



The Southern African Power Pool

www.sapp.co.zw

SAPP Overview

South Asia Regional Workshop on Competitive Electricity Markets

March 18-20, 2014

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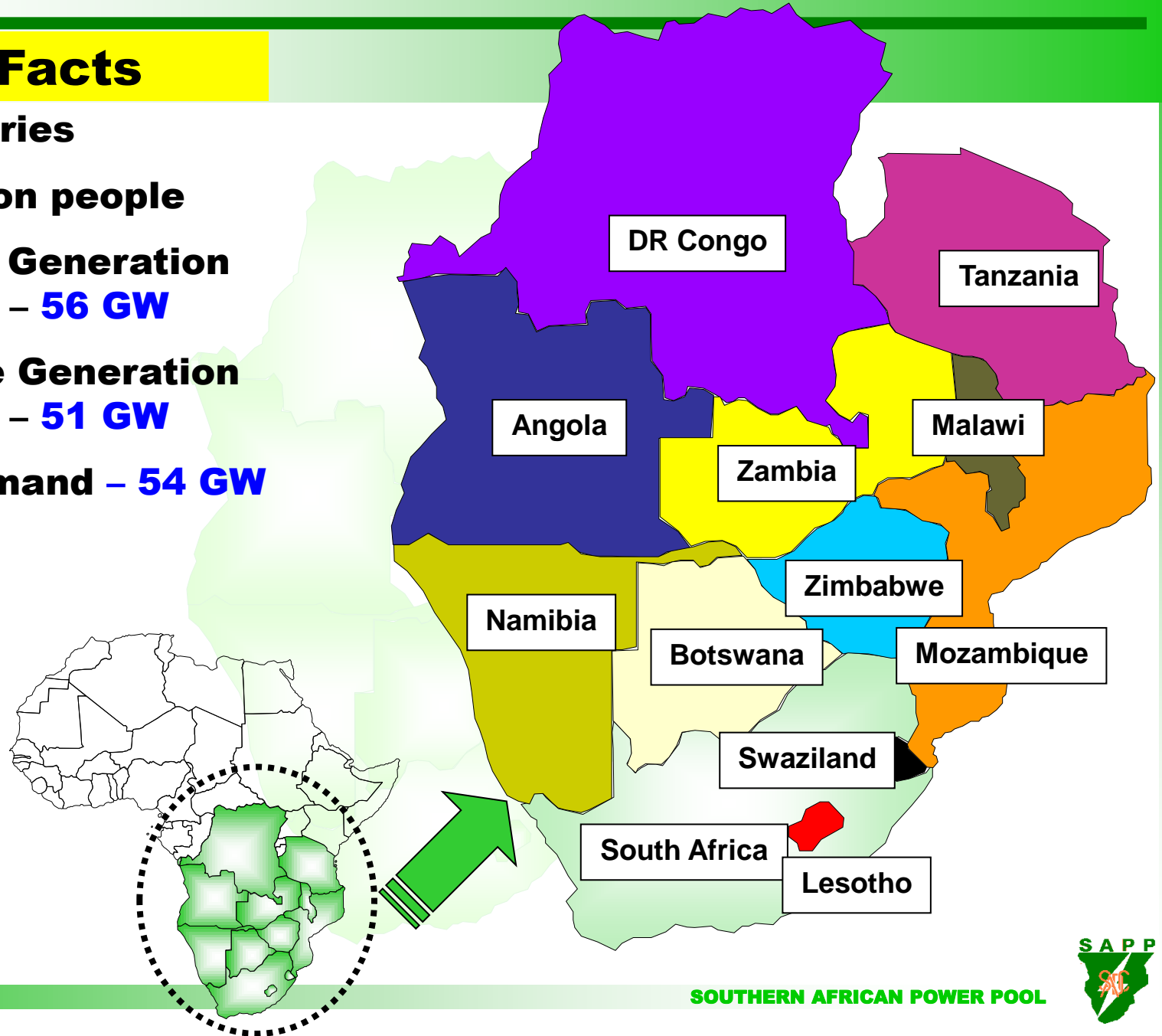
CONTENTS

- 1. INTRODUCTION TO SAPP**
 - 2. SAPP DEMAND & SUPPLY SITUATION**
 - 3. UPDATE ON PROJECTS IMPLEMENTATION**
 - 4. UPDATE ON MARKET ISSUES**
 - 5. KEY POWER SECTOR CHALLENGES**
 - 6. CONCLUSIONS**
- 

1. INTRODUCTION TO THE SAPP

Key Facts

- ❑ **12 Countries**
- ❑ **280 Million people**
- ❑ **Installed Generation Capacity – 56 GW**
- ❑ **Available Generation Capacity – 51 GW**
- ❑ **Peak Demand – 54 GW**



SAPP Vision

The SAPP Vision is to:

- Facilitate the development of a **competitive** electricity market in the Southern African region.
- Give the end user a **choice** of electricity supply.
- Ensure that the Southern African Region is the region of choice for **investment** by energy intensive users.
- Ensure sustainable energy developments through sound economic, **environmental** & social practices.

Historic

1950s: DRC – Zambia

500 kV HVDC -1700km

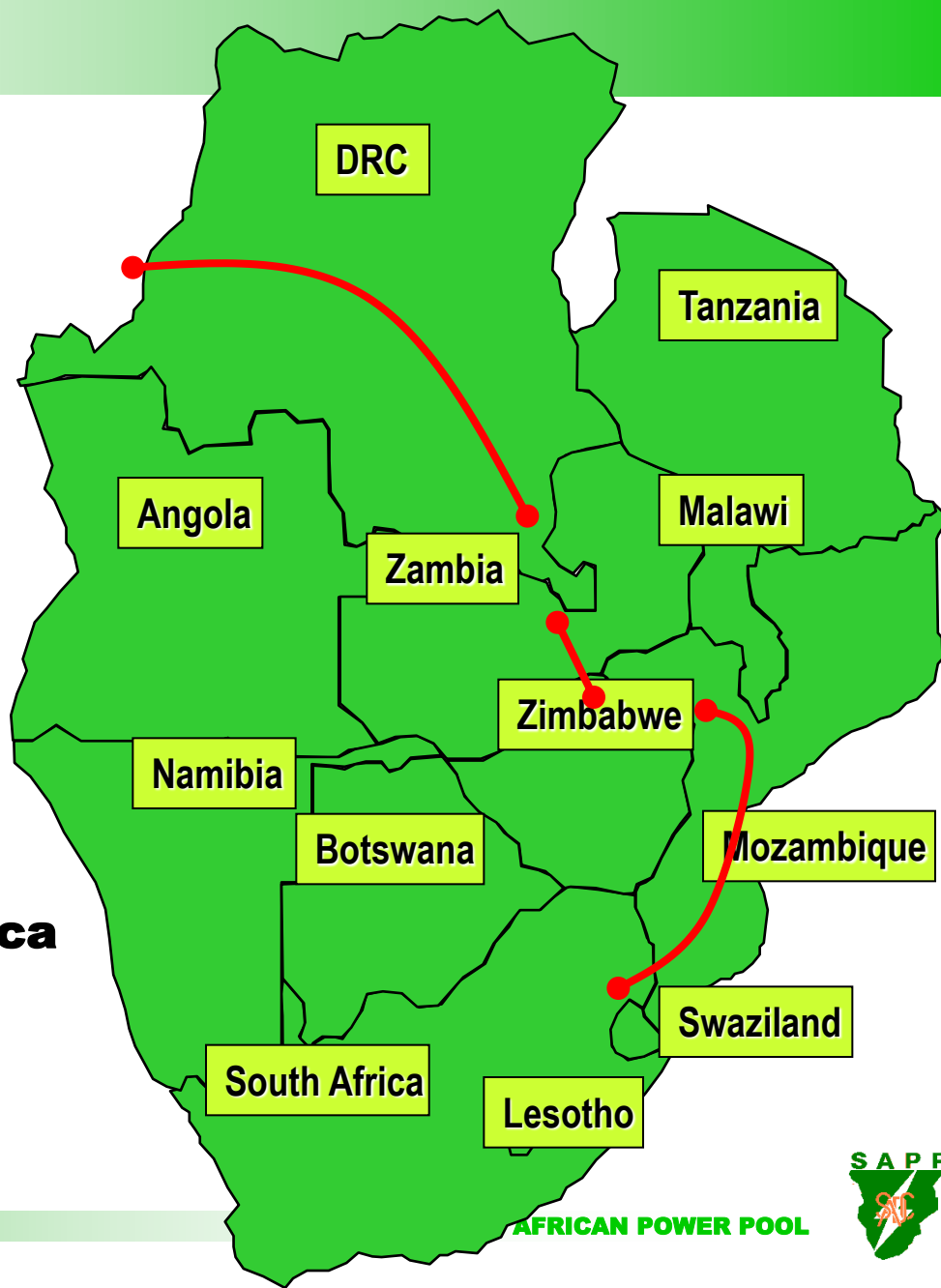
1960s: Zambia – Zimbabwe

330 kV at Kariba Dam

(Zambezi River)

