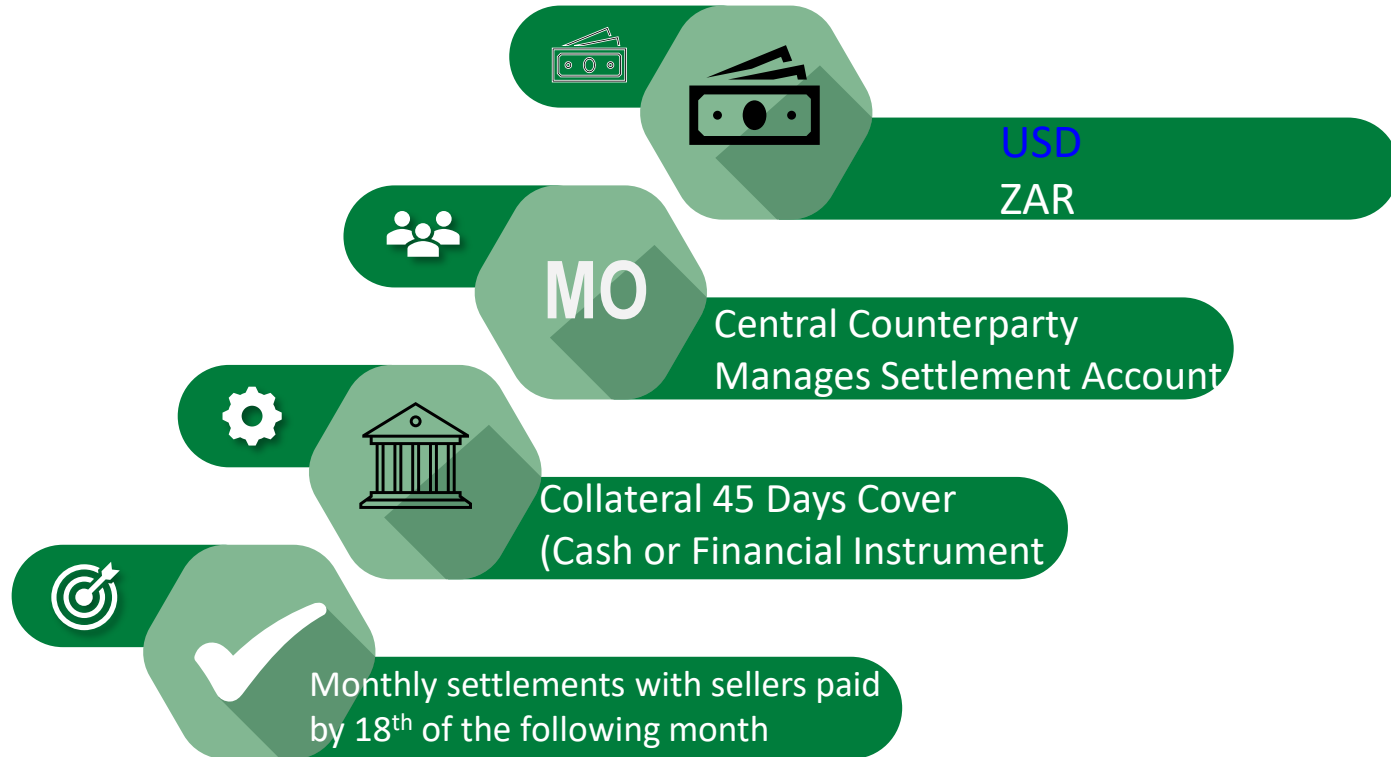


# Role of Different Markets in Supply

## Balancing on the Day – Intra Day Market

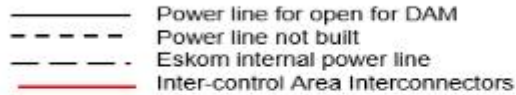


# Market Settlement Arrangements

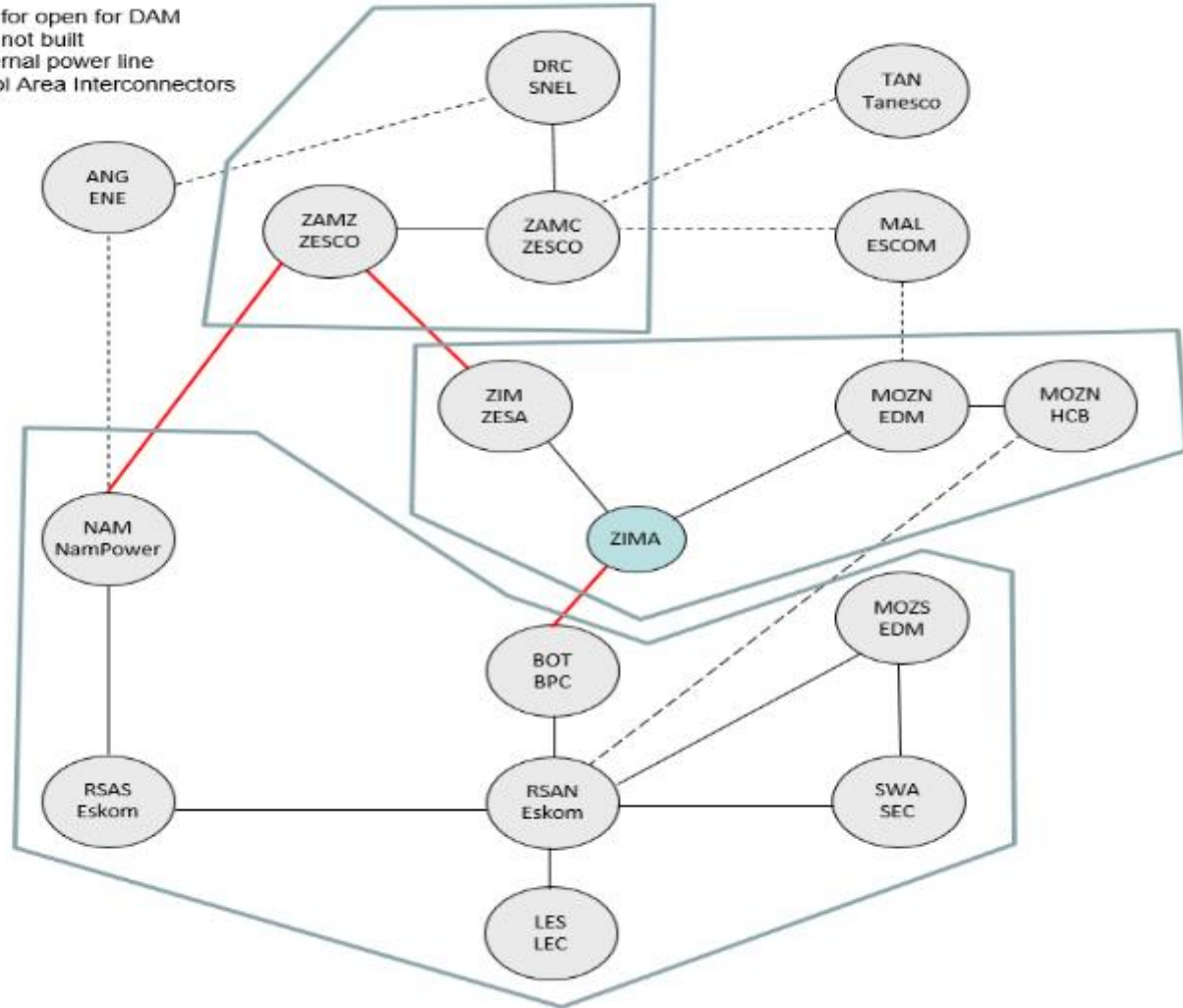


# Transmission Congestion Management

## SAPP Area Model



- ❖ Calculated contract flow between bid areas computed & compared with available transmission capacity for spot trade.
- ❖ In case of congestion, market splitting performed, and local area prices calculated.



# Bilateral Markets and their management

- ❑ **Trading arrangements mutually agreed between bilateral parties**
  - ✓ **Volumes and Prices are the key parameters**
  - ✓ **Transmission path to be secured in advance**
  - ✓ **Bilateral parties directly invoice and settle each other**
- ❑ **Wheeling & Losses charges determined by SAPP**
  - ❖ **SAPP generates invoices and credit notes for wheeling & losses**
  - ❖ **Settlement is currently done bilaterally**
- ❑ **Bilateral contracts management**
  - ❖ **SAPP maintains database of all bilateral contracts**
  - ❖ **Transmission capacity allocation managed as per SAPP criteria**
- ❑ **Energy Imbalance Management**
  - ❖ **SAPP generates invoices and credit notes for energy imbalances**
  - ❖ **Settlement is currently done between control areas**

