

SOUTHERN AFRICA POWER POOL (SAPP)

SAPP/SARI EXECUTIVE EXCHANGE

TRANSMISSION SYSTEM PRICING AND OPEN ACCESS REQUIREMENTS & SAPP TRANSCATION COSTS

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PRESENTATION OVERVIEW

1. INTRODUCTION
2. TRANSMISSION SYSTEM PRICING IN SAPP
3. OPEN ACCESS REQUIREMENTS
4. SAPP TRANSACTIONAL COSTS
5. SUMMARY

INTRODUCTION

1. SAPP IS A EXAMPLE OF GROSS POWER POOL

- Majority of trade takes place under bilateral agreements often on the basis of long-term contracts
- Mainly between the nine interconnected (operating members) utilities of SAPP
- Operations in SAPP are guided by agreements rather than law

2. SAPP GOVERNANCE DOCUMENTS

- IGMOU
- IUMOU
- ABOM
- OG
- STEM BOOK OF RULES

INTRODUCTION

- INTER-UTILITY ELECTRICITY TRADE HAS BEEN IN EXISTENCE IN THE SAPP REGION FOR ABOUT HALF A CENTURY

ELECTRICITY GENERATION AND CONSUMPTION

MAINLY CHARACTERISED LONG DISTANCES BETWEEN GENERATING STATIONS AND LOAD CENTRES DUE PRIMARY ENERGY SOURCES SUCH AS COAL AND HYDRO SITES

RATIONALE FOR POWER SYSTEM INTERCONNECTIONS

- **RELIABILITY AND SECURITY OF ELECTRICITY SUPPLY**
- **OPTIMIZATION OF INVESTMENT IN POWER SUPPLY INFRASTRUCTURE**
- **REDUCED TOTAL RESERVE REQUIREMENTS**
- **OPTIMIZATION OF GENERATION FUEL MIX**
- **ACCESS TO LOWER COST ENERGY SOURCES (ECONOMIC EFFICIENCY)**

...INTRODUCTION

- DELIVERY OF ELECTRICITY REQUIRES ADEQUATE GENERATION CAPACITY AND SUPPLY AND THE ABILITY TO MOVE ELECTRICITY TO THE END-USERS – ***TRANSMISSION NETWORK***
- **RELIABILITY:** THE PERFORMANCE OF THE ELEMENTS OF THE POWER SYSTEM THAT RESULT IN POWER BEING DELIVERED TO CONSUMERS WITHIN ACCEPTABLE STANDARDS AND IN THE REQUIRED AMOUNTS.

TRANSMISSION SYSTEM PRICING IN SAPP

TRANSMISSION SYSTEM PRICING OFTEN REFERRED TO A
“**WHEELING**” PRICING

WHEELING

The transmission of power through a member's system who is neither the seller nor the buyer of this power. This is based on the point-to-point concept recognising national borders as the points of entry and exit- (MWh/km)

Firm Wheeling:

Often possible in the case of a single wheeler

Wheeler guarantees that the wheeled power enjoy same priority as any firm supply to its own customers – penalties apply in case breach

TRANSMISSION SYSTEM PRICING IN SAPP

In SAPP all Operating Members are obligated to wheel except where technical problems prohibit (**Open Access**)

Wheeling is paid on ***schedule*** rather than ***actual***.

Firm Wheeling:

Often possible in the case of a single wheeler

Wheeler guarantees that the wheeled power enjoy same priority

as any firm supply to its own customers – penalties apply in case breach

TRANSMISSION SYSTEM PRICING IN SAPP

Non- Firm Wheeling

Normally applicable in the case of multiple wheelers.

The wheeler in non-firm wheeling may curtail or interrupt the flow of wheeled power based on technical and economic considerations for its system without any penalty. The reasons for interrupting wheeling must be **disclosed and should be open to investigation.**

Where one of the multiple wheelers is unable to provide firm wheeling then all serial firm wheeling contracts are automatically nullified

... TRANSMISSION SYSTEM PRICING IN SAPP

Compensation for wheeling includes:

- **Rent of Assets**

Derived from the levelised capital costs of the transmission facilities used for wheeling in the proportion to the use made of such facilities to implement the wheeling transaction

- **Opportunity costs** of foregone benefits with the following conditions

- Demonstration of financial loss due to a firm wheeling transaction replacing firm sale which the wheeler could otherwise have made
- Prove foregone potential contributions to existing system costs by other potential transactions

