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Case study: SAPP

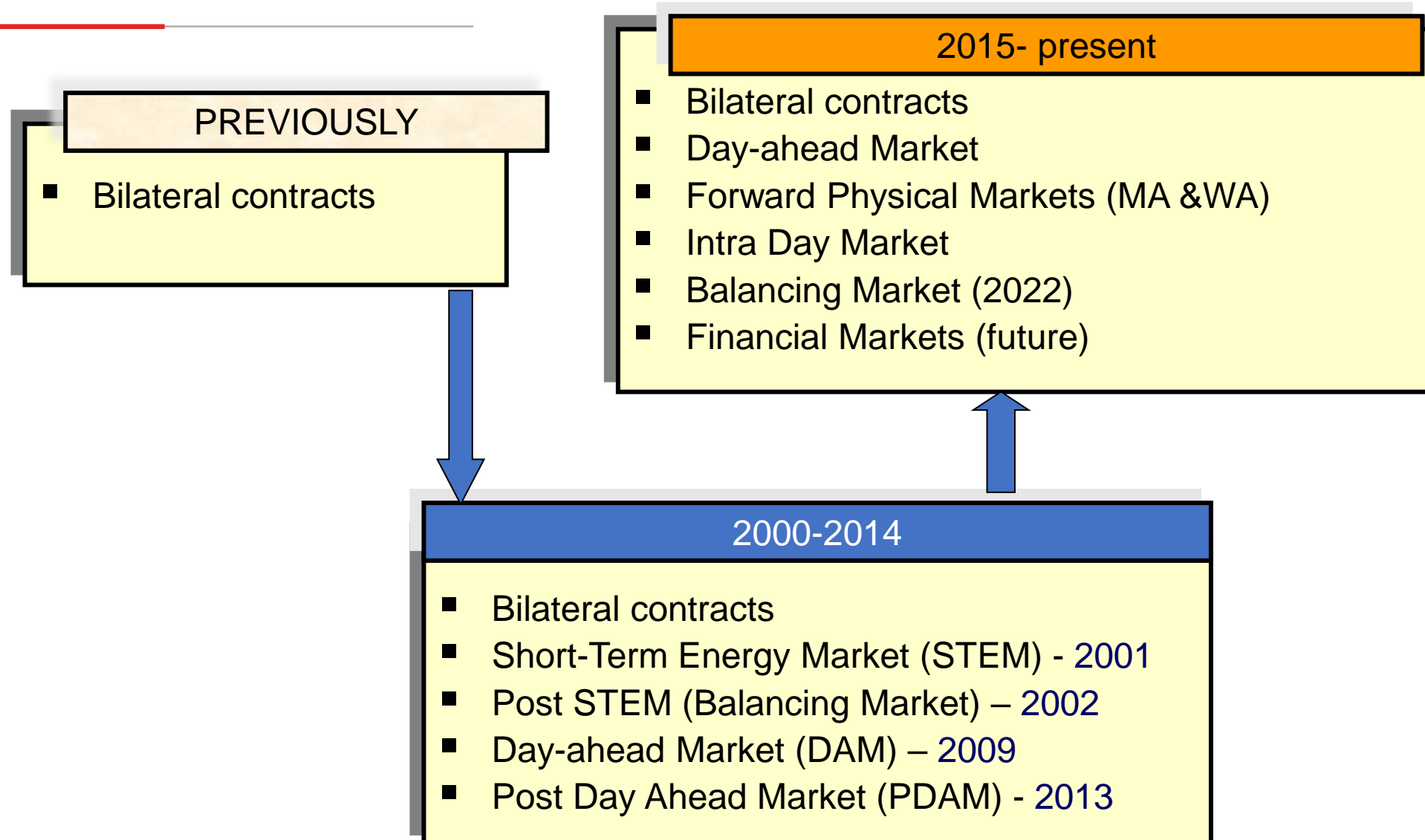
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Bredesen Consulting



Webinar Series: Wholesale Electricity Market Design and Challenges in Developing Economies

May 23-26, 2022 | Online format

SAPP Market evolution



SAPP Main governing documents

| Document | Dated | Main Content |
|---|---|--|
| Inter-Governmental MOU | November 1995 Revised in February 2006 | Established SAPP on a political level and was signed by the 12 energy ministers |
| Inter-Utility MOU | November 1995 Revised in April 2007. | Established the Management of SAPP (both the organizational structure SAPP, the meeting structure and the main areas of work) and signed by the utility members |
| Agreement Between Operating Members | Initial version in 1996; Revised in May 2008 | This is essentially the implementation of the Inter-utility MOU outlining the main content of the cooperation of the interconnected members of the pool. Often referred to as ABOM |
| Operating guidelines and procedures | Initial versions in 1996; Reviewed and approved in 2014. | These guidelines are the details of the ABOM outlining the detailed technical operation and cooperation, for instance management of transmission capacity, wheeling and losses methodologies etc. |
| Market rules (consisting of both Book of Rules as the binding rules and the Market guidelines) | Initial version in 2001 Revised version in February 2017 | These are the detailed trading rules for all markets |

Requirements to be allowed to trade in SAPP

- Having been **licensed or given permission** by the host country to undertake **cross border** trading
- **Acceptance** as a Market Participant **by SAPP Executive Committee**
- Being party to a TSO connected to a SAPP Control Area and have arrangements for **Balance Responsibility**
- Signing the **SAPP Market governance documents**
- Opening of the requisite **accounts for trading purposes** and having the requisite security for trading purposes
- Have at least two trained Traders

