Energy Trading in the SAPP

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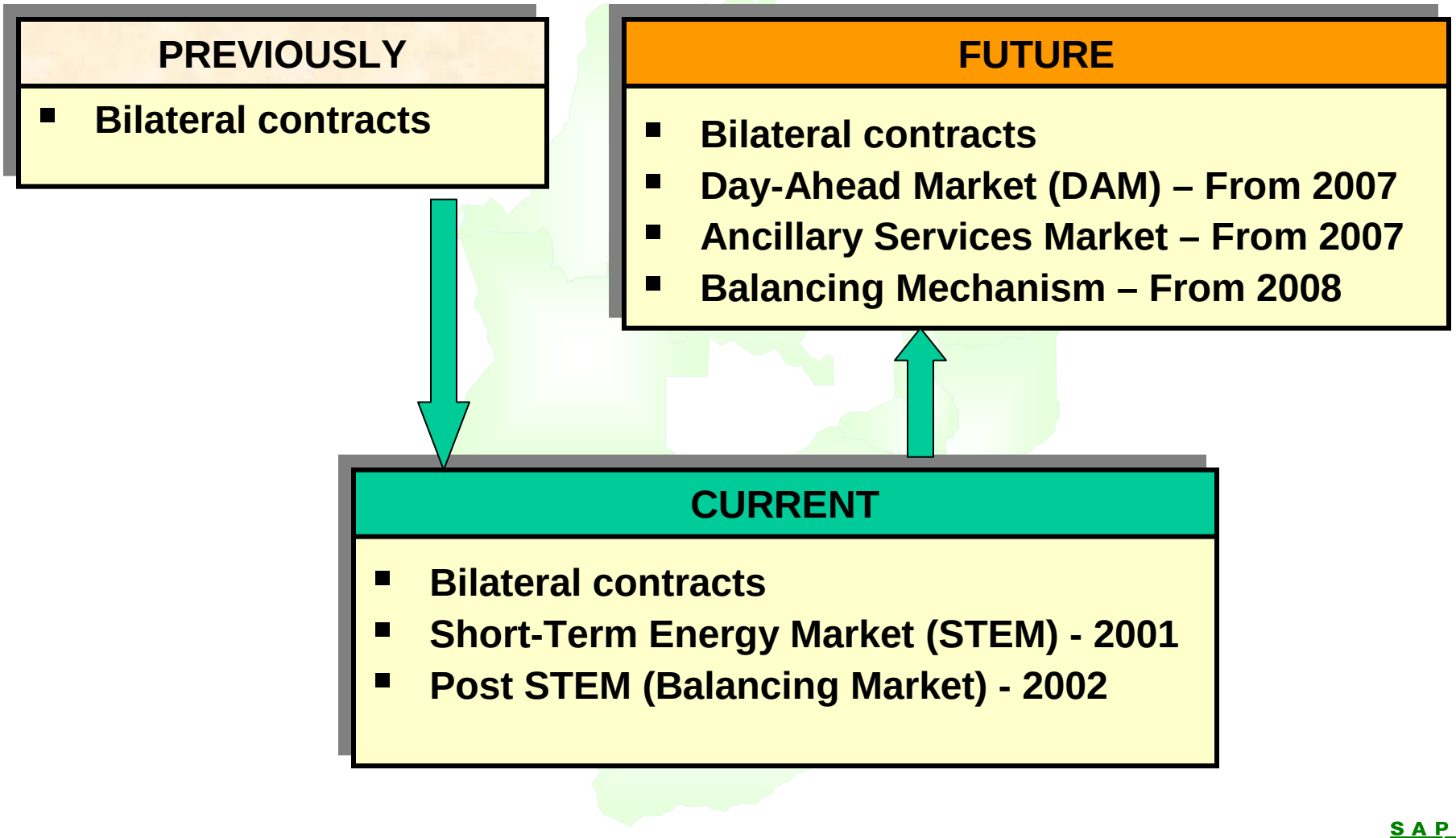
CONTENTS