Formula for Calculating Rent on Transmission Assets

$$R = \frac{r}{1 - (1 + r)^{-n}}$$

Where: r = net discount rate
 n = economic life of asset
 R = rent per annum for an asset worth US\$1.0

... FORMULA FOR CALCULATING RENT ON TRANSMISSION ASSETS

Example:

If the required return on investment “r” is 4% and the economic life of an asset is 25 years,

$$\begin{aligned} R &= \frac{0.04}{1 - (1.04)^{-25}} \\ &= 4\% + 1.6003 \\ &= 6.40\% \end{aligned}$$

- For **non-firm** and **STEM** wheeling half of this value would apply

TRANSMISSION LOSSES

Transmission Losses

The purchasing member is liable for losses incurred in the wheeler's network (only +ve losses). **A special override exists for negative losses**

Settlement for losses incurred in the wheeler's network:

An agreement between members is required to separate losses from wheeling

TRANSMISSION LOSSES

- **Settlement in-kind** (based on time of use)

The wheeler is paid back the amount losses by the purchaser of wheeled power in-kind according to the time of use that the losses where incurred; **peak times** or **off peak times**

- Works well for participants with direct interconnections
- In the process of reimbursing losses further losses may be incurred
- During the time that the other owing party is in a position to pay back the losses in-kind, the owed party may not need the power and vice versa
- Transmission constraints

Transmission Losses

- **Financial Settlement**

The wheeler is reimbursed for the losses incurred in his system financial

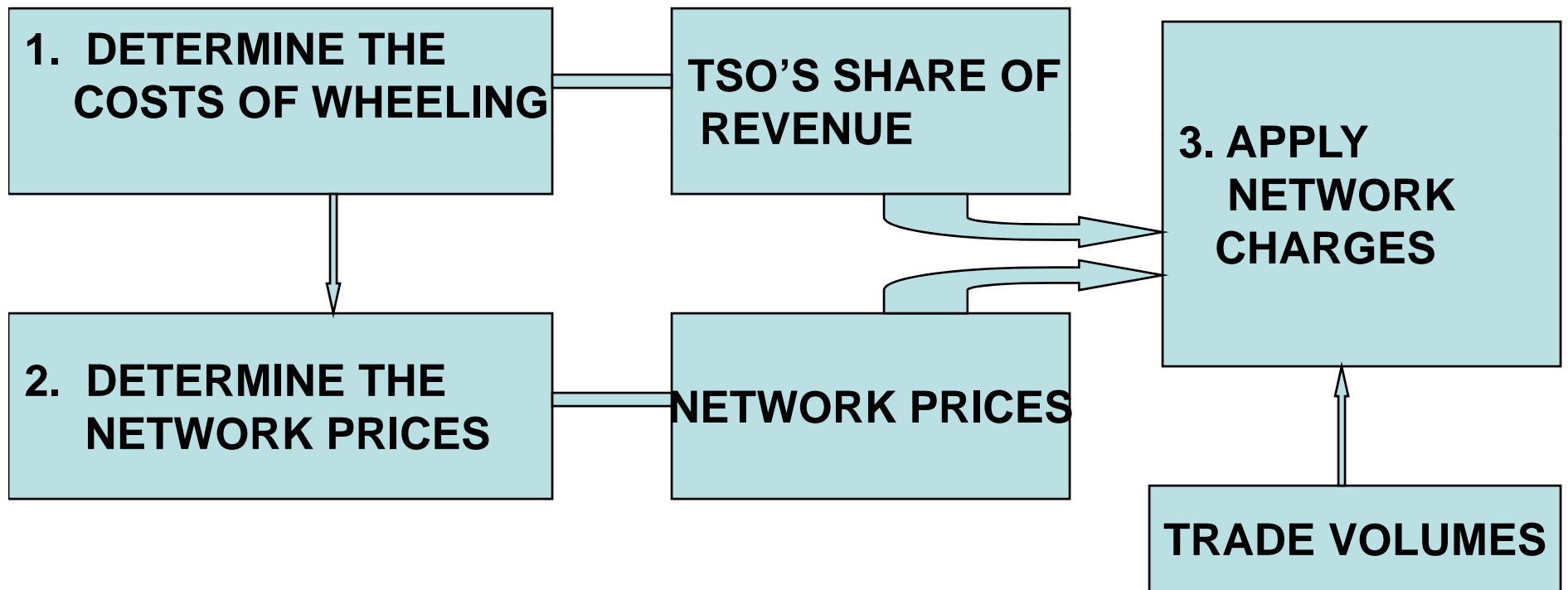
- Best method as its supposed to reflect the cost of power generation to cater for the losses
- Utilities have been reluctant to disclose their MC of generation
- Cost of generation may not be known making it difficult to determine a price to charge for the the losses
- Complex accounting burden
- Difficult to determine price for settlement of losses financially when no trade agreements exist between the parties

PROPOSED CHANGES TO TRANSMISSION PRICING

WHY THE NEED FOR CHANGE?