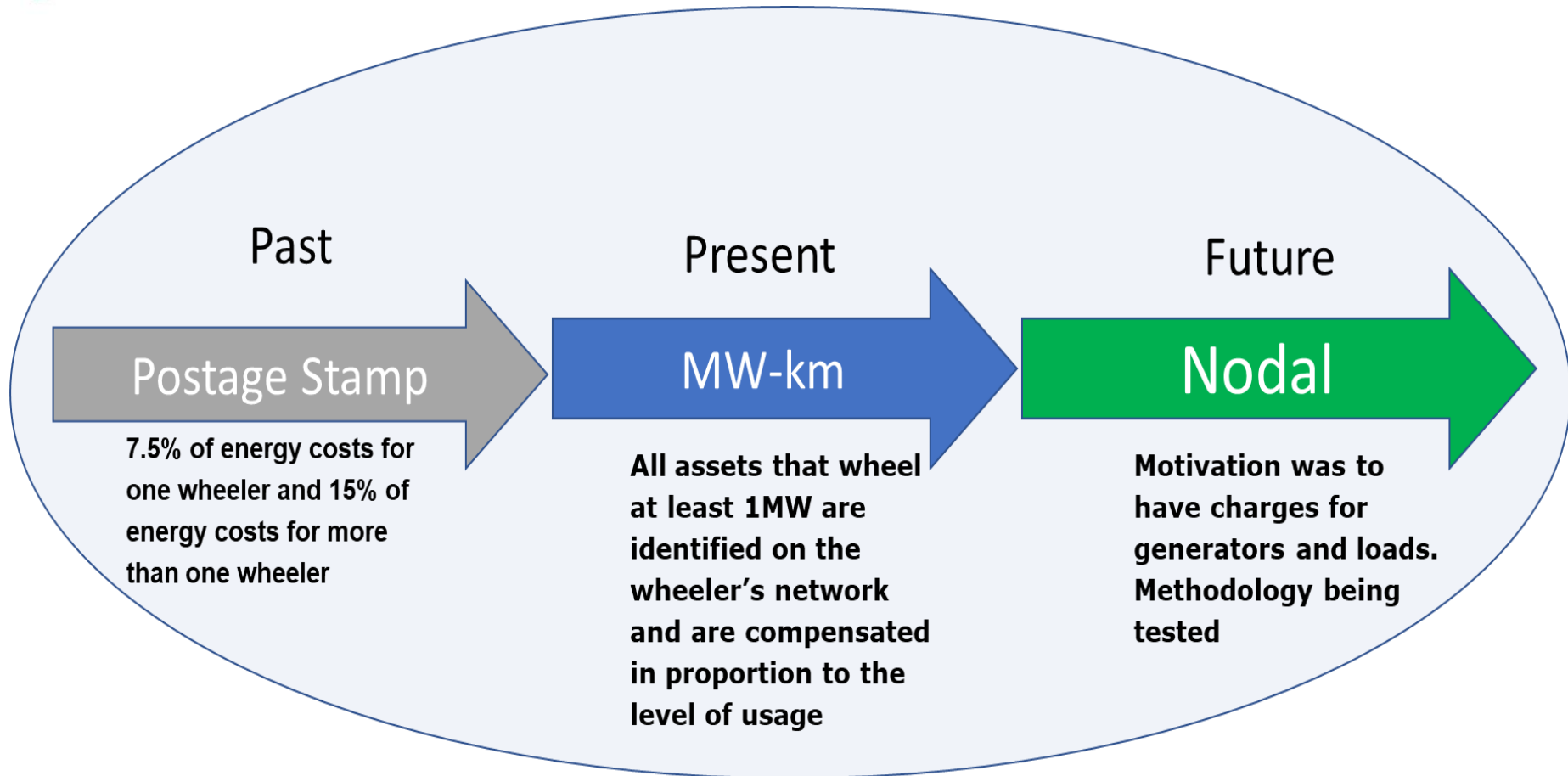
# SAPP Market Surveillance Unit

**Main objectives of Market Surveillance are to ensure that:**

- ✓ **All participants within the market benefit from the same level of protection, regardless of type of participant, country and market**
- ✓ **Participants only place safe products on the market**
- ✓ **Conduct investigations of possible breaches on laws and regulations**
- ✓ **Issue sanctions and penalties to defaulters with a clearly defined process**



# SAPP Transmission Wheeling Pricing History



# SAPP Outlook

- ❑ **Achievement of adequate Transmission Infrastructure through:**
  - Implementation of proposed SAPP Regional Transmission Infrastructure Financing Facility (RTIFF)
  - Improved Transmission Pricing Methodology
  
- ❑ **Increased electricity market liquidity through:**
  - addition of members
  - investment in generation by members
  - Efficient transmission capacity allocation
  - Improved trading portfolios
  - Development of Financial Markets
  
- ❑ **Improved system operations:**
  - Utilising the balancing market to reduce energy imbalances
  - Development of Ancillary Services Market
  - Improved system performance
  
- ❑ **Being part of the African continental power integration**
  - Leading to the creation of the African Single Electricity Market (AfSEM)

## For more information contact:

Eng Stephen Dihwa  
SAPP Coordination Centre Executive Director  
Harare, Zimbabwe

Email: [steve.dihwa@sapp.co.zw](mailto:steve.dihwa@sapp.co.zw)

Main Website: [www.sapp.co.zw](http://www.sapp.co.zw)

Markets Public Website: [www.sappmarket.com](http://www.sappmarket.com)

Phone: +263 242 335558

Mobile: +263 774 308 101

# Thank you!