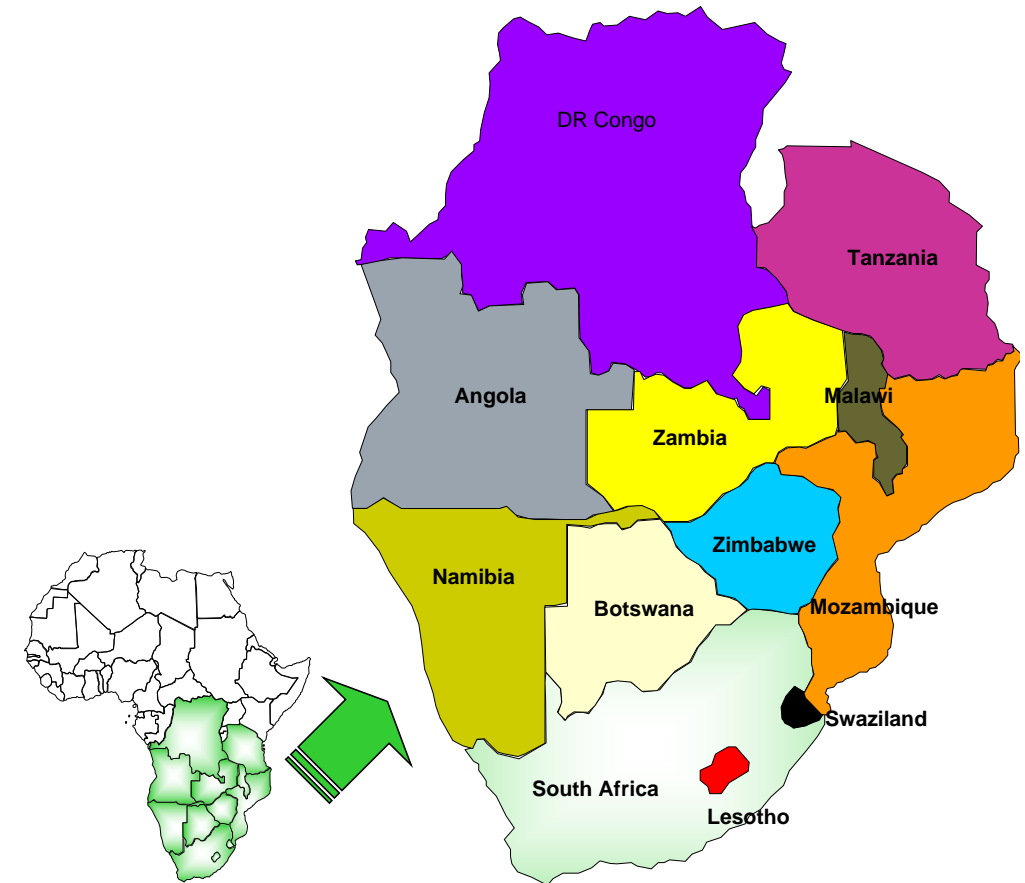
SAPP

The aim for SAPP was to enable national power capacity merging into regional market in order to further optimize social welfare and increase security of supply.

- ▶ Cooperation and coordination of both planning and operation
- ▶ Facilitate cross border trading in the region
- ▶ Facilitate more efficient management of available production and transmission resources, security of supply
- ▶ Increase Access to Electricity in Rural areas
- ▶ Facilitate to attract investments in the electricity sector

The slogan for the market integration in SAPP can be summarized as:

“National control – regional cooperation”



Key Objective of Power Markets

Optimise resources on a **regional** bases **instead of a national bases** in order to **balance the demand and supply** of electricity in the region as a whole at the lowest cost possible.

Different Types of Markets

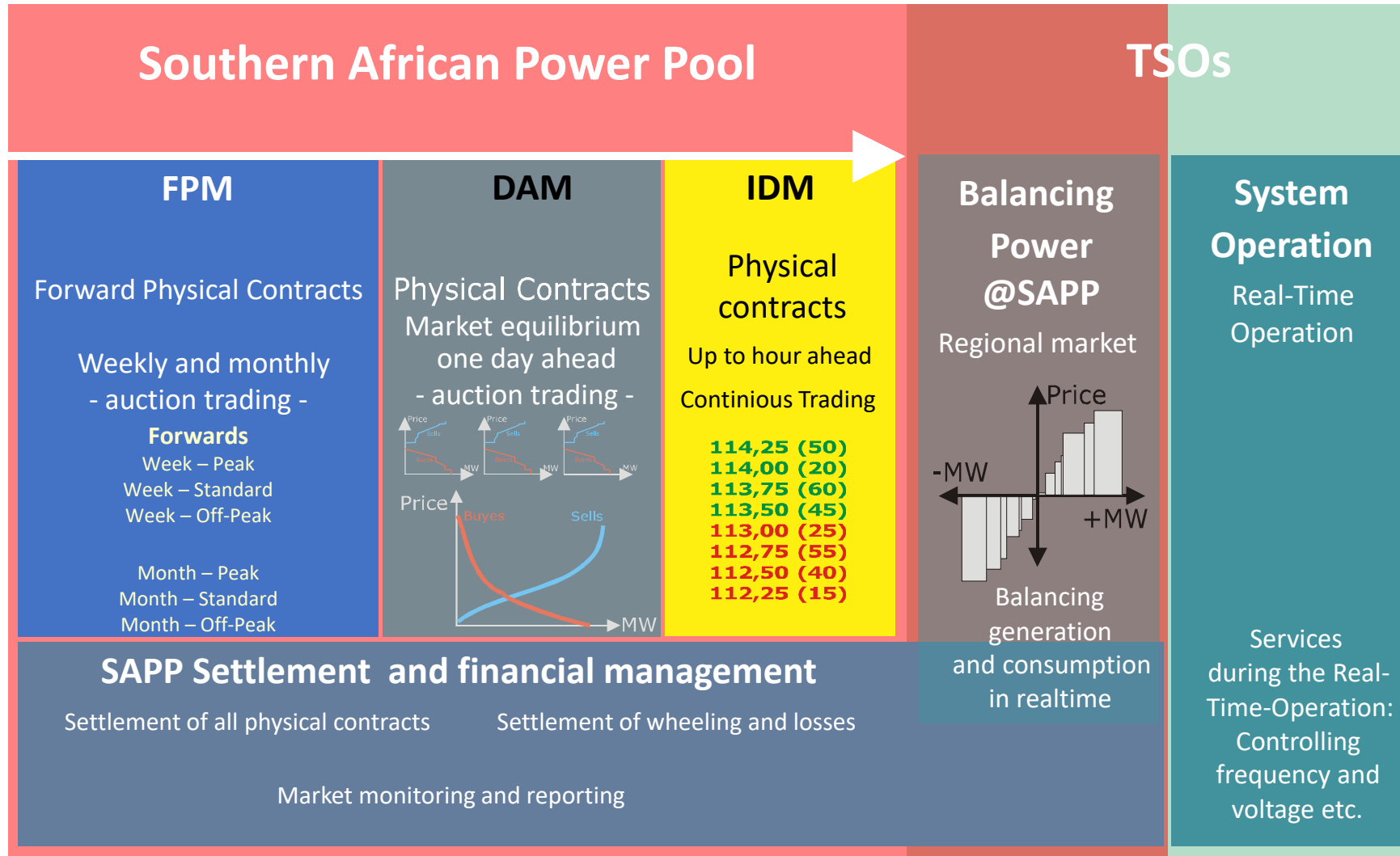
Auction Markets:

- FPM-Monthly, FPM-Weekly, DAM
 - Buyers and sellers need to submit their bids and offers before a specific time.
 - All bids and offers are cleared at the same time.
 - Market price is set at the interception between the sellers willingness to produce and the buyers willingness to consume.
 - The Market price algorithm determines the unconstrained system marginal price and the constrained area marginal price for a defined market area.
 - Buyer who were willing to pay the marginal price or more will be successful (\leq bid price).
 - Seller who were willing to sell at the marginal price will be successful (\geq offer price).