1975: Mozambique – South Africa

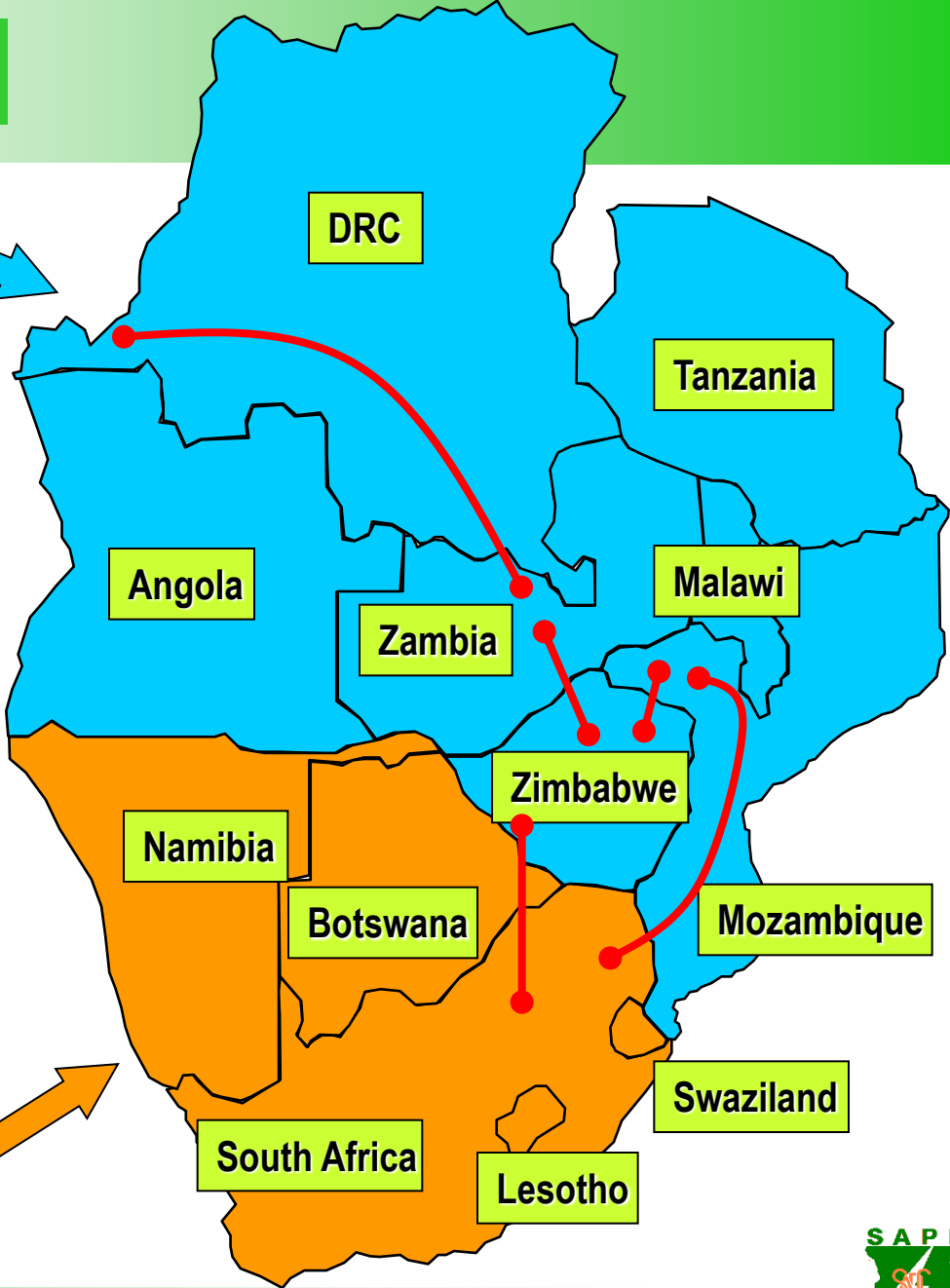
533 kV HVDC – 1400 km



Historic

Hydro Northern Network

Thermal Southern Network



Governing Legal Documents

Inter-Governmental MOU

- **Established SAPP.**
- **Signed by SADC Member Countries in 1995.**
- **Revised document signed on 23 February 2006.**

Inter-Utility MOU

- **Established the Management of SAPP.**
- **Revised document signed on 25 April 2007.**