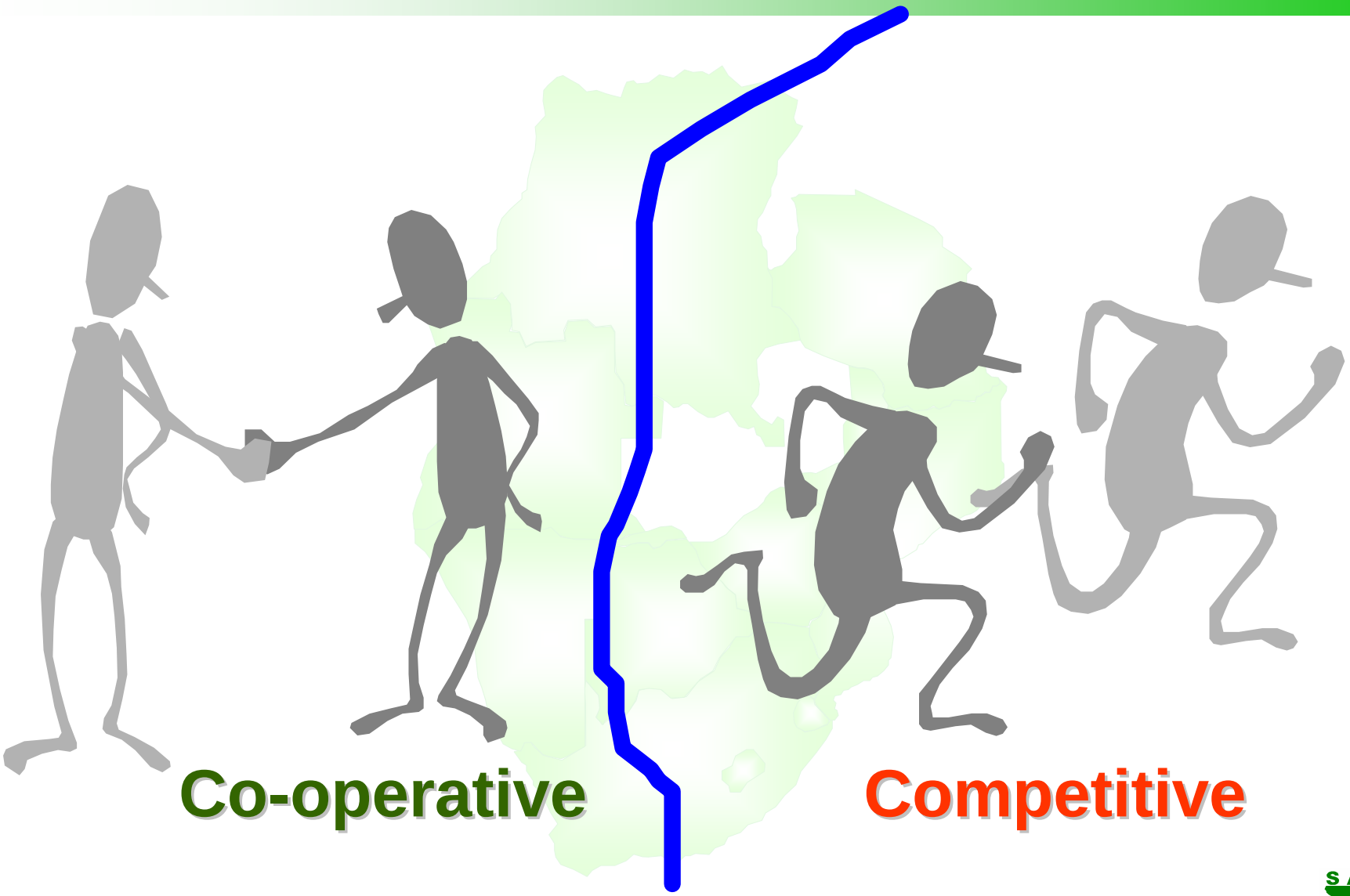
1. TRADING ARRANGEMENTS

1.1 Rationale for Power Trading

- Some countries in the SAPP have **excess** Generation Capacity, others have **deficit:**
  - The result is energy flow between member countries in form of energy trading.
- Northern network is predominantly **hydro** and Southern network **thermal:**
  - Good generation mix that mitigates drought
  - Members share in the resulting benefit.

1.2 Power Trading Platforms




Co-operative
Competitive

BILATERAL CONTRACTS

- Takes up 90-95% of energy trade: 15 - 20 TWh
- Peak, off-peak and standard times.

STEM

- The short-term energy market (STEM) was introduced in April 2001
- Precursor to full competition
- Caters for 5-10% of energy trade: 0.8 – 4.3 TWh
- Daily and hourly contracts
- Off-peak periods

Competitive Market Development

- Development of competitive market in the form of a Day-ahead Market (DAM) started in 2003.
- The SAPP has also developed an Ancillary Services Market and a Balancing Mechanism.

2. BILATERAL TRADING

- The bulk of cross border trading in electricity is governed by fixed co-operative bilateral contracts.
- Generally cover a period from 1-5 five years, could be longer.
- The agreements provide for assurance of security of supply but are not flexible to accommodate varying demand profiles and prices.
- The pricing of electricity depends on the consumption period; Peak, Standard and off-peak.
- Essential for financing of new generation & transmission projects.
- Price: Negotiated between willing buyer & seller.
  - Price range: 0.85 – 3.00+ USc/kWh

BILATERAL CONTRACTS

- Can be firm on non-firm contracts

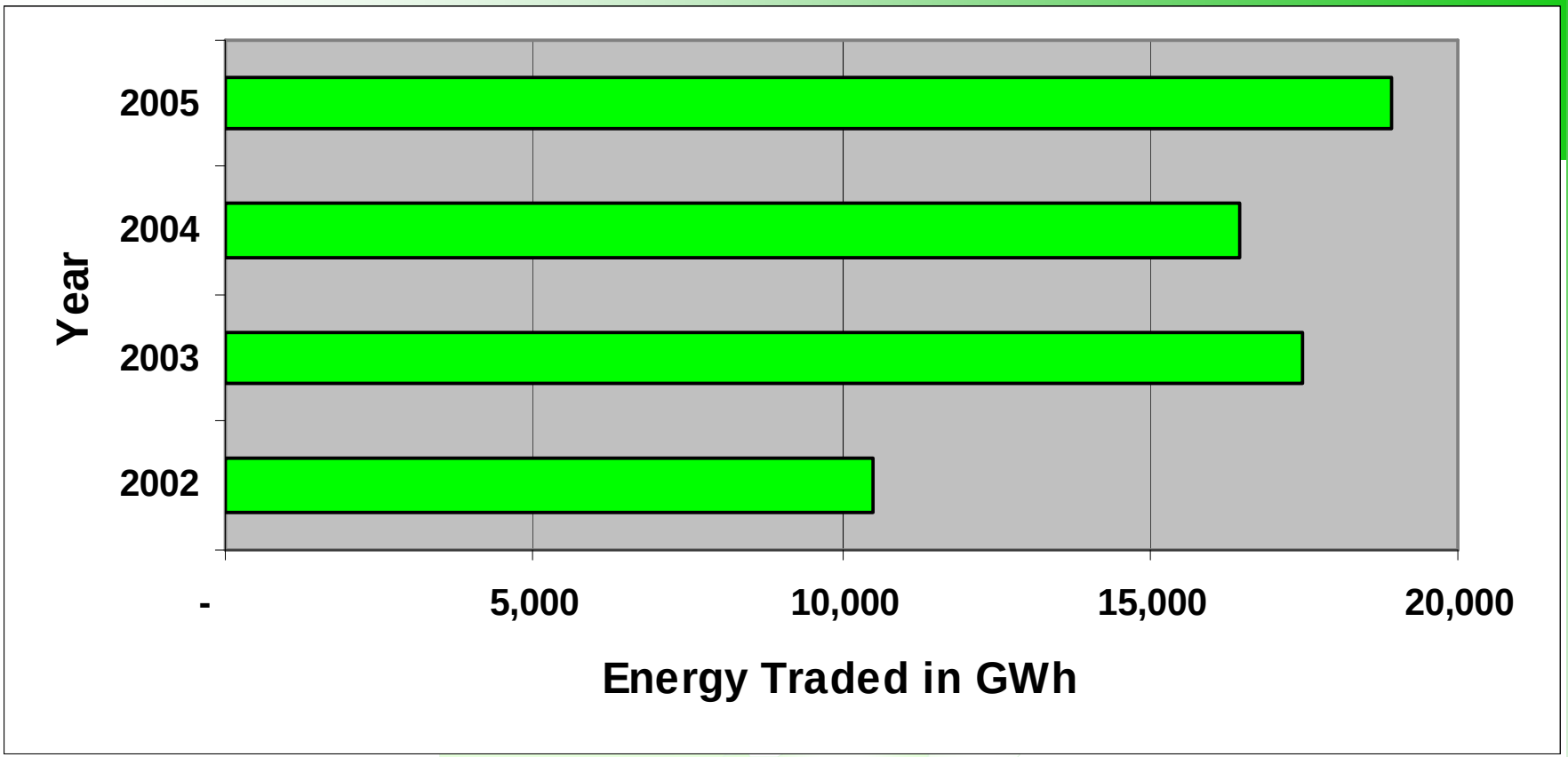
- Non-firm contracts:
  - Are interruptible with notice
  - If notice given, no penalties
  - Generally less than 75% reliable.

- Firm contracts:
  - Most have attached reliability premium
  - Penalties for non-delivery applies.

- **Pricing of Bilateral contracts**
  - The parties agree to both capacity and energy charges.
  - The prices are negotiated by both parties.
  - Wheelers are notified and are a party to the agreement.