Continuous Markets:

- Intraday:
 - Sellers and buyers can submit order up and until the interval closed for trading.
 - Trades are concluded on a continuous bases when the buyer is willing to pay the sellers price AND transmission capacity is available to deliver the order.
 - Trades are concluded at the **sellers price**.
- Balancing Market:
 - Up and Down regulation orders need to be submitted from 1 hour up to 45 minutes before the interval starts.
 - Orders can be activated (traded) on a continuous bases provided that TX capacity is available to deliver the order.
 - Trade (currently) is concluded at the **marginal area price** (most expensive up regulation order activated or least expensive down regulation order that was activated).

SAPP Market Framework



Forward Physical Market

- Auction based market
 - Based on the principles where market price is set at the interception between the seller's willingness to produce and the buyer's willingness to consume.
- FPM-Monthly
 - Open to trade monthly products as an alternative to bilateral contracts
 - Peak
 - Standard
 - Off-Peak
 - All months of the year
 - Trading apply to all hours included in the monthly product
- FPM – Weekly
 - Open to trade weekly products
 - Peak
 - Standard
 - Off-Peak
 - All weeks of the year

The Day-Ahead Market

- Open to trade individual hours for every day of the year.
- The participants main opportunity for short term trading of power.
- Called the Cornerstone of the market concept.
- Used to balance the total portfolio before next delivery day.
- Can be used as the reference price for other markets like the financial market, intraday market and the balancing market.

The Intraday Market - IDM

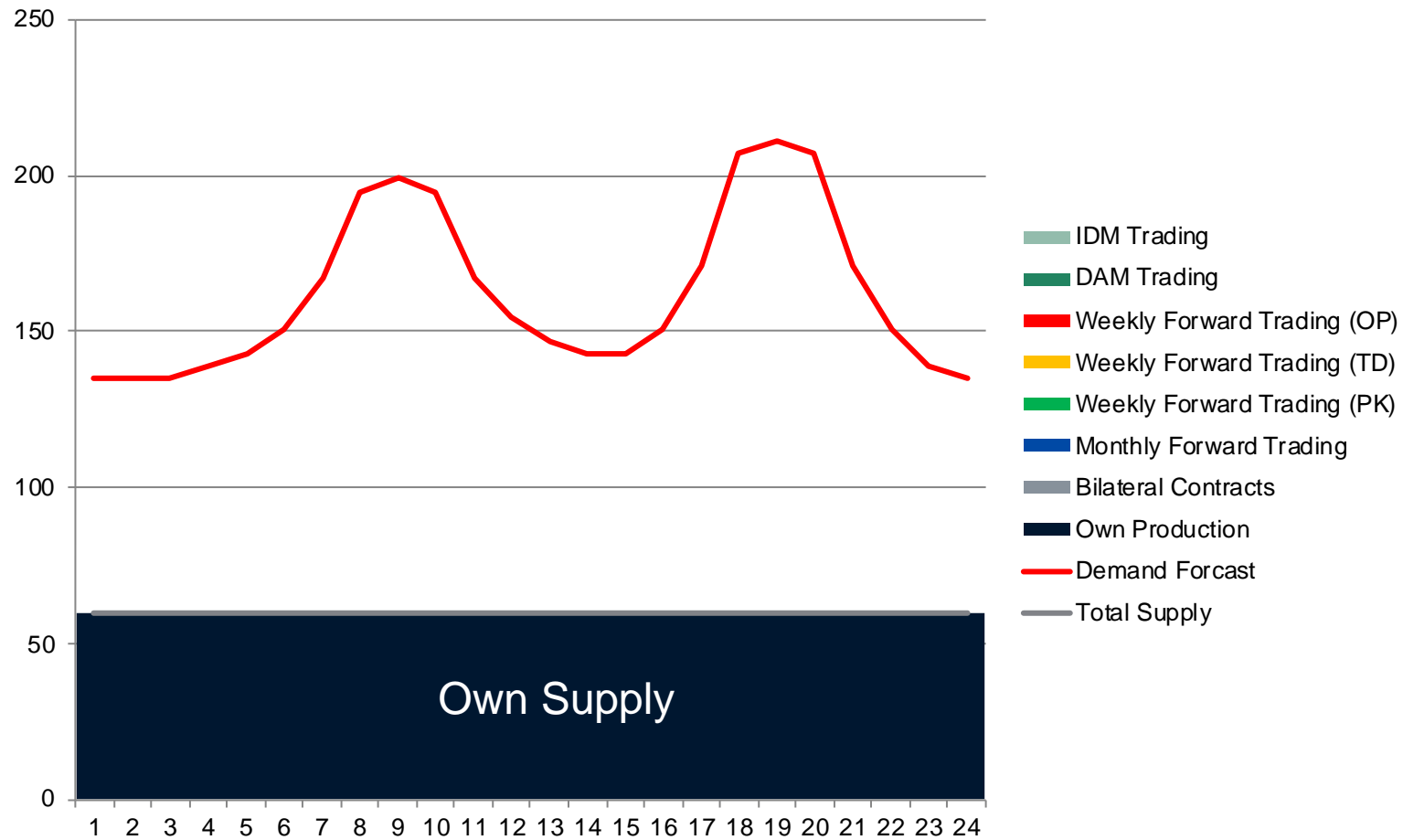
- Continuous trading
- To adjust balance ahead of operating hour
- Utilizes the Available Transmission Capacity (ATC) after DAM trades have been allocated.
- Hours for the next day is opened for trading at 14:00 provided that DAM for that day has been concluded.

The Balancing Market - BM

- Continuous trading
- To respond to short term imbalances primarily to respond to system events
- Utilizes the Available Transmission Capacity (ATC) after IDM trades have been allocated.
- Orders are submitted of the entire hour.
- Hours are opened for trading 45 minutes before the hour starts.
- It is allowed to trade only a portion of the hour.
- Trading continues until 10 minutes before the end of the hour.