Agreement Between Operating Members

- **Signed by Operating Members.**
- **Revised document signed May 2008**

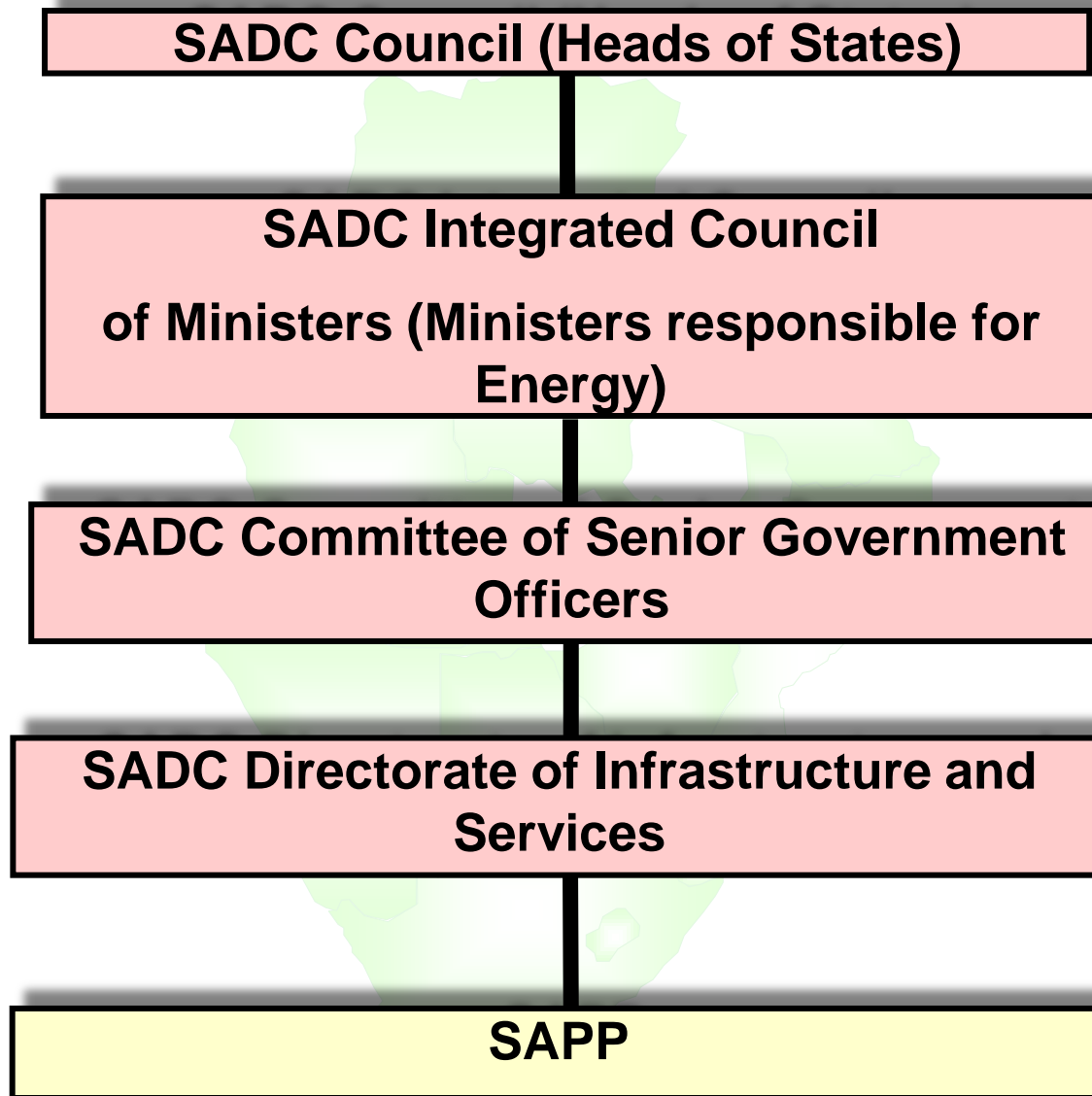
Operating Guidelines

- **Revised in 2013**

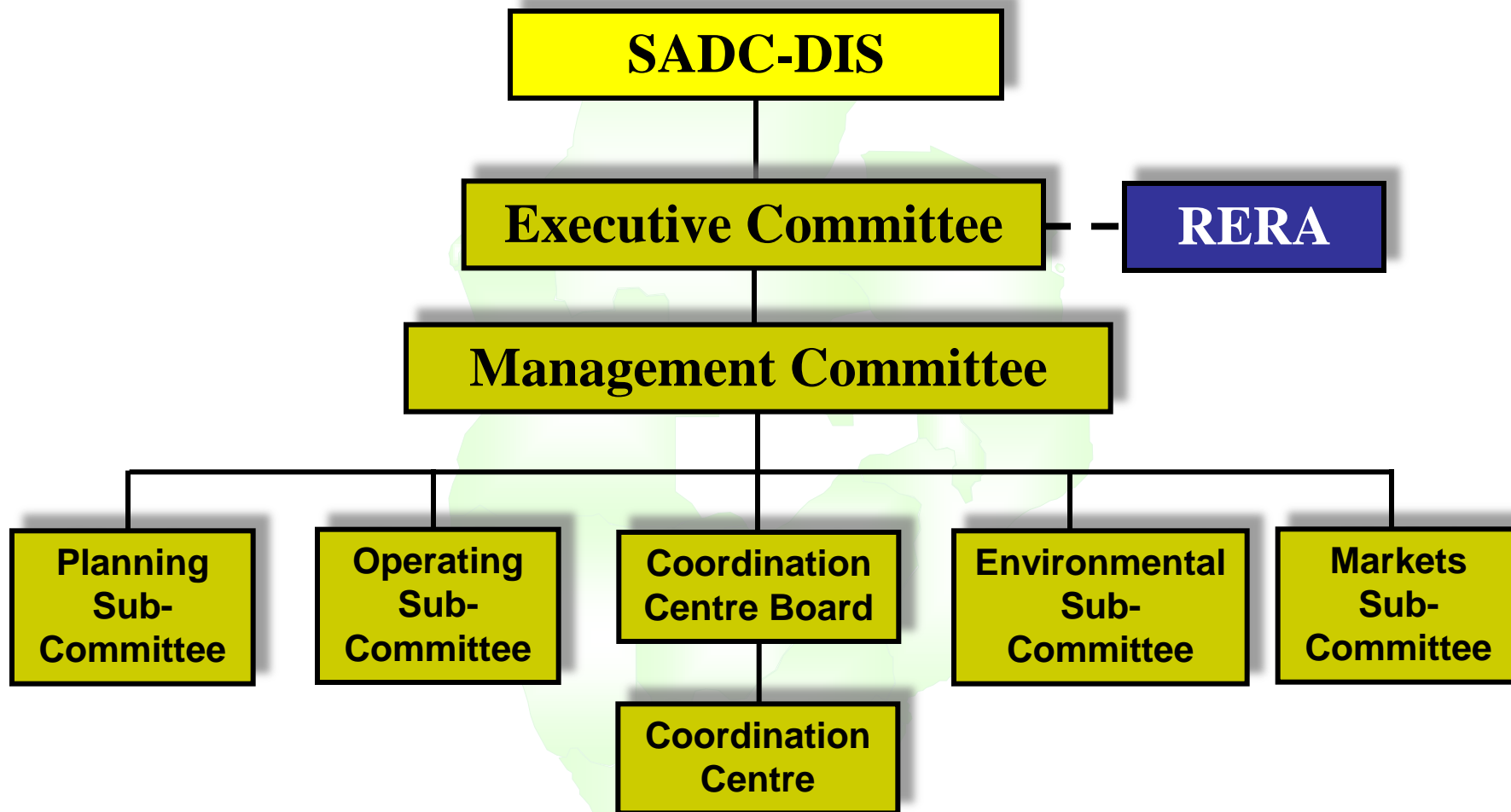
Market Guidelines

- **Draft**

SAPP Reporting Protocol



SAPP Management & Governance Structure



RERA – Regional Electricity Regulatory Association

SOUTHERN AFRICAN POWER POOL



SAPP Membership -2013

No	Full Name of Utility	Status	Abbreviation	Country
1	Botswana Power Corporation	OP	BPC	Botswana
2	Electricidade de Mocambique	OP	EDM	Mozambique
3	Electricity Supply Corporation of Malawi	NP	ESCOM	Malawi
4	Empresa Nacional de Electricidade	NP	ENE	Angola
5	ESKOM	OP	Eskom	South Africa
6	Lesotho Electricity Corporation	OP	LEC	Lesotho
7	NAMPOWER	OP	Nam Power	Namibia
8	Societe Nationale d'Electricite	OP	SNEL	DRC
9	Swaziland Electricity Board	OP	SEC	Swaziland
10	Tanzania Electricity Supply Company Ltd	NP	TANESCO	Tanzania
11	ZESCO Limited	OP	ZESCO	Zambia
12	Zimbabwe Electricity Supply Authority	OP	ZESA	Zimbabwe
13	Copperbelt Energy Corporation	ITC	CEC	Zambia
14	Lunsemfwa Hydro Power Station	IPP	LHPS	Zambia
15	Hidro Cahora Bassa	OB	HCB	Mozambique
16	Mozambique Transmission Company	OB	MOTRACO	Mozambique

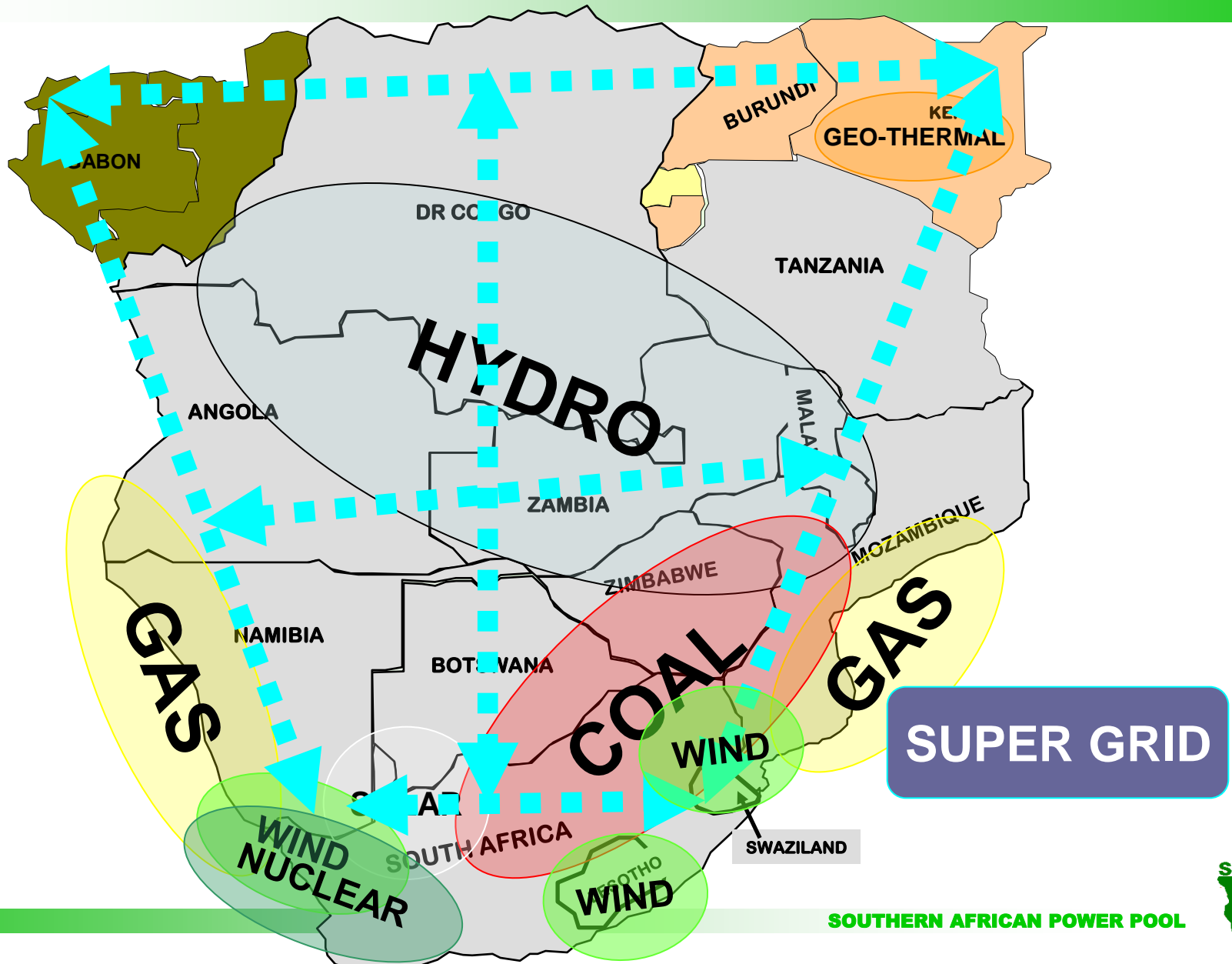
OP: Operating NP: Non-Operating ITC: Independent Transmission Company