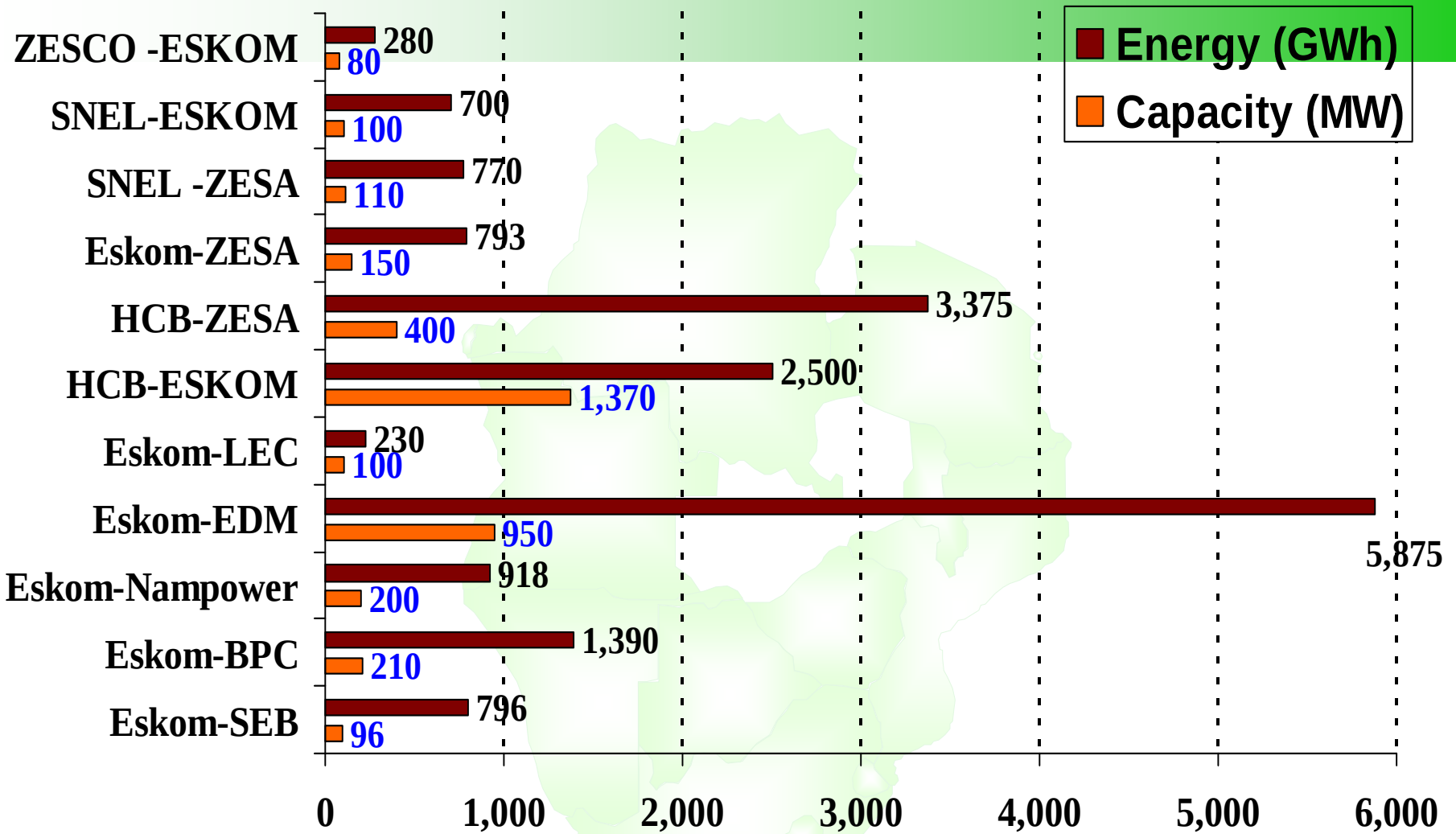
- **Billing**
  - Direct billing from seller to buyer.
  - Billing is on schedules and not on actual.

- **Metering and settlement**
  - Actual meter readings done on monthly basis.
  - Inadvertent energy management follows.



- **Bilateral trading has been increasing year by year.**
- **Demand in the SAPP is rising by 3% annually.**
- **Small reduction in 2004 – rehabilitation projects**