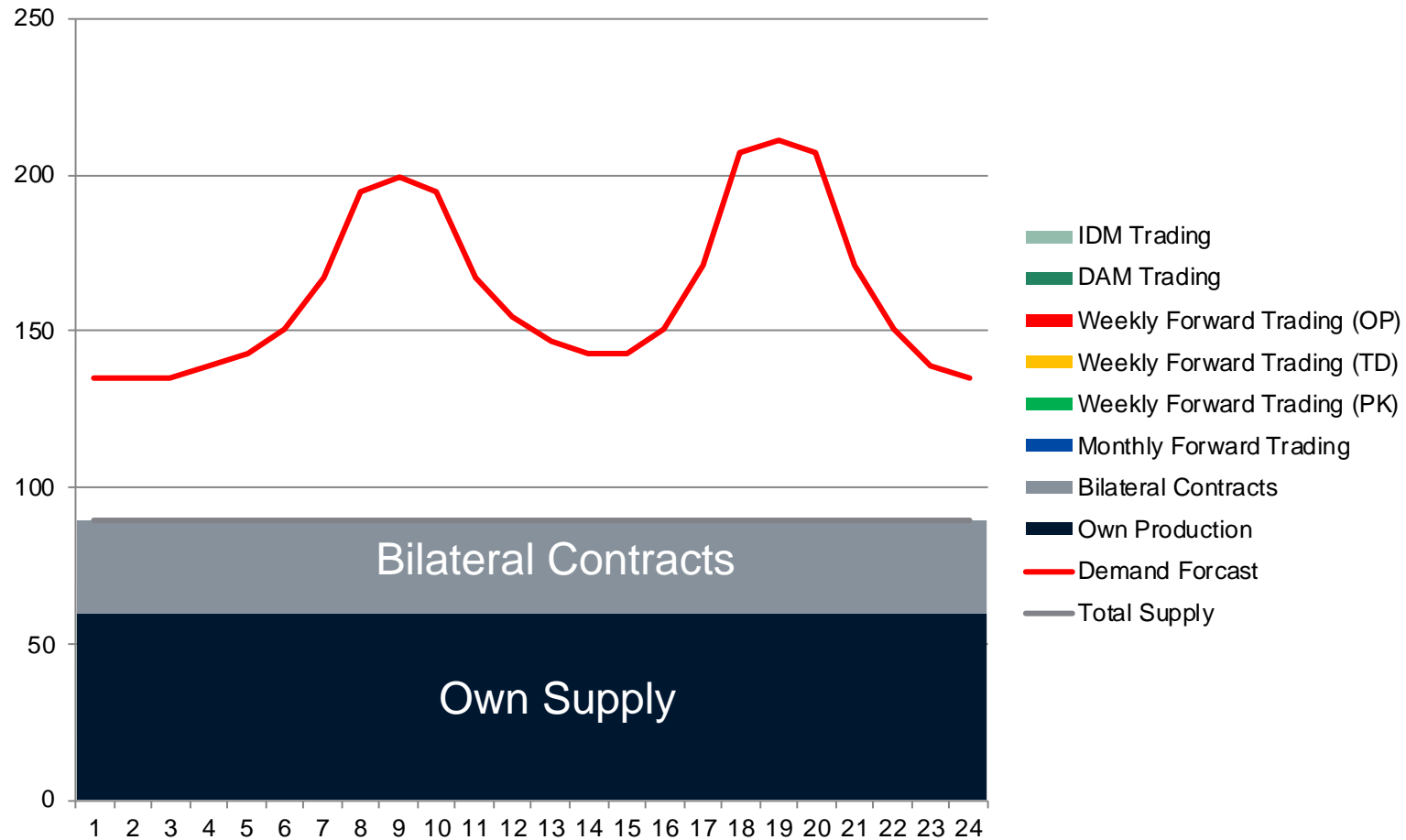
Role of Different Markets in Supply

Own Supply for National Needs



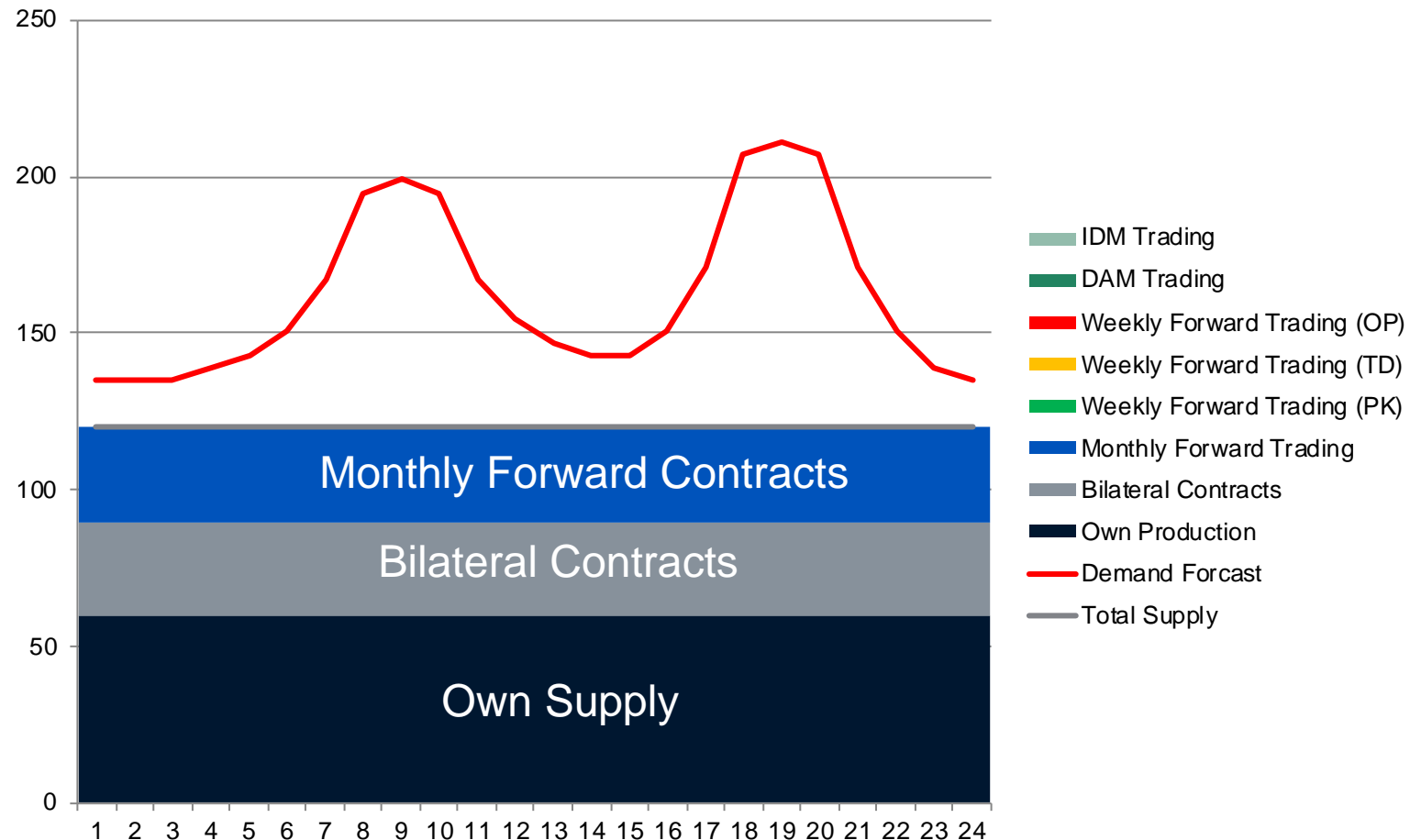
Role of Different Markets in Supply

Long Term – Bilateral Contracts



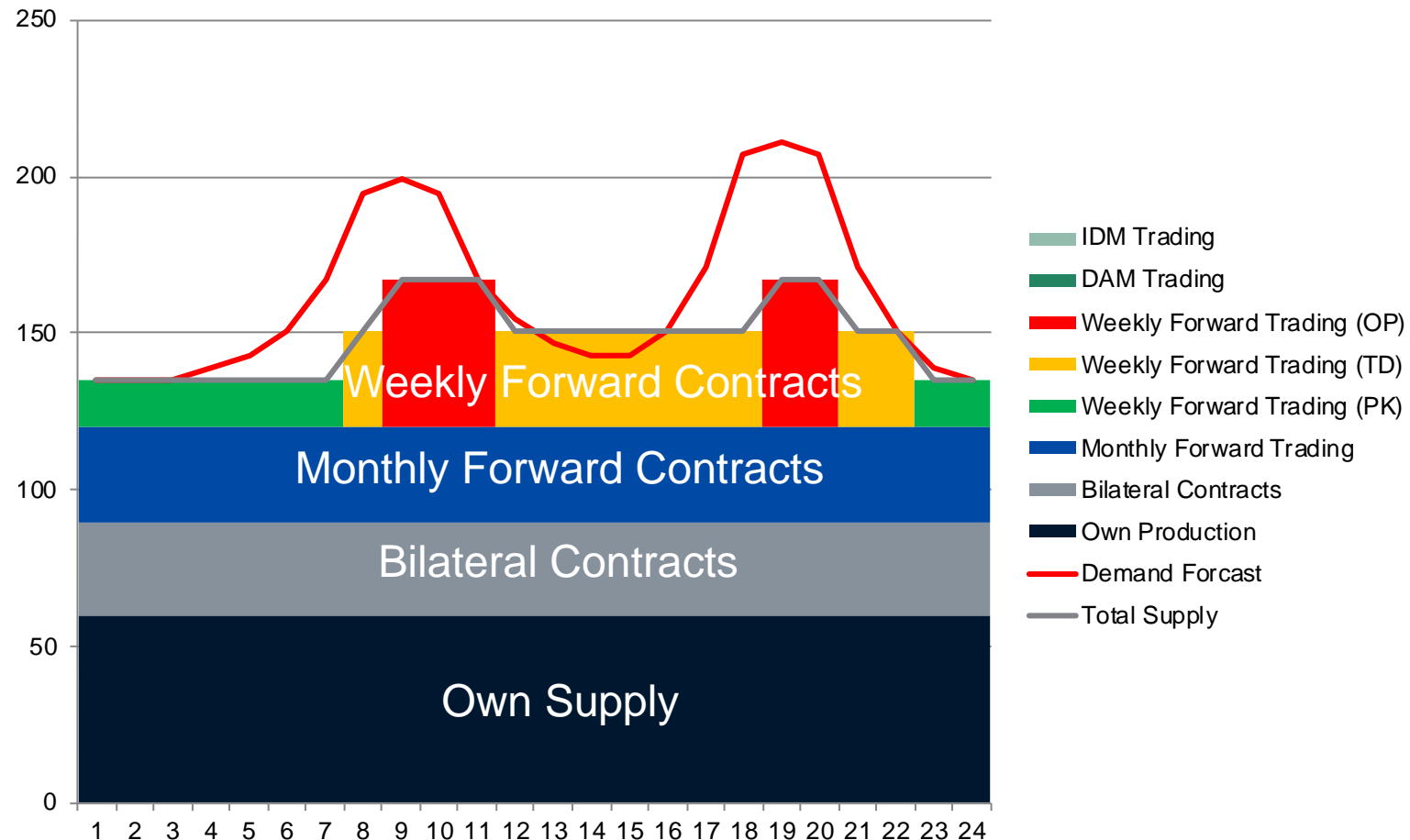
Role of Different Markets in Supply

Medium Term – Monthly Base Load Forward Contracts