OB: Observer

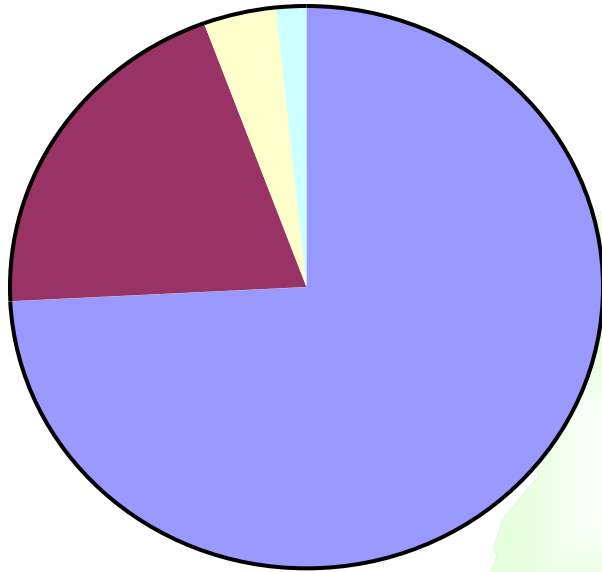
IPP: Independent Power Producer



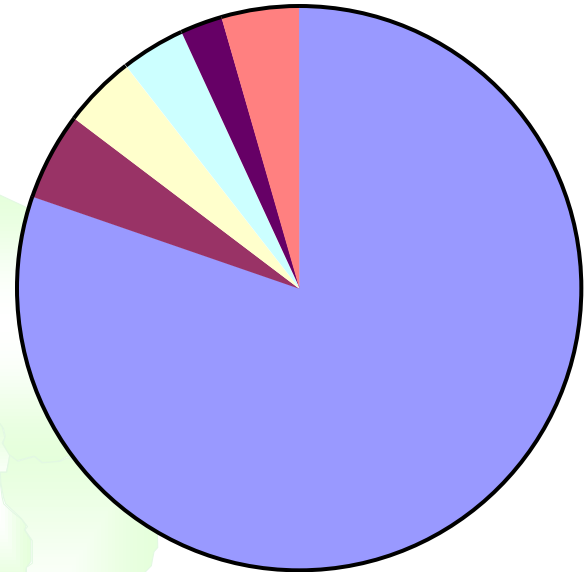
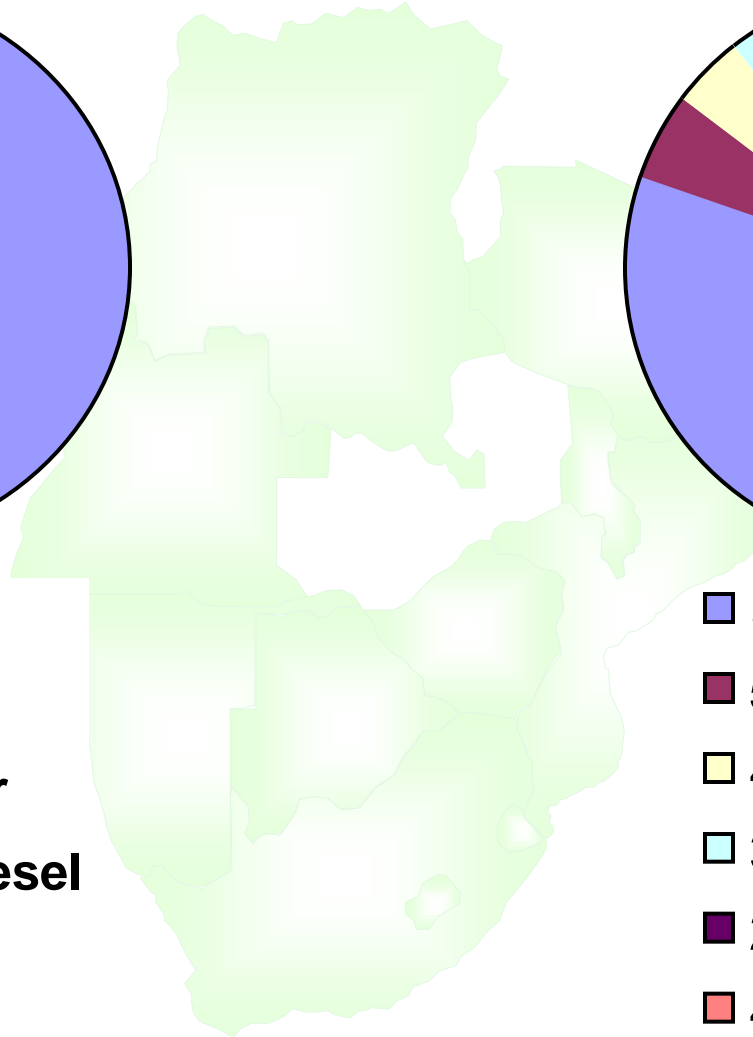
SADC POTENTIAL ENERGY SOURCES



Generation Mix & Contributions – Year 2013



- 74.3% Coal
- 20.1% Hydro
- 4.0% Nuclear
- 1.6% Gas/Diesel



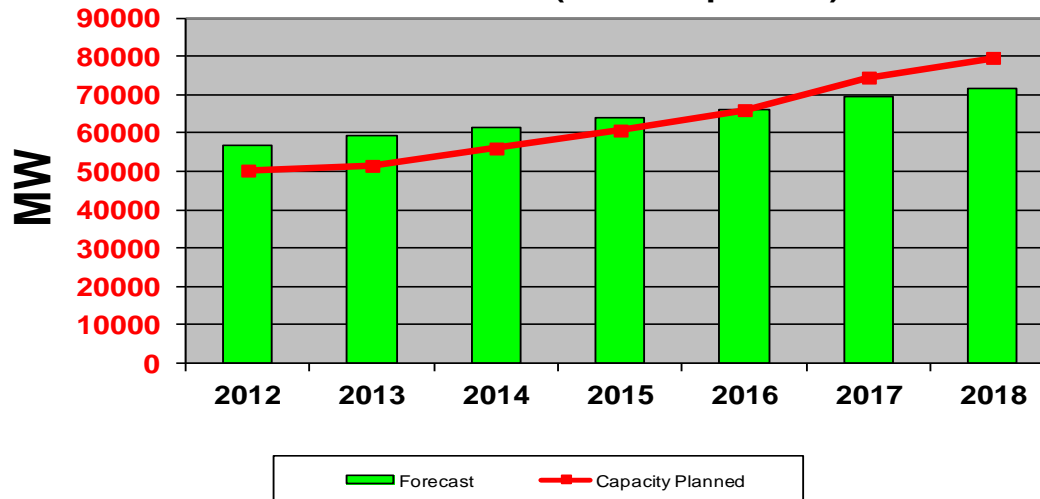
- 80.4% South Africa
- 5.0% Mozambique
- 4.1% Zimbabwe
- 3.6% Zambia
- 2.6% DRC
- 4.4% Rest

2. SAPP Demand and Supply Situation

No.	Country	Utility	Installed Capacity [MW] As at Feb 2014	Available Capacity [MW] Feb 2014	Forecast Demand	Capacity Shortfall including reserves, MW	Calculated Reserve Margin, %
1	Angola	ENE	2,028	1,805	1333		
2	Botswana	BPC	352	322	580		
3	DRC	SNEL	2,442	1,268	1342		
4	Lesotho	LEC	72	72	138		
5	Malawi	ESCOM	351	351	323		
6	Mozambique	EDM /HCB	2308	2,279	763		
7	Namibia	NamPower	501	392	635		
8	South Africa	Eskom	44,170	41,074	38775		
9	Swaziland	SEC	70	70	222		
10	Tanzania	TANESCO	1380	1,143	898		
11	Zambia	ZESCO / CEC/LHPC	2,128	2,029	2287		
12	Zimbabwe	ZESA	2,045	1,600	2267		
TOTAL SAPP			57,847	52,405	49,563	(4,592)	5.4%
Total Interconnected SAPP			54,088	49,106	47,009	(2,787)	4.3%

SAPP Planned & Required Capacity

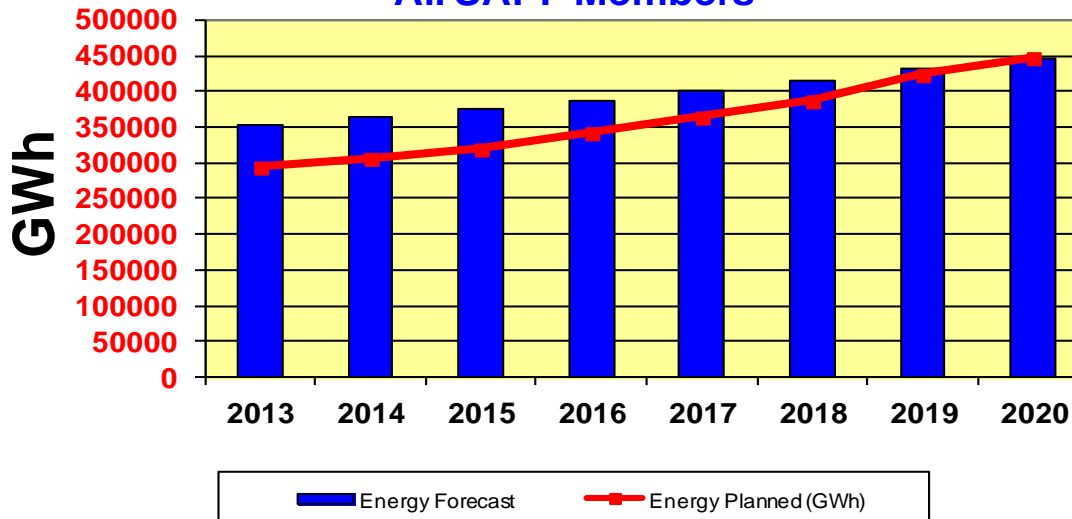
Planned Capacity vs Forecast , MW
All SAPP Members (As at Sept 2013)