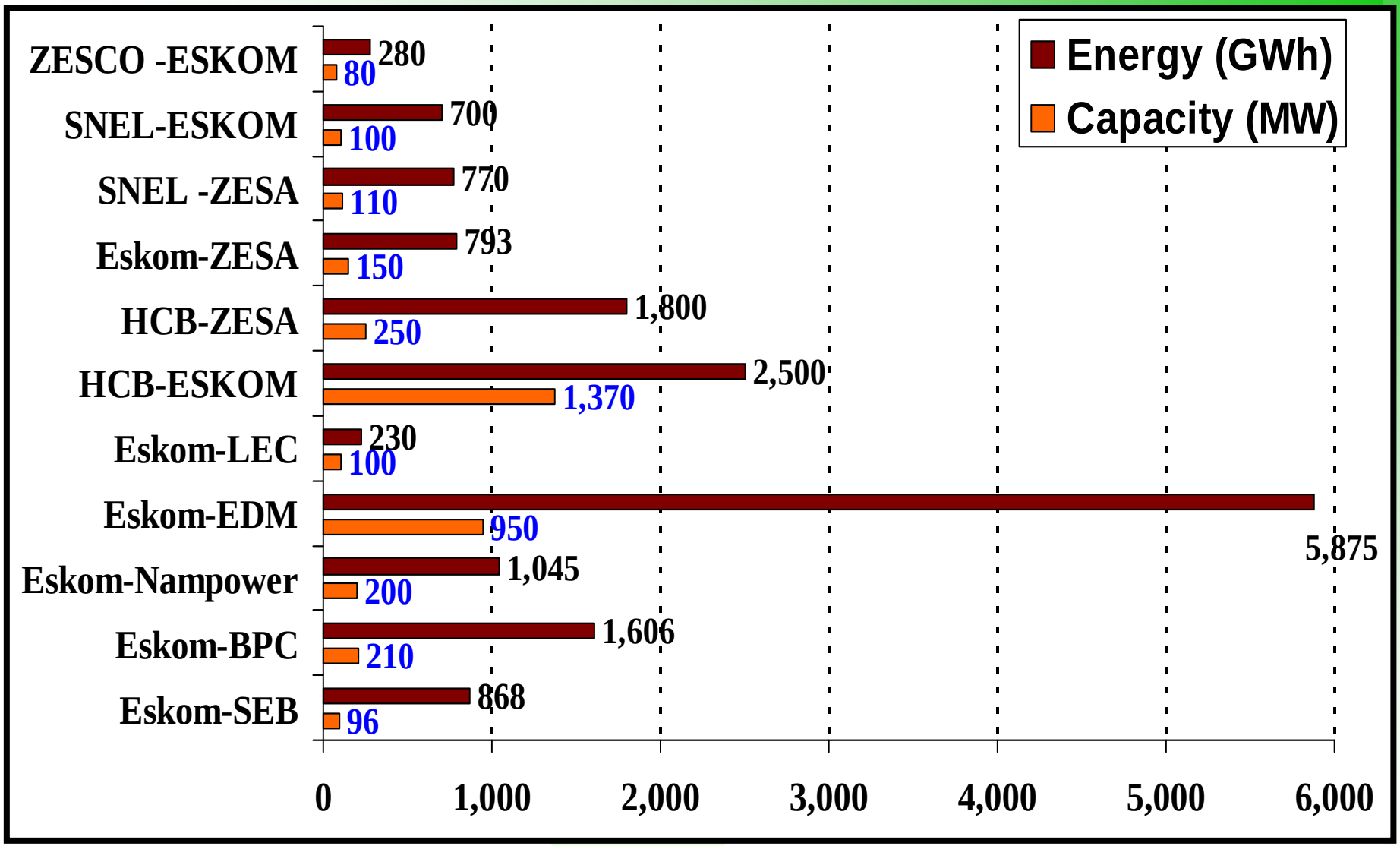
SAPP Bilateral Agreements - 2003



HCB supply (hydro) – 1770 MW

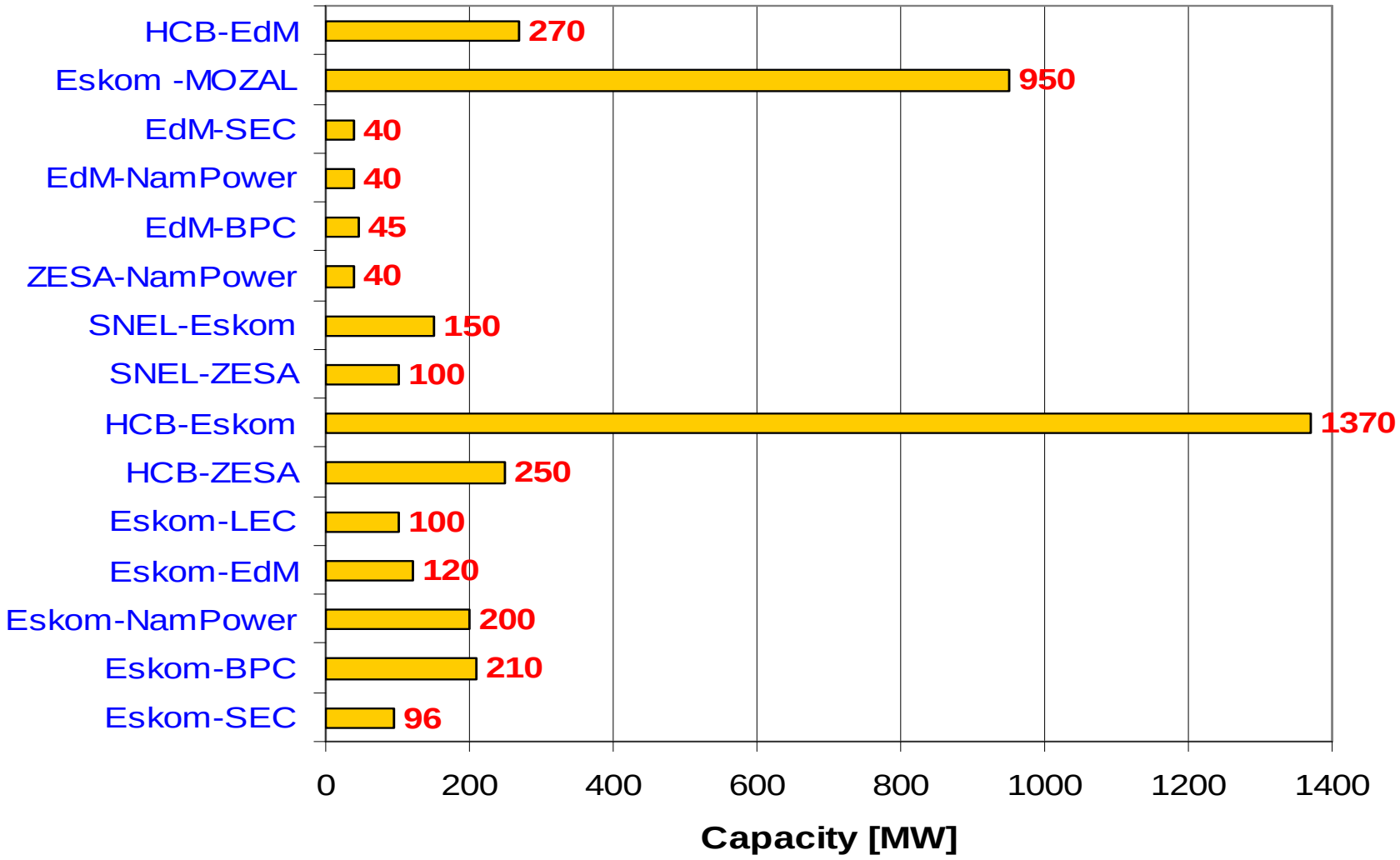
ESKOM supply (thermal) – 1706 MW

Bilateral Contracts - 2005



HCB supply (hydro) - 1770 MW, ESKOM supply (thermal) -1706 MW

2008 Bilateral Contracts in SAPP



3. THE SHORT-TERM ENERGY MARKET

Documentation

The SAPP documents that govern the STEM are:

- Legal Agreement
- STEM Book of Rules:
  - Trading Rules
  - Financial Rules

Participation

- Participation is open to all Operating Members and IPPs.
- Participants are levied 1% administration fee.

STEM Design Principles

i. **Transmission rights – Bilateral contracts have first priority of transmission over STEM contracts.**

ii. **Security requirements - Participants lodge sufficient security before trading commences.**

iii. **Settlement - Accounting on daily basis with monthly billing for all transactions in USD or ZAR.**

iv. **Allocation method - Allocation based on available transmission capability and fair competitive bidding.**

v. **Type of contracts: Daily and hourly firm contracts.**

STEM Trading Timeline

- *At 08:30 HRS, a day before trading*
  - SAPP-CC publishes USD to ZAR exchange rate.
- *Any time before 09:30 HRS, a day before trading*
  - Participants submit offers & bids to SAPP-CC.
- *At 09:30 HRS, a day before trading*
  - The market close.
  - SAPP-CC matches offers & bids for any future trading day;
- *At 12:00 HRS, a day before trading*
  - SAPP-CC publishes the results to all Participants.
- *After 12:00 HRS, a day before trading*
  - Members negotiate for Post-STEM bilateral trade
  - Financial settlement follows.