- SAPP is in the process of developing its competitive electricity market and this cannot work well with point to point wheeling system – disaggregate portions for wheeling
- Improvement of price signals to encourage network investment
- More effective way of managing losses by settling in cash rather than in kind
- The developed competitive market needs new congestion management arrangements

... SAPP PROPOSED CHANGES TO TX PRICING



... SAPP PROPOSED CHANGES TO TX PRICING

1. DETERMINE NETWORK COSTS OF WHEELING (ANNUALLY)

- Defining the transit horizontal network
- Calculation of the transit key (period interval/addition of new assets)
- Establishment of standardised **network costs**
- Calculation of the network **cost of wheeling**
- Calculation of each TSO's share of wheeling revenue

... SAPP PROPOSED CHANGES TO TX PRICING

2. DETERMINE NETWORK PRICES ANNUAL

- Establish Beta matrix
- Establish standardised network costs
- Calculation of the nodal prices
- Calculation of the network cost of wheeling
- Calculation of each TSO's share of wheeling revenue

... SAPP PROPOSED CHANGES TO TX PRICING

3. APPLICATION OF NETWORK CHARGES AND DISTRIBUTION OF WHEELING REVENUES (QUARTERLY)
 - DETERMINE THE VOLUMES OF BILATERAL & DAM TRADES INVOLVED IN WHEELING
 - APPLY THE NETWORK PRICES TO THE VOLUMES TRADED
 - CHARGES DEPOSITED IN FUNND FOR NETWORK COSTS OF WHEELING
 - CALCULATE EACH TSO'S SHARE OF WHEELING REVENUES AND DISTRIBUTE ACCORDINGLY

OPEN ACCESS REQUIREMENTS TO THE TRANSMISSION GRID

- **OPEN AND NON-DISCRIMINATORY ACCESS TO THE TRANSMISSION GRID IS ONE OF THE CORE CONDITIONS FOR A COMPETITIVE ELECTRICITY MARKET**
- **IN SAPP ALL OPERATING MEMBERS ARE OBLIGATED TO WHEEL EXCEPT WHERE TECHNICAL LIMITATIONS EXIST**
- **THE ORDER OF ACCESS FOR WHEELING IN SAPP IS AS FOLLOWS:**
 - BILATERAL AGREEMENTS RECOGNISING MATURITY DATES
 - STEM MONTHLY CONTRACTS
 - STEM WEEKLY CONTRACTS
 - STEM DAILY

(CONTRACTS THAT MEET THE BASE LOAD ARE HIGH PRIORITY)

THIS IS LIKELY TO GO AWAY AS SAPP MOVES TOWARDS A MORE COMPETITIVE ELECTRICITY MARKET

SAPP TRANSACTIONAL COSTS

- Most transactional costs are due to stem trade, wheeling, losses and **inadvertent energy** flows
- The stem book of rules outlines the following fees payable by participants:
 - Participation fees to the CC in respect of actual and potential costs in providing trading service
A BASIC US DOLLAR SUM PAYABLE IN THE FIRST MONTH OF EACH CALENDAR YEAR)
 - An administration fee payable to the CC comprising of:
 - Charges payable for the administration of the clearing service
 - Volume dependant trading fee (1% of revenues from STEM)

SUMMARY

- IN A POWER POOL ALL GENERATORS AND LOADS SHOULD HAVE OPEN AND NON- DISCRIMINATORY ACCESS TO THE TRANSMISSION GRID
- TRANSMISSION PRICES MUST BE REFLECTIVE OF THE COST OF TRANSMISSION ASSETS AND PROVIDE SIGNALS THAT ENCOURAGE NETWORK INVESTMENT
- AN INDEPENDENT ENTITY MUST BE ESTABLISHED TO MANAGE ELECTRICITY TRADE BETWEEN MARKET PARTICIPANTS TO ENSURE ADHERENCE TO COMMON STANDARDS AND RULES, AND ENSURE FAIRNESS TO ALL PARTICIPANTS (e.g. PROHIBIT GAMING)

END