- **Projects are facing delays**

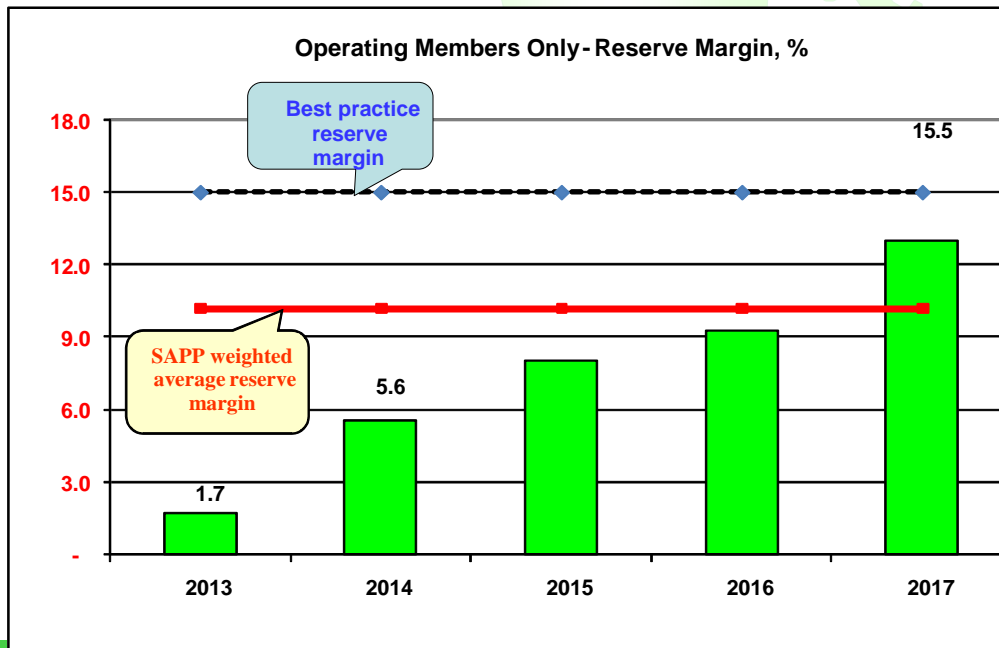
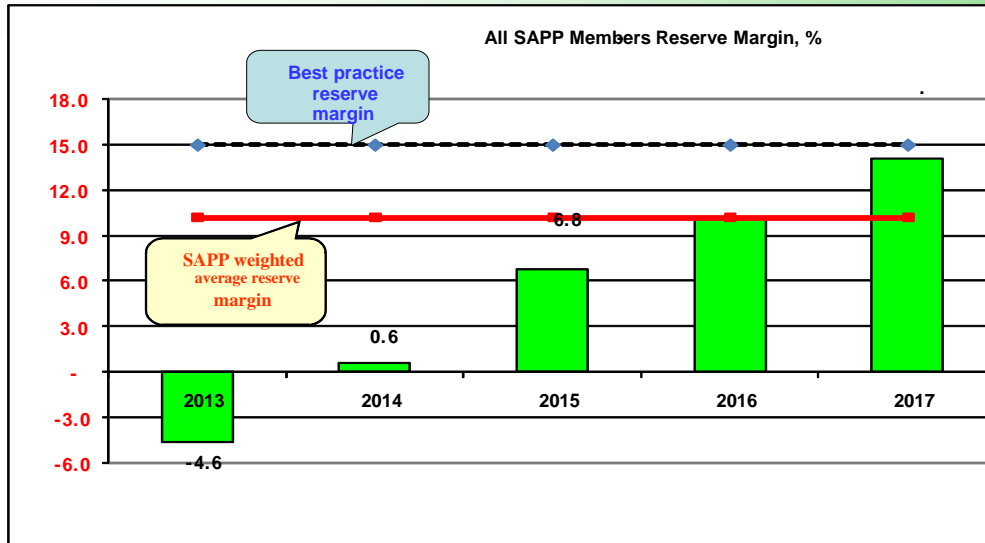
- **Capacity balance by 2017 but energy balance by 2019**

Energy Planned vs Forecast , GWh
All SAPP Members



- **This is due to low load factor plants being commissioned.**

Reserve Capacities vs Requirements



**Tight Reserve Margin
Position for SAPP Members
Generation Capacity
shortfalls up to 2017.**

Power Supply Challenges in SAPP

- ❑ Demand for power in Southern African has been increasing at an average rate of **3%** per annum.
 - ✓ In **2007**, demand growth for South Africa was **4.9%** and for the whole region **4.6%**.
- ❑ In the last 10 years demand in the SAPP increased by more than **32%** which is equivalent to **13,000 MW (from 41,000 MW in 2004 to 54,000MW in 2013)**.
- ❑ Unfortunately, there has been no corresponding **investments** in generation and transmission infrastructure, **(11,202MW generation added from 2004 to 2013)** resulting in the current **supply deficit** that the region is experiencing.

Why has the SAPP run into supply deficit ?

1. **Economic Growth** of more than **5%** in most of the SADC member countries resulting in unprecedented growth in electricity **consumption** and **demand**.
2. **Increase in demand for base metals resulting in high metal prices** on the World Market with new mining companies being established in the **SADC** region in the last few years.
3. **Inadequate Investments** in generation and transmission **infrastructure** over the last **20-years**.
4. **Electrification Programmes** have **partly** contributed to the increased consumption and demand.
5. The **challenge** was identified and communicated but not **adequately mitigated**.

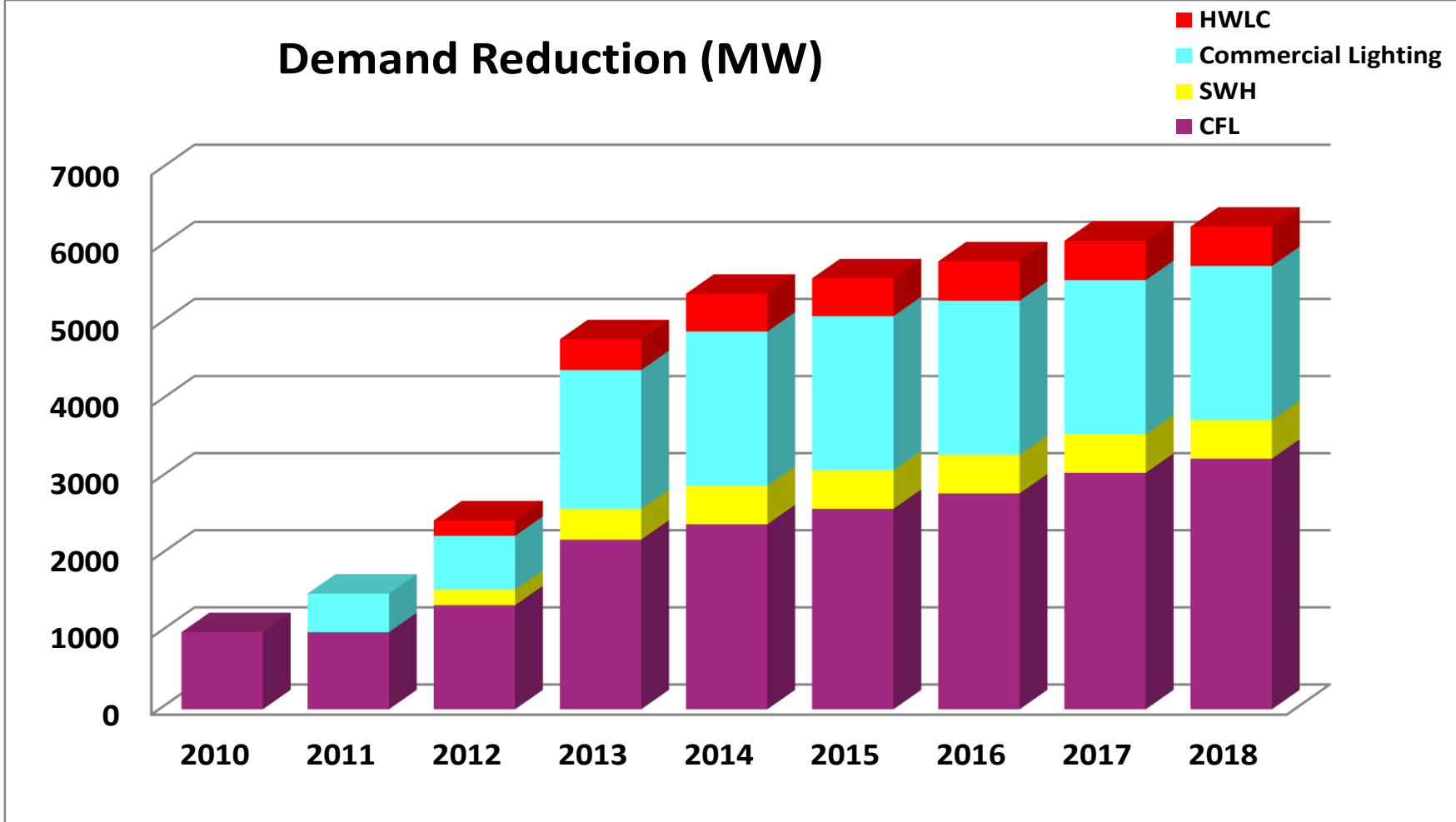
MANAGING THE GENERATION SHORTFALL

- SAPP is managing current generation shortfall through
 - ✓ **Promotion of sharing of available resources**
 - ✓ **DSM Initiatives**
 - ✓ **Load management** incl. time of use tariffs, demand response and load shedding
 - ✓ **Implementing Projects** (short, medium and long term)

DSM INITIATIVES

- SAPP embarked on DSM initiatives to manage generation shortfalls targeting CFLs, HWLC, SWH & Commercial Lighting
- Most utilities are still focusing on CFLs currently and planned roll-out for the next three years.
- Some utilities are also focusing on Hot Water Load Control (HWLC) for peak demand reduction.
- Most utilities have started awareness campaigns in the commercial, industrial and residential sectors.
- There is marginal activity on SWH and commercial lighting due to the cost of the programs.
- Other DSM initiatives include; Power Alert, retailing of EE appliances at subsidized price.