Pricing of STEM Contracts

- Participants send bids and offers to the SAPP-CC.
- SAPP-CC matches bids and offers.
- The prices are set based on matching sellers price.
- STEM contracts

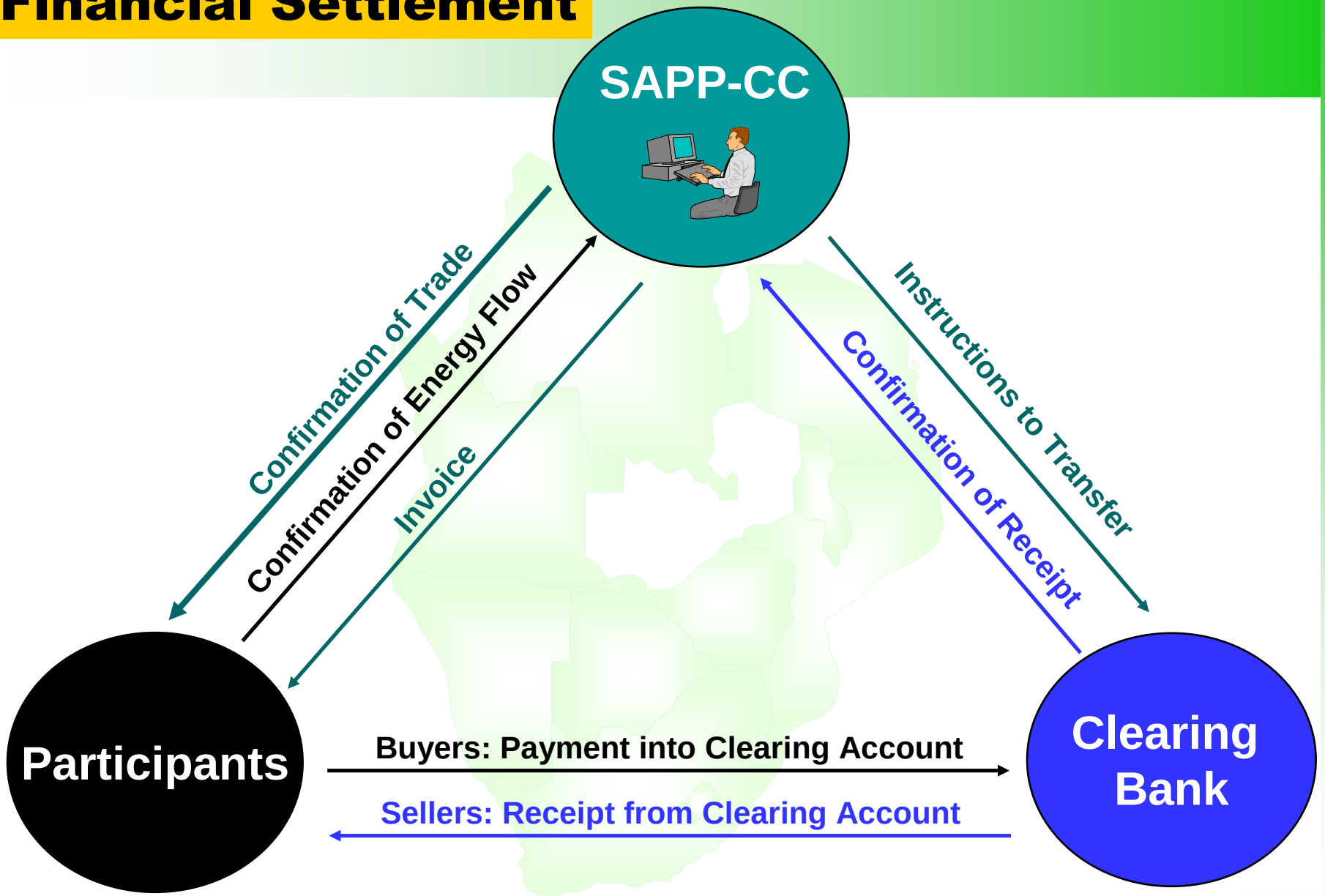
Billing

- The SAPP-CC bills participants on a daily basis.
- Billing is on schedules and not on actual.

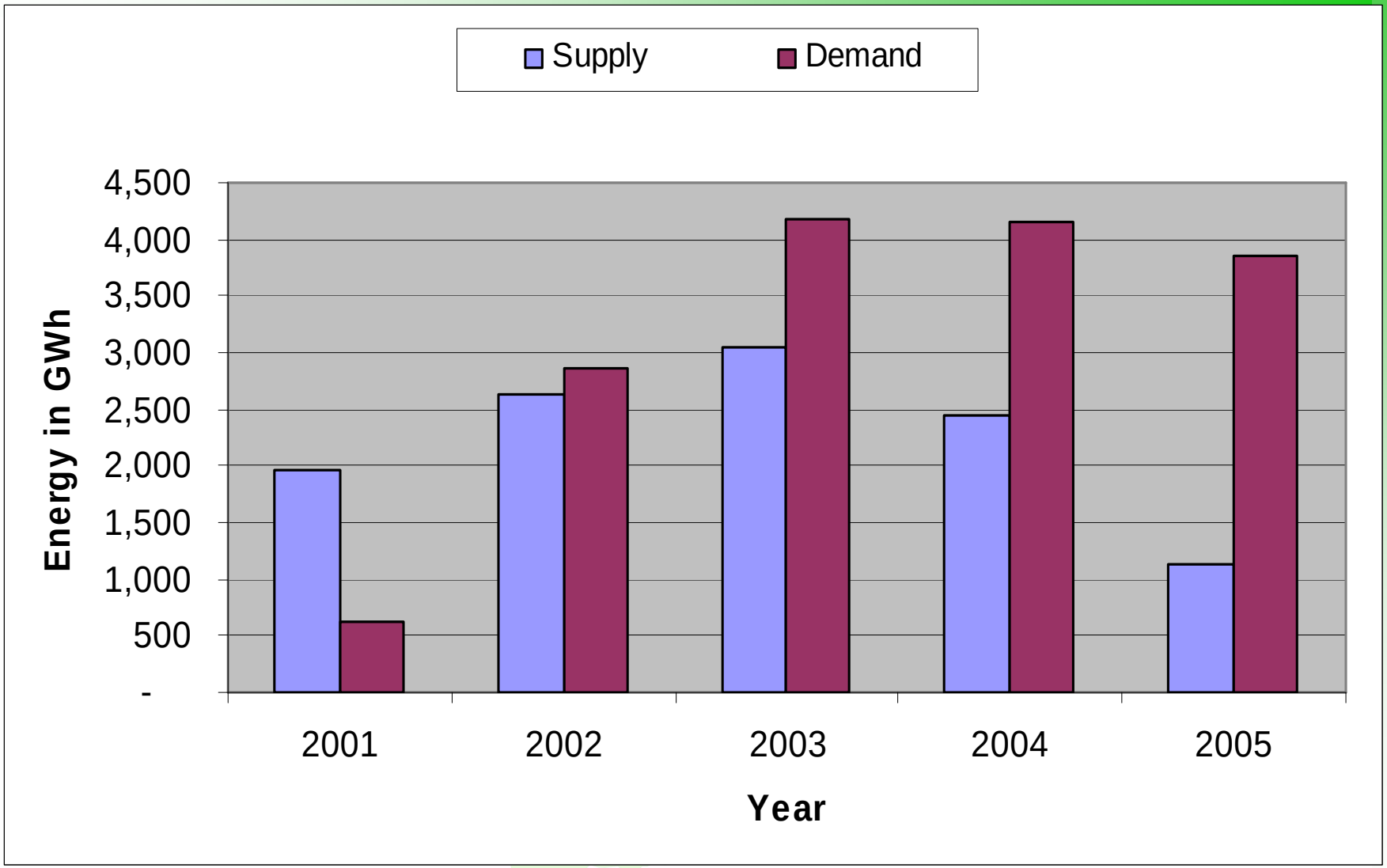
Metering and settlement

- Financial settlement on daily basis.
- Penalties indicated where applicable.
- Inadvertent EM is part of overall settlement.