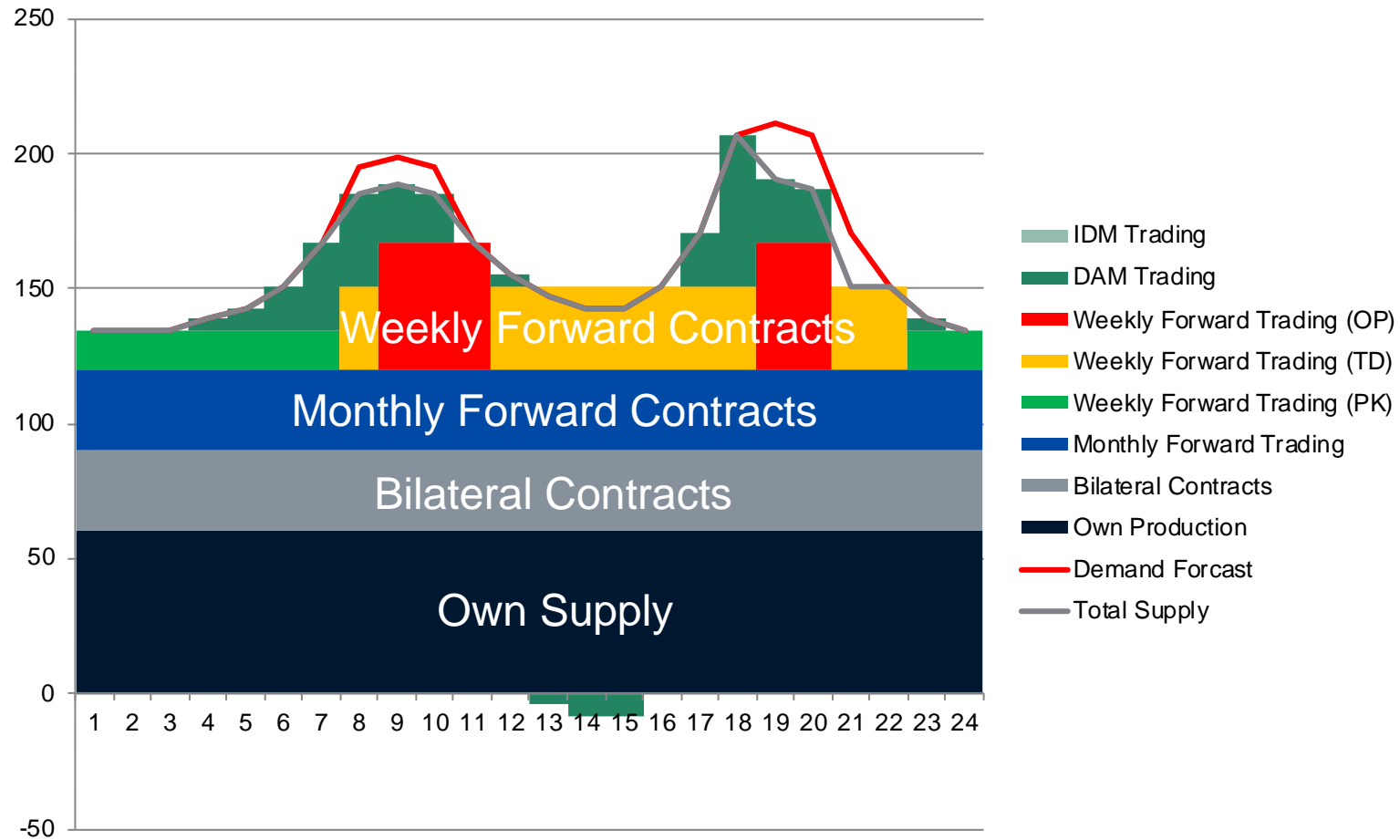
Role of Different Markets in Supply

Medium/Short Term – Weekly Forward Contracts



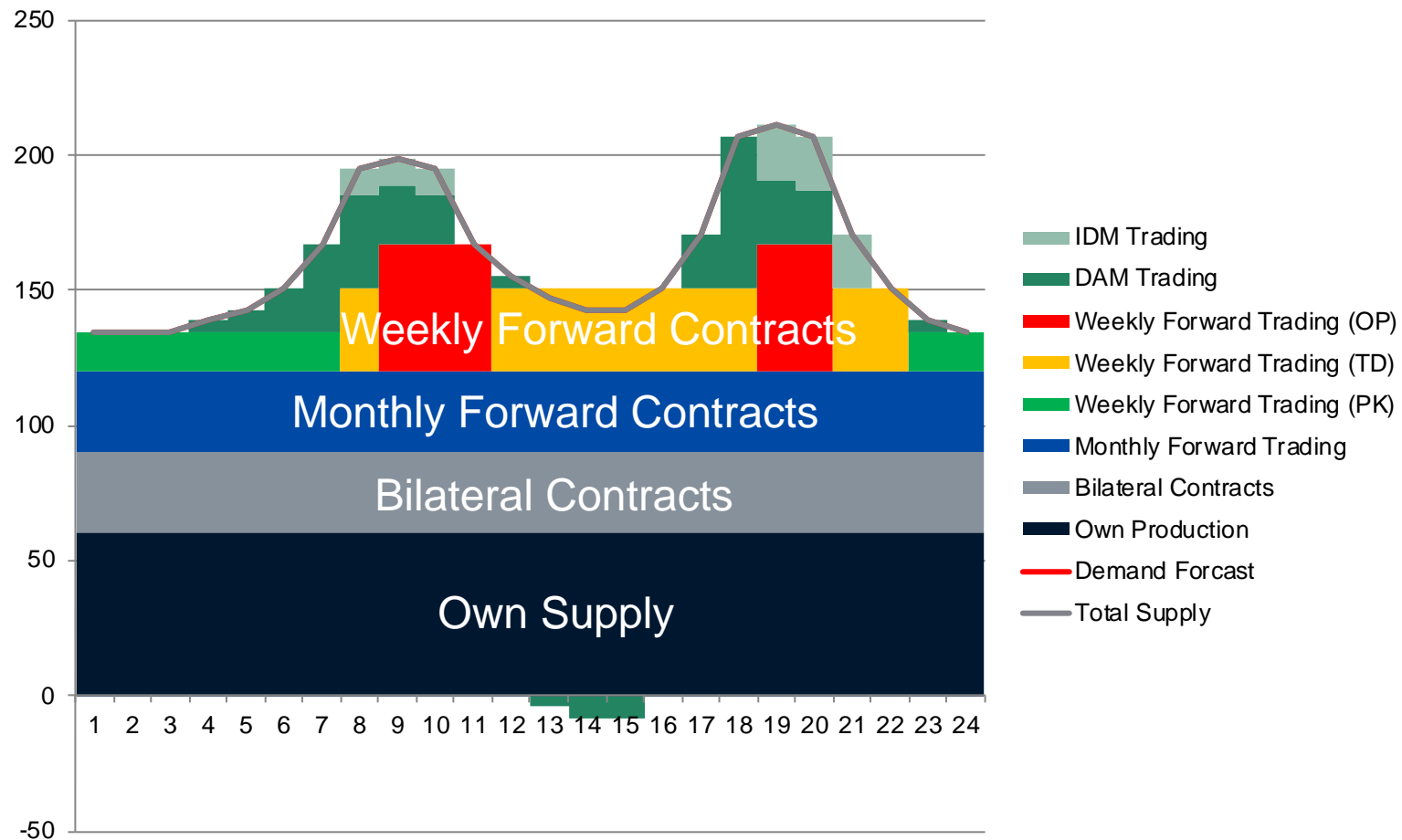
Role of Different Markets in Supply

Day Ahead – Hourly Contracts



Role of Different Markets in Supply

Balancing on the Day – Hourly Contracts