DSM VIRTUAL POWER STATION – WHERE IS THE SAPP?



2,450 MW saving and Virtual Power Station established



3. UPDATE ON PROJECTS IMPLEMENTATION



Projects Commissioned in 2013

GENERATION PROJECTS COMMISSIONED 2013					
No	Utility	Country	Name	Type	Capacity [MW]
1	BPC	Botswana	Morupule B	Coal	450
2	IPP	Zambia	Ndola Energy	HFO	50
3	SNEL	DRC	Inga 1	Hydro	55
4	IPP	Tanzania	Mwanza HFO	Gas	60
5	Eskom	South Africa	Komati	Coal	202
6	Eskom	South Africa	Grotvlei	Coal	40
7	Eskom	South Africa	Koeberg	Nuclear	30
8	IPP	South Africa	Solar	Solar	130
9	IPP	Malawi	Kapichira	Hydro	64
10	ZESCO	Zambia	Kariba North	Hydro	180
11	IPP	Mozambique	Ressano Gassia	Gas	100
TOTAL					1361

Projects Planned to be Commissioned in 2014

GENERATION PROJECTS -2014 TARGET					
No	Utility	Country	Name	Type	Capacity [MW]
1	ENE	Angola	Lomaum	Hydro	65
2	ENE	Angola	CFL New	Coal	70
3	ENE	Angola	BIOCOM	Coal	50
4	ENE	Angola	BOM- JESUS	Coal	50
5	IPP	Tanzania	Kinyeredzi	Gas	150
6	IPP	Tanzania	Sao Hill	Gas	10
7	IPP	Tanzania	Somanga	Gas	290
8	Eskom	RSA	OCGT	Gas	800
9	Eskom	RSA	Medupi	Coal	722
10	Eskom	RSA	Ingula	Hydro	1332
11	IPP	RSA	Cogen	Gas	100
12	IPP	RSA	Sere	Wind	100
13	IPP	RSA	RE - Round 1	PV, CSP, Solar	1328
14	IPP	RSA	RE - Round 2	PV, CSP, Solar	554
15	IPP	Mozambique	Ressano Garcia	Gas	175
16	BPC	Botswana	Morupule	Coal	150
17	ZESCO	Zambia	Kariba North	Hydro	180
18	ZESCO	Zambia	Lunzua	Hydro	15
TOTAL					6141

685 MW
Not Interconnected

1982 MW
Renewable Energy

SAPP Committed Generation Projects

No	Country	COMMITTED GENERATION CAPACITY, MW				
		2014	2015	2016	2017	TOTAL
1	Angola	235	0	1280	2271	3,721
2	Botswana	150	-	-	-	150
3	DRC	-	580	-	240	820
4	Lesotho	-	-	35	-	35
5	Malawi	-	-	-	34	34
6	Mozambique	175	-	40	300	515
7	Namibia	-	-	15	-	15
8	RSA	4,936	2,527	3,717	1,918	13,098
9	Swaziland	-	-	-	-	-
10	Tanzania	450	240	660	250	1,600
11	Zambia	195	735	40	126	1,096
12	Zimbabwe	-	15	-	1,140	1,155
TOTAL		6,141	4,097	5,787	6,279	22,304

SAPP Priority Transmission Projects

Priority transmission projects are defined as follows:

1. Outstanding transmission interconnectors whose aim is to interconnect non-operating members of the SAPP:
 - Mozambique-Malawi
 - Zambia-Tanzania-Kenya and
 - Interconnection of Angola
2. Transmission interconnectors aimed at relieving congestion on the SAPP grid, and
3. New transmission interconnectors aimed at evacuate power from generating stations to the load centres.