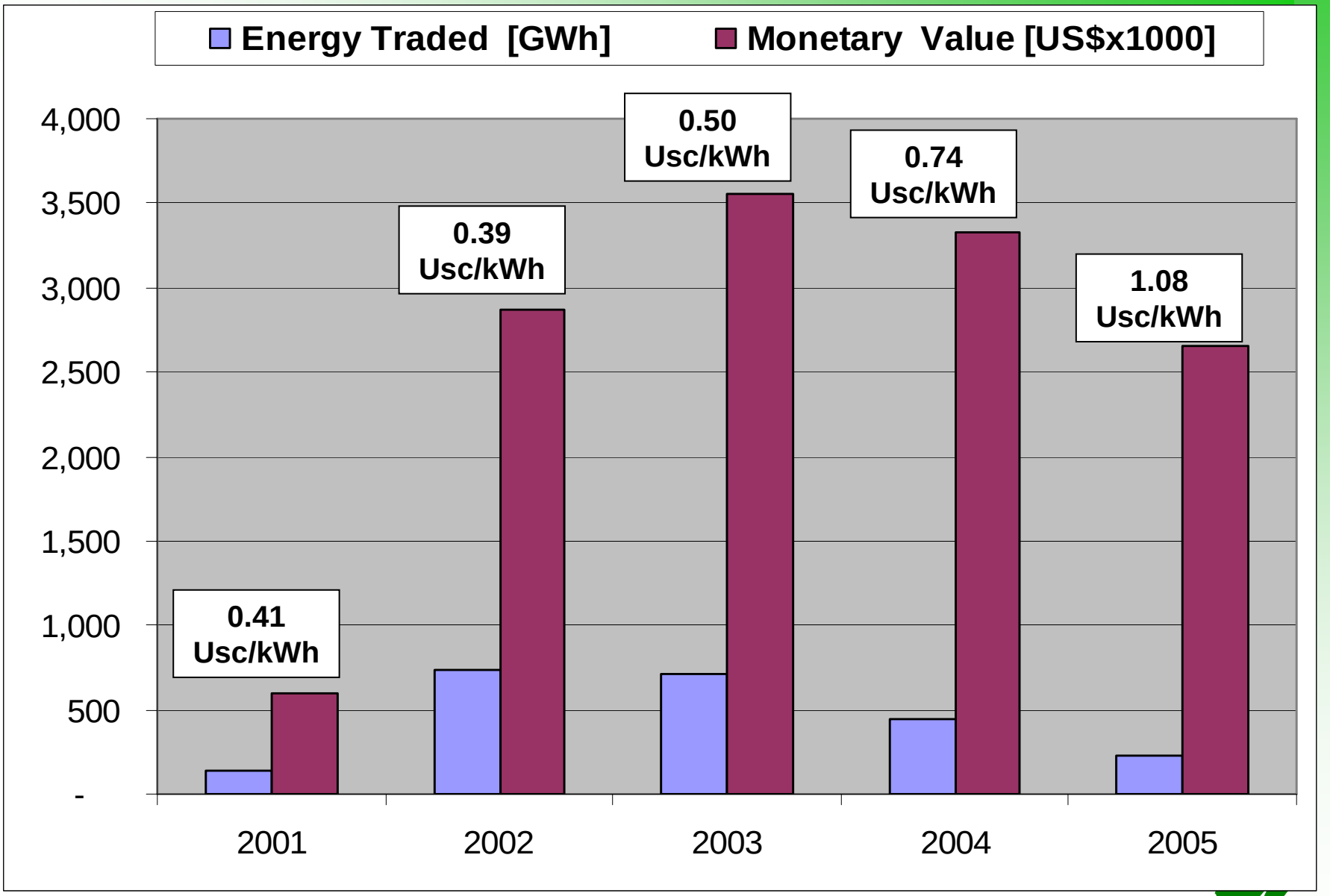
Financial Settlement



STEM TRADING: Supply & Demand



STEM TRADING: Energy Traded & Cost



STEM Current setbacks

- Sellers control the price in each and every hour.
- Allocation of offers and bids not competitive.
- Insufficient generation capacity to enable competitive trading.

The desire for the SAPP is to move towards a competitive market and to develop and apply trading rules that suit a competitive environment.

- **There has been no energy trading on the short-term energy market (STEM) from June 2007 due to:**
  - ✓ **Lack of power supply in the market**
  - ✓ **Constrained transmission paths.**

- **Bilateral trading has however continued.**

4. THE SAPP COMPETITIVE MARKET

4.1 Goals and Methodology

***GOALS* of the SAPP DAM design:**

- Establish an **efficient** and **competitive** marketplace
- Ensure that **consumers** benefit from the market

***METHODOLOGY*:**

- Development of **consistent** market mechanisms.
- Efficient **price signals** for the procurement and transmission of electricity.
- Assurance of **fair** and **open access** to the transmission system.
- **Optimization** of generation & transmission capacity.

4.2 DAM Features

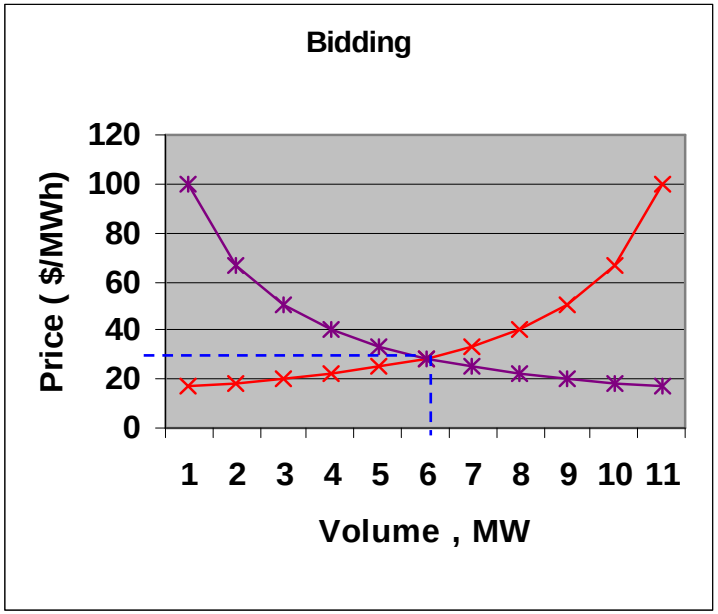
- **Market for secure, effective and non-discriminatory trade of electricity:**
  - Trading to be concluded daily for delivery next day
  - Forward bidding up to 10 days
  - Participants submit bids (purchase) & (sale) offers
  - Closed market – only market operator and participant know the details of the bid / offer
- **Provides a neutral reference price**
  - Price discovery
  - Could provide reference for bilateral contracts