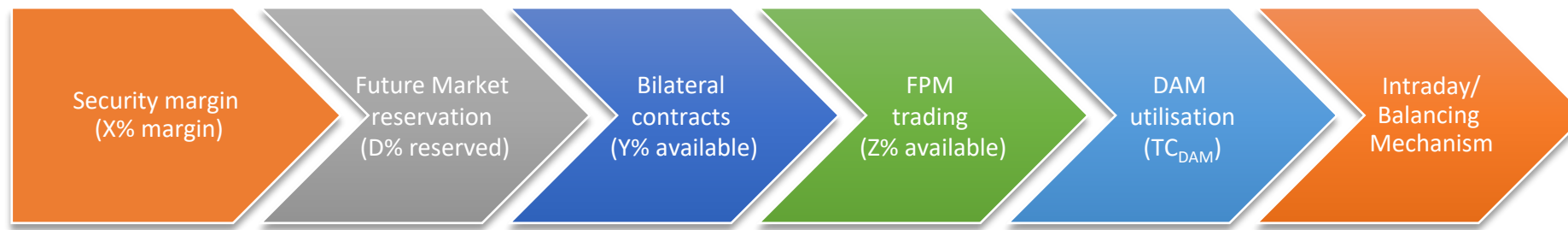


Management of Transmission Capacity

- The **effective** management of Transmission Capacities is a **critical** success factor for the operation of all markets.
- In the case that we have several different markets, it is crucial that this is done based on some sound principles