Transmission Projects

USD 5.6 billion

2016 -2017: ZIZABONA -220/330 kV

2016: Mozambique Malawi

2017: Zambia - Tanzania - 400 kV

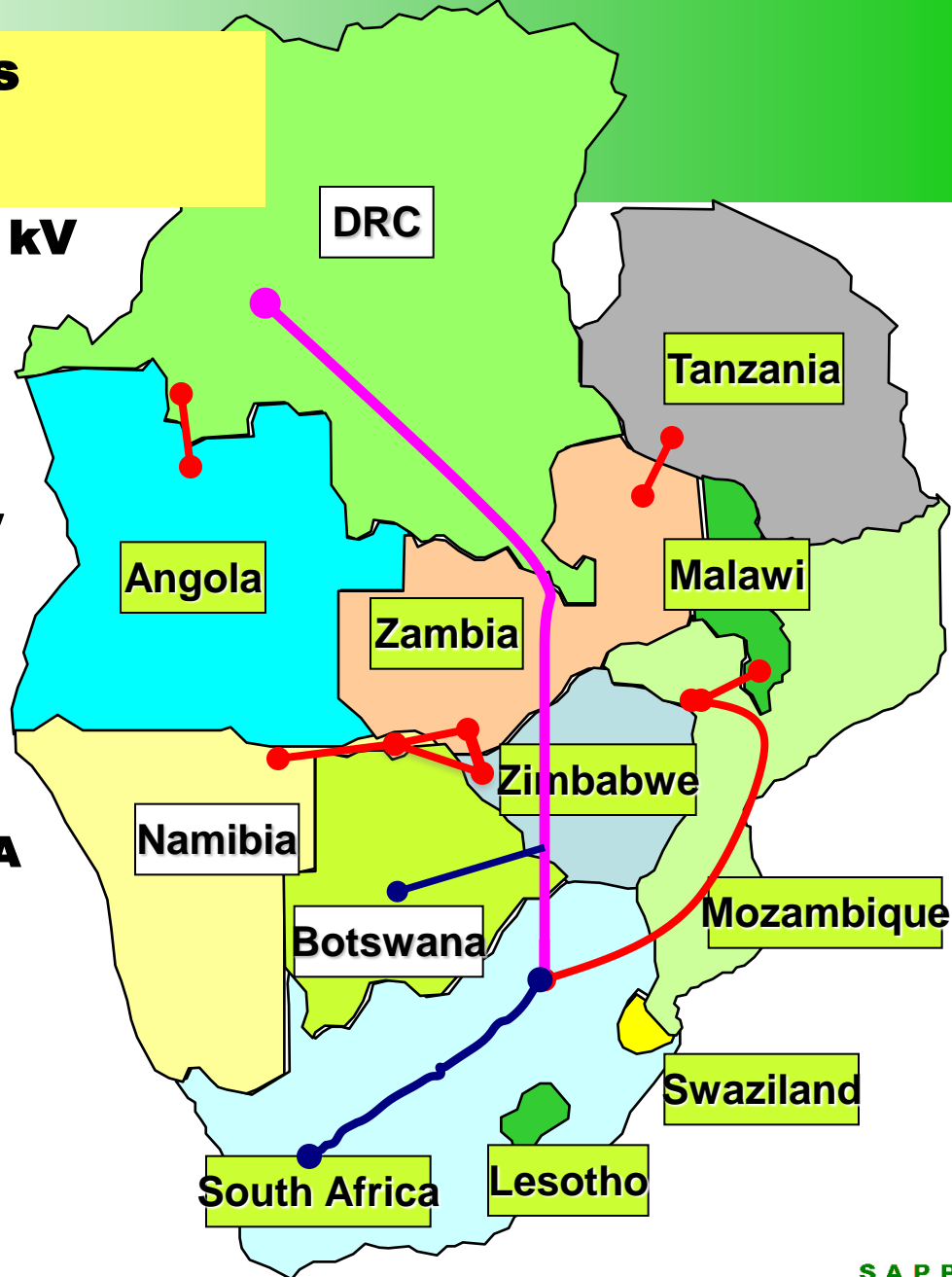
2018:DRC - Angola – 400 kV

2017: MOZAMBIQUE BACKBONE -RSA

2015-2025: 765 kV Strengthening

2016: RSA Strengthening

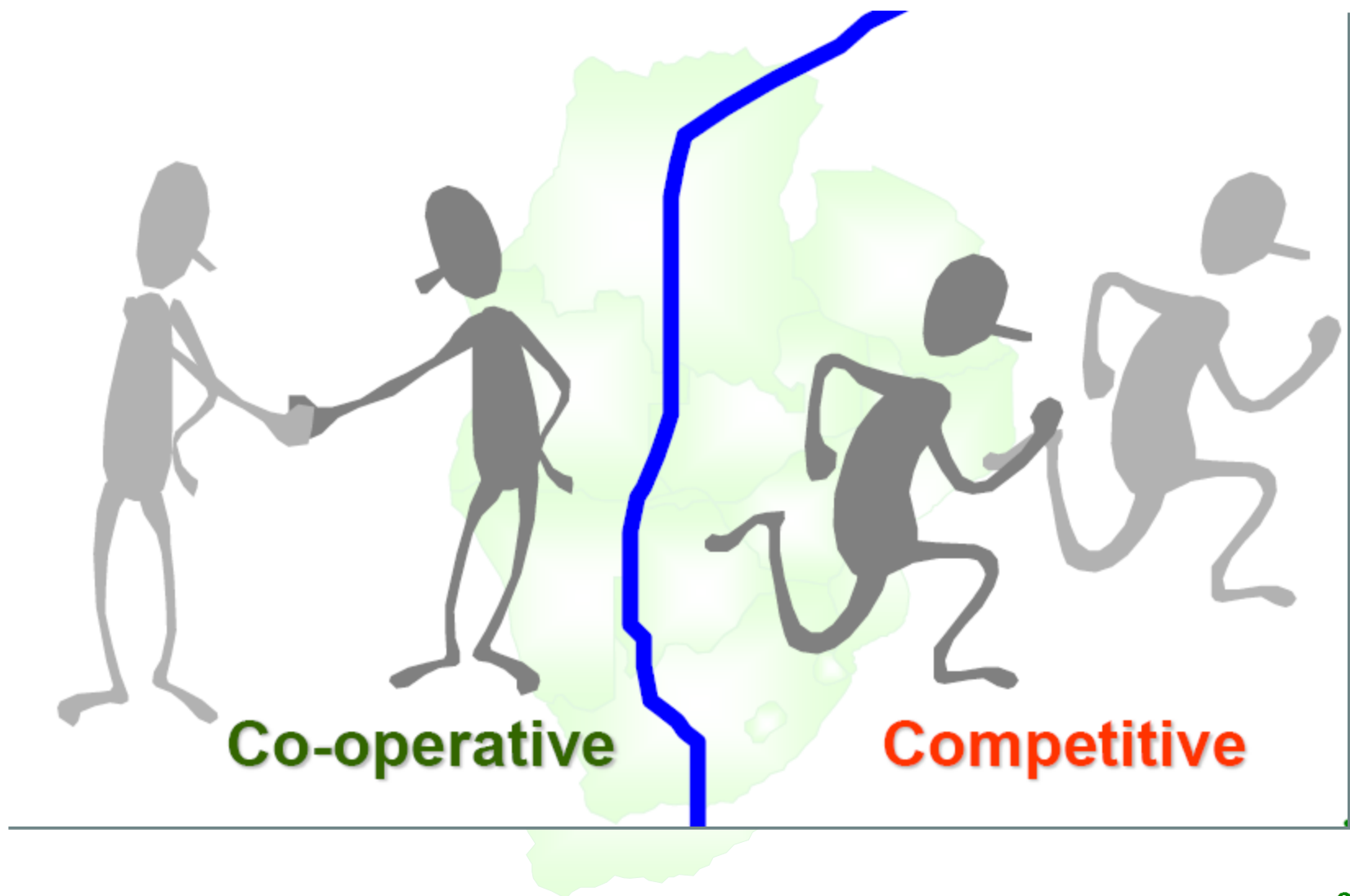
2017: Botswana Strengthening



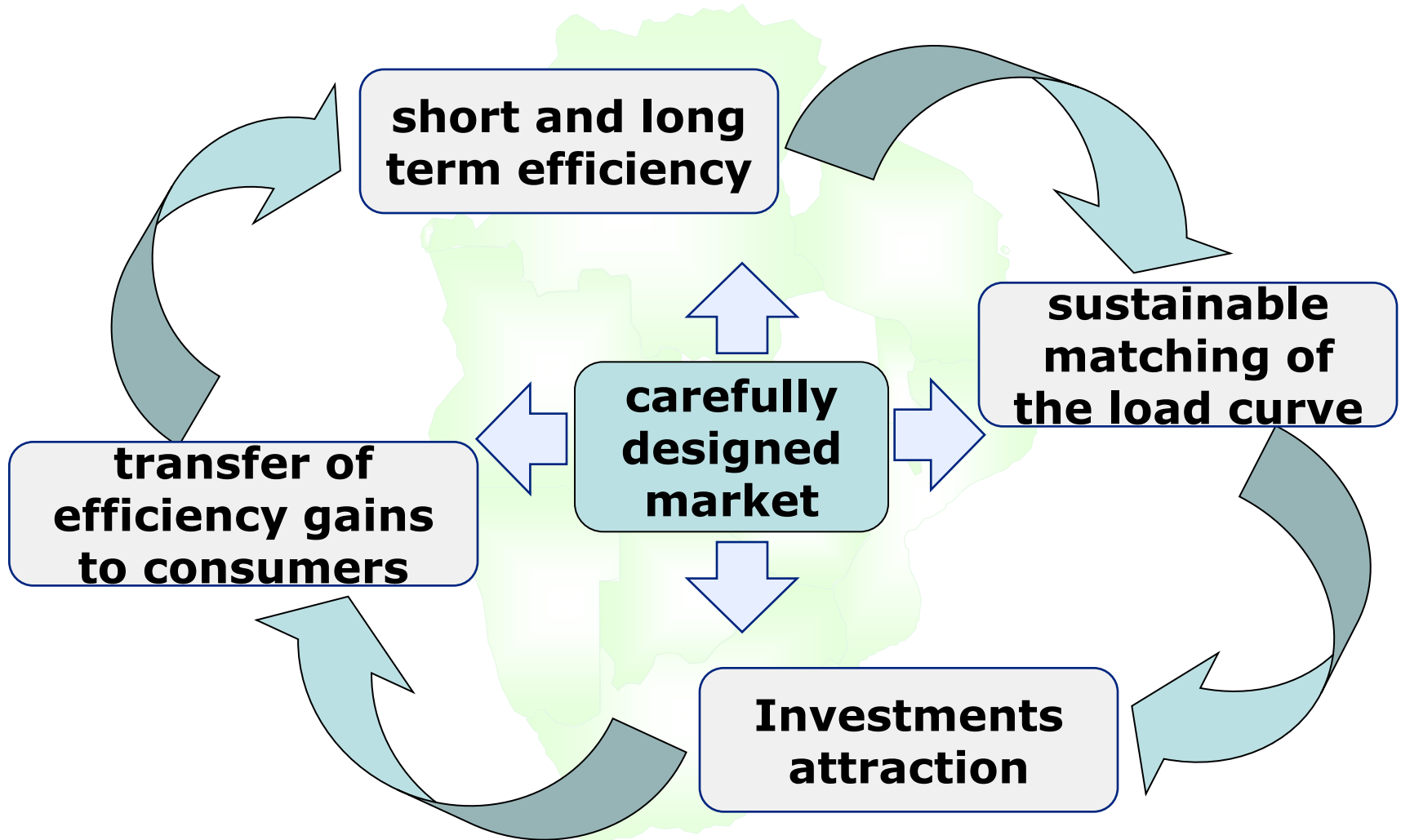


4. UPDATE ON MARKET ISSUES

Evolution SAPP trading platforms



SAPP Market Design Objectives



SAPP Trading Platforms

EARLY YEARS

- Bilateral contracts

CURRENT AND FUTURE

- Bilateral contracts
- Day-Ahead Market (DAM) – From 2009
- Energy Imbalance Settlement – From 2010
 - Post Day Ahead Market – From 2013
- Ancillary Services Market – From 2014/15
 - Balancing Market – From 2017/8
 - Financial Markets – From 2018

FROM YEAR 2001

- Bilateral contracts
- Short-Term Energy Market (STEM) - 2001

SAPP Current Trading Portfolios

1. **Bilateral Trading Objectives are mainly**

- ✓ To meet long term demand and supply balance
- ✓ To underpin Generation and Transmission Investments

2. **Over The Counter Trading (OTC) Objective is**

- ✓ To meet short term demand and supply balance

3. **DAM & PDAM Trading Objectives are mainly**

- ✓ To optimize supply & demand portfolios in a bid to minimize cost of supply and maximize participants profits
- ✓ Assists in managing load and generation fluctuations

- ❖ **Bilateral, OTC and DAM trading compliment each other and are not meant to compete against each other**

DAM & PDAM Main Features

❑ **Market for secure, effective and non-discriminatory trade of electricity:**

- ➔ Trading to be concluded daily for delivery next day
- ➔ Forward bidding up to 10 days
- ➔ Participants submit bids (purchase) & (sale) offers
- ➔ Closed market – only market operator and participant know the details of the bid / offer
- ➔ Price discovery

❑ **Provides a neutral reference price**

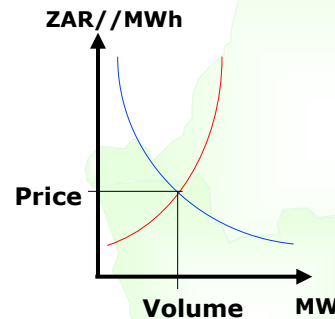
- ➔ Open and competitive market
- ➔ Provides platform to manage demand & supply fluctuations
- ➔ Gives price signals to policy makers
- ➔ Stable & Liquid market will give investor confidence

DAM – Two Tier Market Concept

Day-ahead Market

Bid form

Hour	Prices (ZAR//MWh)				
	0	200	201	300	5000
1-06					
07-18	300	300	150	150	150
18-24					



Day of Trading

Price / volume bids

Price determination based on bids and transmission capacities

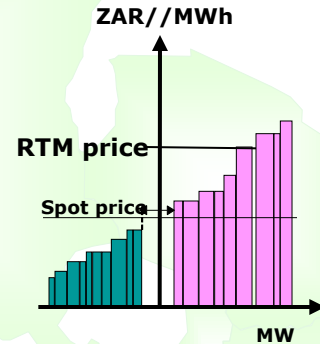
Binding contracts - de-centralised dispatch

Financial settlement based on contracted volume and price.