- **Supports an auction-trading model**
  - All sales & demand bids are aggregated at a fixed time
  - The balance price is valid for all trades
- **Tool for managing grid congestion**
  - System price (no grid congestion)
  - Area prices (if transmission capacity is exceeded)

4.3 DAM Price Setting Mechanism

Free Market

- Allows free trade in energy
- In theory
  - Many small players
  - Not Storable commodity
  - No barriers to new entrants



- In Practice: Dominant player
- Tried to some extent in the USA Bidding (Used in UK)

- Bids dispatched using lowest bid to match demand
- Pay all bidder at most expensive bid accepted (marginal bid)
- Marginal bid price should be close to SRMC
- In theory: Profit maximizing bidders should bid close to SRMC
- In practise: Gaming
- Tends to exclude demand side sources of energy

4.3 DAM Design Principles

1. **Market type**
   - Auction type market
   - Participants bid into market for all 24 hrs of next/future day.

2. **Bidding**
   - Participants submit both purchase & sale bids.
   - Types of bids: Single hour and Block bids.

3. **Bid areas**
   - Multiple bid areas with configurable transmission capacities between areas.

4. **Price calculation**

- At defined time, market closes & Market Clearing Price (MCP) calculated.
- MCP is price where supply equals demand without taking transmission constraints into consideration.

5. **Congestion Management**

- 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.

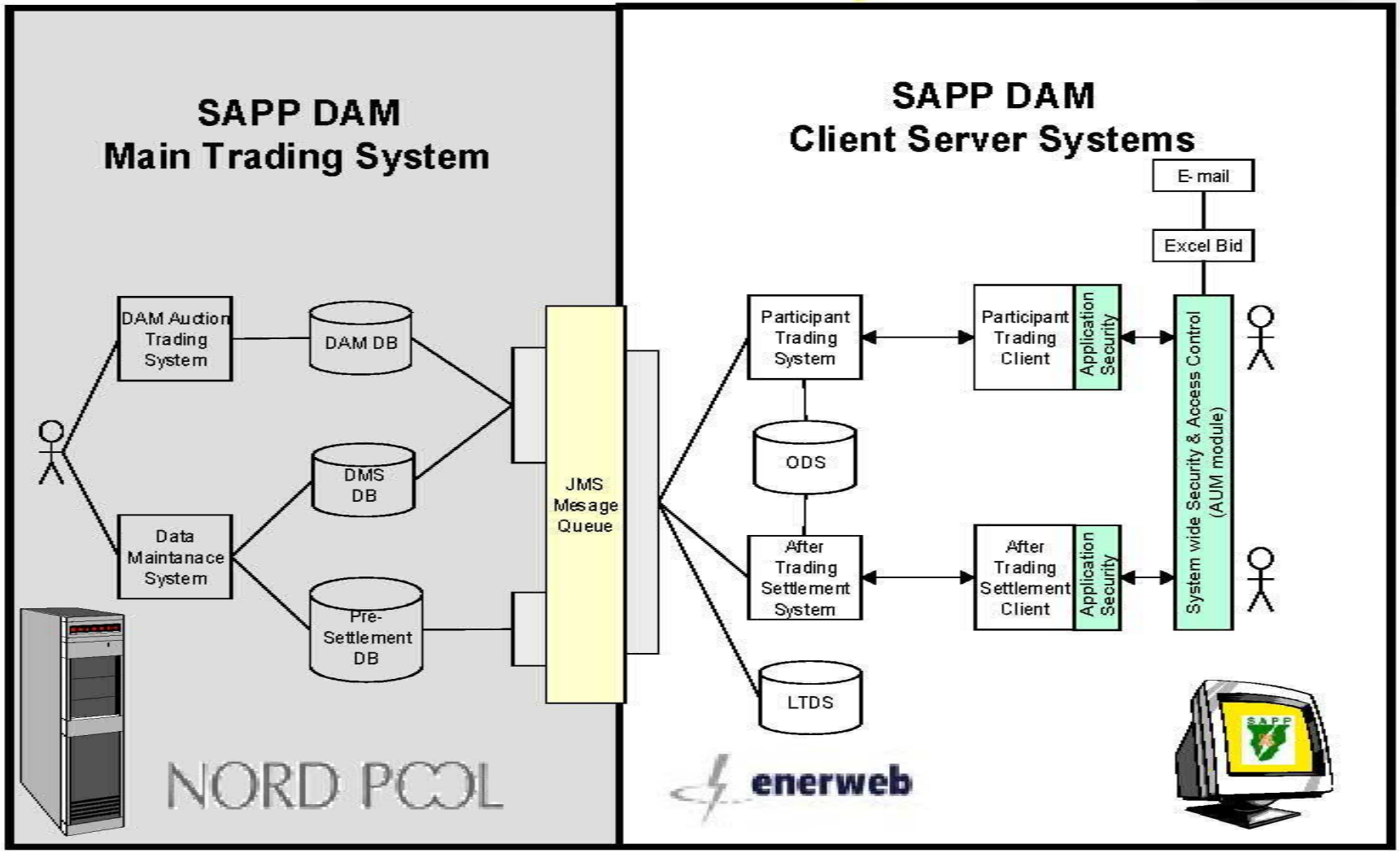
6. **Auction results**

- Participants receive area prices with associated volume. Multiple currencies.

4.4 DAM Trading Timeline

- 08:30 HRS
  - Usage of the bilateral contracts registered by participants.
  - Calculation of available transmission capacity performed.
  - Opening of the market for delivery day X.
- 09:30 HRS Market is closed for delivery day X.
- 10:00 HRS Price calculation
- 12:00 HRS Distribution of prices and schedules
- 12:30 HRS Participants receive price information & schedules.
- 13:00 HRS Deadline for complaints
- 14:00 HRS A report about the contracted volume per Balance Responsible Party is sent to System Operators.
- 24.00 HRS Delivery start for Day-ahead contracts for hour 1

Day Ahead Market (DAM) System



DAM System ...