Management of Transmission Capacity

- This is a key issue when introducing new markets on top of today's.
- An illustration of the allocation:

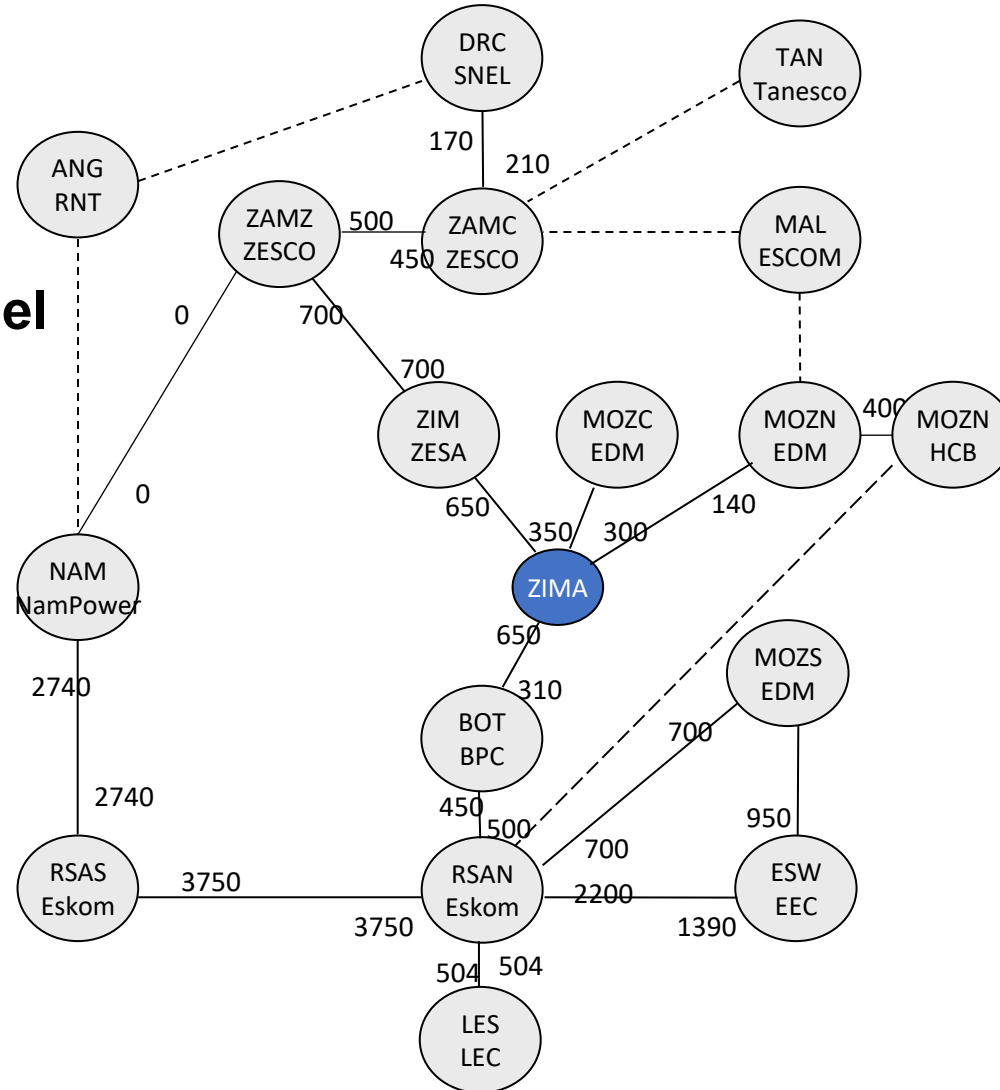


- The management of this is part of the Book of Rules

SAPP Market area model

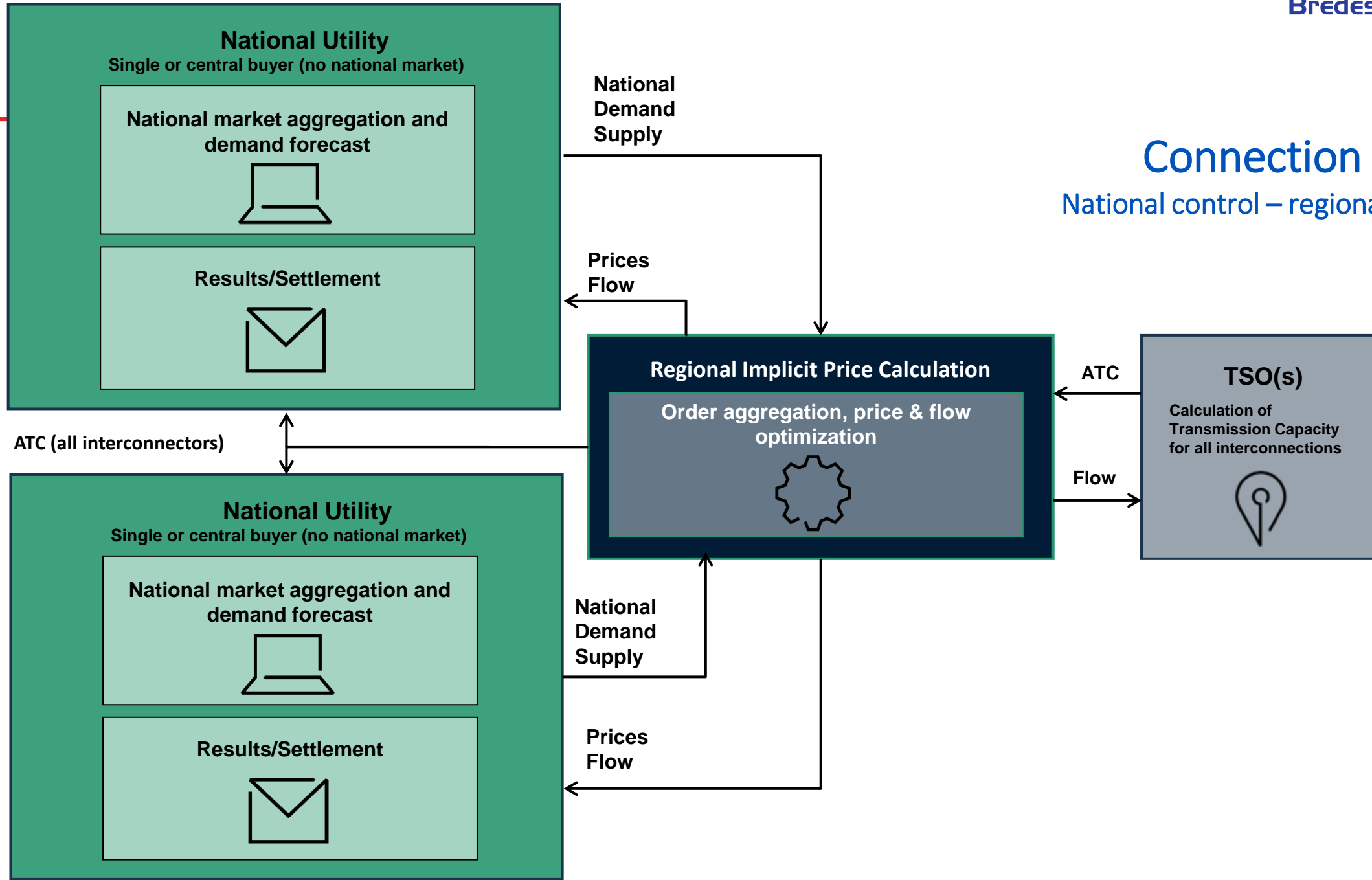
SAPP Trading Area Model

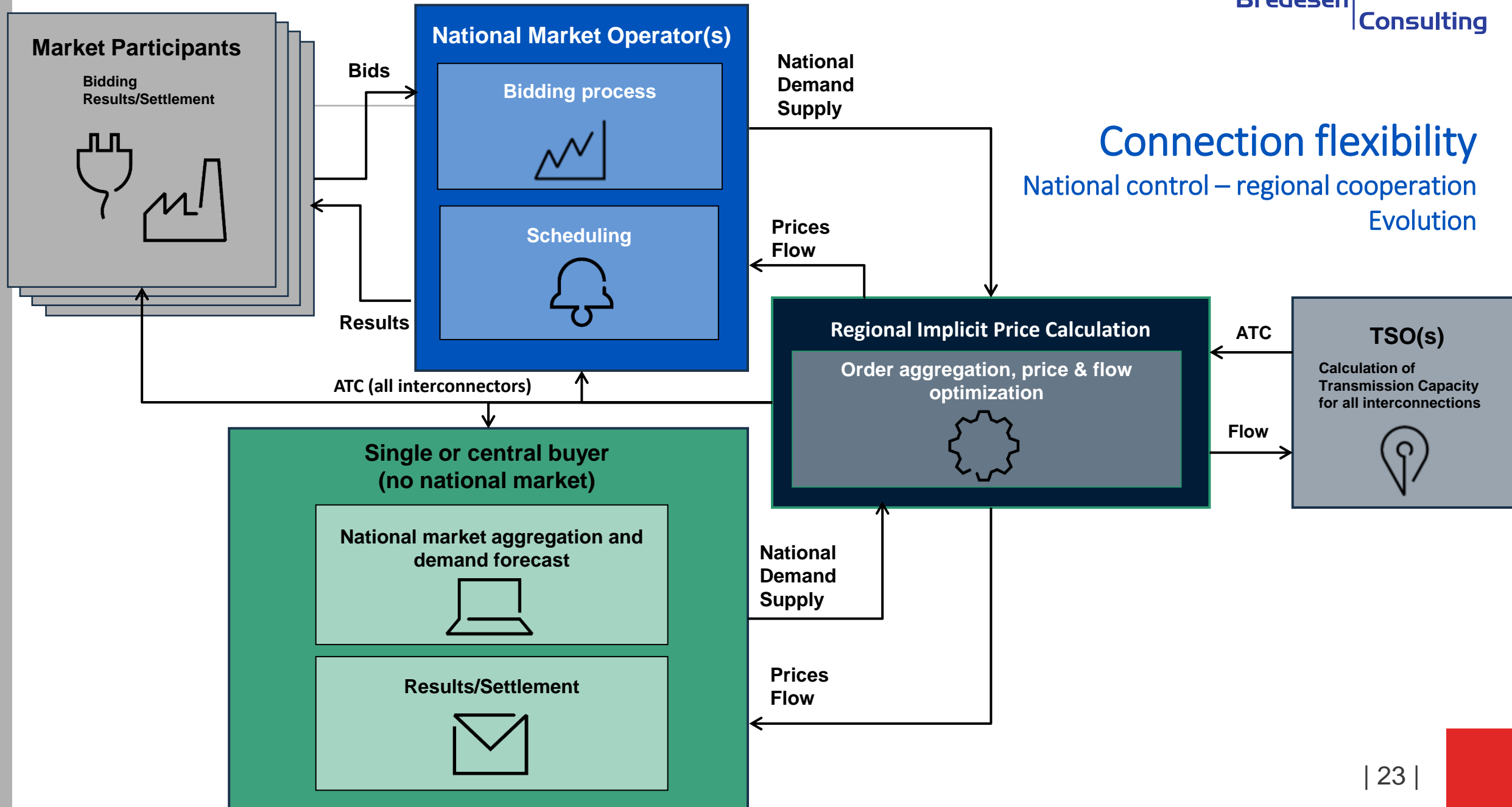
- Power line for open for DAM
- - - - Power line not built
- - - - Eskom internal power line



Connection flexibility

National control – regional cooperation
Starting point





Connection flexibility

National control – regional cooperation
Evolution

Does it really work?

- One could think that based on the installed capacity that the market would be totally dominated by South Africa
- However – the trading is based on ***cross-border capacities***
- The trading pattern has changed over time:
 - Initially (2009-2011) buying in South-Africa from the others
 - Changed with new interconnection – and increased understanding of the market
 - Now flow of base-load capacity in off-peak hours from South-Africa all the way to Zambia (+ Zimbabwe) and Mozambique
 - Trading more expensive (but flexible) hydropower in the opposite direction during standard and peak time
 - The focus on capacity building has improved the trading patterns to follow economic principles
- Ongoing project to couple SAPP and the EAPP

Does it really work?

- **How can a market work in an under-supplied region?**
 - In a shortage situation, the use of the scarce resources should be based on economics
 - There are hours/periods of the day where there is little trading – but trading small volumes “on the margin” also help.
 - The same objections was made in India – but has proved to be wrong

- **But the national markets are not deregulated?**
 - True – but still the region benefits of regional cooperation and integration
 - The market model is flexible so that when the underlying national markets opens, they will have access to the larger market from day one.



**THANK YOU
FOR YOUR ATTENTION!**

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