Price = local energy price

Real Time Market/ balancing mechanism

Calculation of Imbalances



Resources Commitments

Resources	Commitments
Metered generation	Imbalance
Spot sale	Contract

Day of Operation or Delivery Day

Real Time Market based on bids of increments and decrements of generation and load.

Imbalance = contracted volumes - metered volumes.

Financial settlement based on imbalance volumes and RTM-price.

Post Day Ahead Market (PDAM) – Main Features

- PDAM trading was introduced in April 2013 with the objective of maximizing trade:
 - ✓ After DAM is run, MO publishes a PDAM bulletin that shows power offered, requested and traded in DAM, supply and demand available after DAM and the MCP prices
 - ✓ MO then sends specific requests for power to suppliers **at DAM MCP prices** in accordance to power requested but not matched on DAM
 - ✓ Suppliers confirm power availability and prices offered in PDAM
 - ✓ MO then sends to specific members offers of power incl. prices
 - ✓ Buyers confirm PDAM volumes & prices
 - ✓ MO confirms traded volumes & prices on PDAM – trade confirmation
 - ✓ PDAM should be concluded & scheduled before 1600 on trading day

Market Performance Highlights – Bilateral Trading

➤ **Bilateral Contracts registered in 2013 - 30 (28 for 2012)**

Firm - 16 (18 for 2012)

Non firm - 14 (10 for 2012)

Active Contracts - 17 (15 for 2012)

➤ **Generation and transmission constraints are the main reasons why some contracts are inactive**

➤ **Around 800,000 MWhr is traded bilaterally in a month**

➤ **Summary for the bilateral market performance for the period April 2013 to December 2014**

➤ **Appetite for trade 7,482,834 MWh**

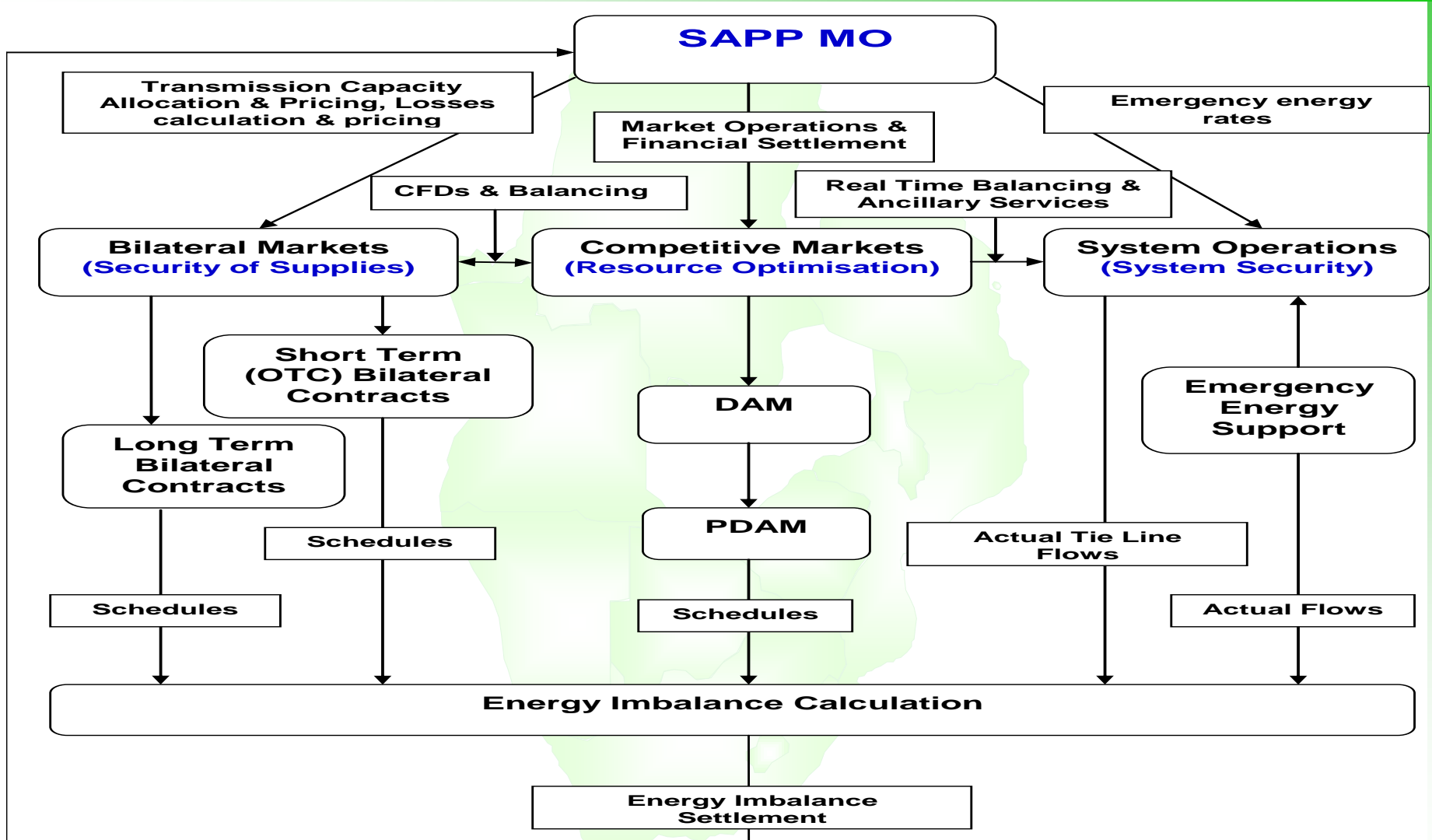
➤ **Traded volume 6,324,122 MWh**

✓ **Difference not traded as a result of transmission constraints**

Market Performance – Competitive Market

- **Competitive market performance (April 2013 to December 2013)**
- **Matched - 214,892 MWh**
- **Traded on DAM – 48,788 MWh**
- **Traded on PDAM – 21,578 MWh (32% of total traded volumes)**
- **Matched volume is around 10% of power offered on the market**
- **Competitive Market share of total trade – 1%**
- **Competitive Market share could have been 3% had all matched energy been traded**
- ❖ **SAPP Target is to grow competitive market by at least 10% annually**

SAPP Market Operations Overview



5. CHALLENGES – Demand and Supply

- a. **Supply Shortfall as a result of Slow/Lack of Projects Implementation**
 - i. **Projects Preparation and Packaging – Projects good on paper but lacks development to bankability levels**
 - ii. **Tariffs Setting regimes and Levels not favorable for new projects development – focus is more on operational cost recovery and not LRMC recovery**
 - iii. **Projects dates not linked to project preparation requirements**
 - iv. **Weak Utility Balance Sheets – more reliance on “external” anchor customers**
 - v. **Over reliance on IPPs and Project Finance mechanisms – these require complex processes, governance setups etc**
- **Current SAPP Projects Peer Review would assist Project preparation and packaging**
- ❖ **SAPP plans to strengthen Project Management capabilities**

5. CHALLENGES – Trading and Operations

a. Members' Market Structures

- ✓ Slow/Lack of Reforms of member utilities – **most vertically integrated hence in reality unlevel playing field for new entrants**
- ✓ Market structure is dominated by Single Buyer Models – **not favorable for new entrants e.g IPPs, demand participation etc**

b. Limited Transmission facilities & No Open Access

- ✓ Lack of investment in Tx projects – **over reliance on project financing mechanisms**
- ✓ Allocation criteria favors owners of assets ahead of regional use – **no open access for pool usage (USA had FERC Order 888)**

c. Bidding Patterns and Pricing

- ✓ Bids based on marginal power (excess or shortfall) and not entire portfolio – **lacks overall optimization opportunities**
- ✓ Market prices linked to tariffs as opposed to marginal costs – **regulatory requirements**

6. Conclusions

SAPP believes that the creation of a competitive market would:

- ❑ **Help to **optimise** the use of regional resources**
- ❑ **Assist in determining the correct electricity price in the pool**
- ❑ **Send signals for **investments** and real time utilization of existing assets; transmission, generation and consumption.**
- ❑ **Enable the demand side to respond to the supply side price signals.**



Thank you for your attention