SAPP DAM Main Trading System

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Used by Market Operator in Harare

SAPP DAM Client Server Systems

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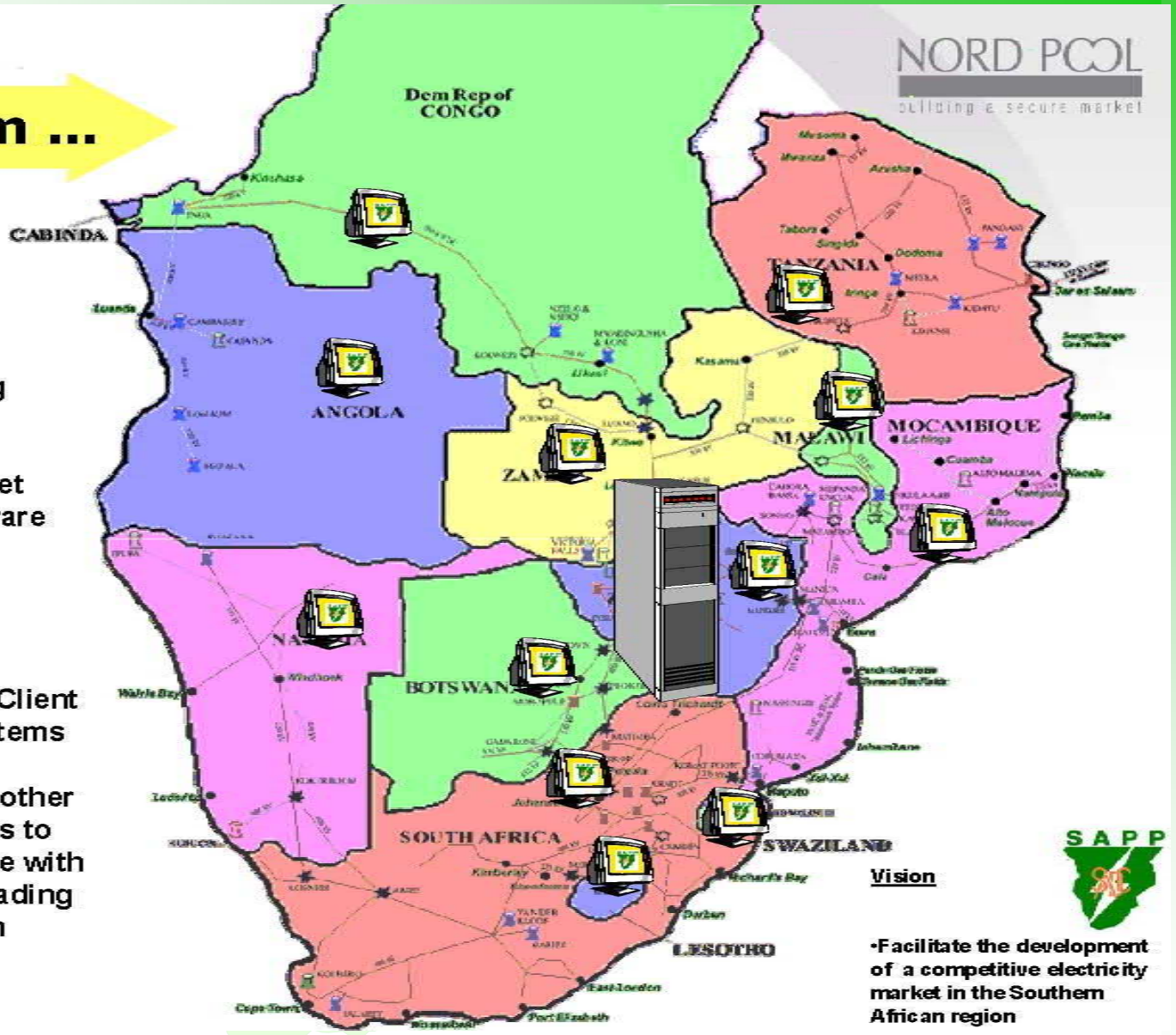
Used by all other particpants to communicate with the Main Trading System

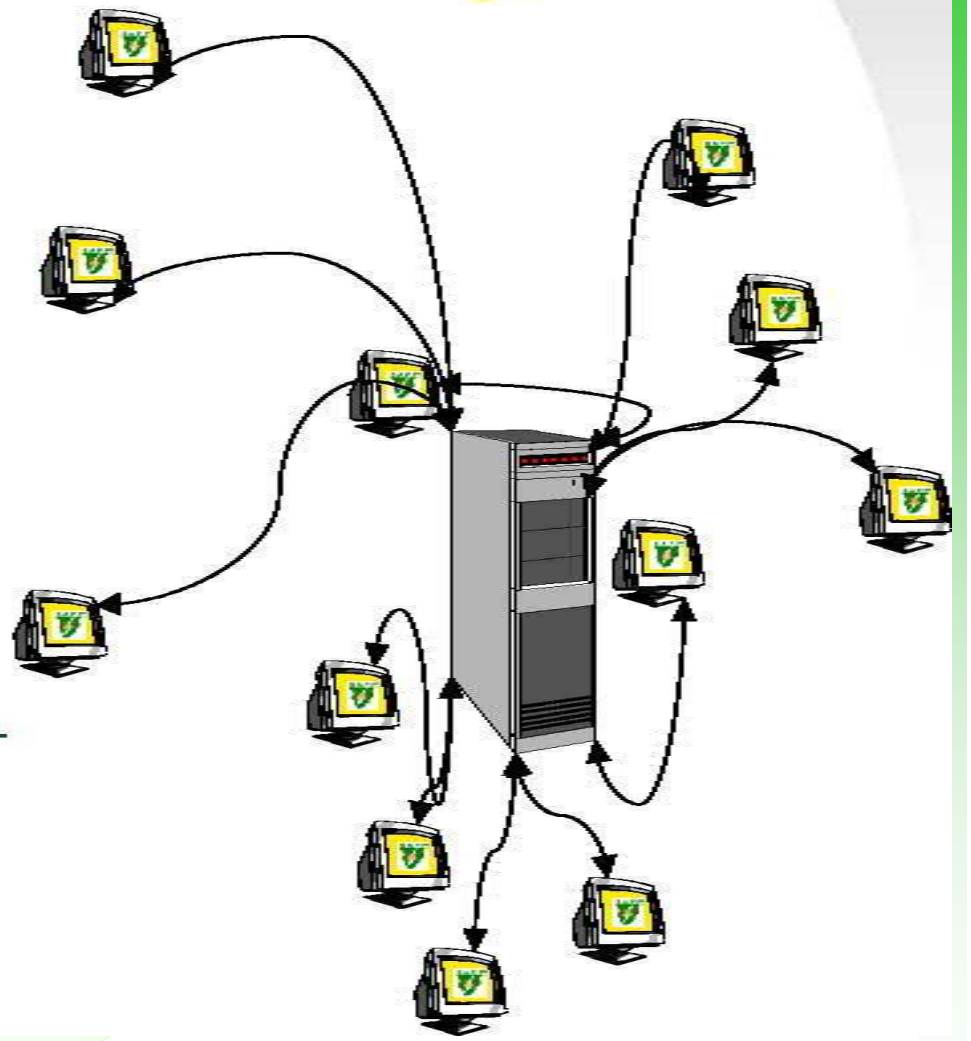


Vision

- Facilitate the development of a competitive electricity market in the Southern African region

DAM System Communication Methods...

- **Through the Internet**
  - Similar to current method
  - Web address published by Market Operator
- **Electronic Mail**
  - Templates distributed by Market Operator
  - *E-Mail address:* *damtradingdesk@sapp.co.zw*
- **By facsimile (back up solution)**
  - Fax number provided



5. CONCLUSION

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.**
- **Designing a market is not simply a matter of copy and paste exercise, but hands on experience is necessary to know possible solutions of practical problems.**

THANK YOU