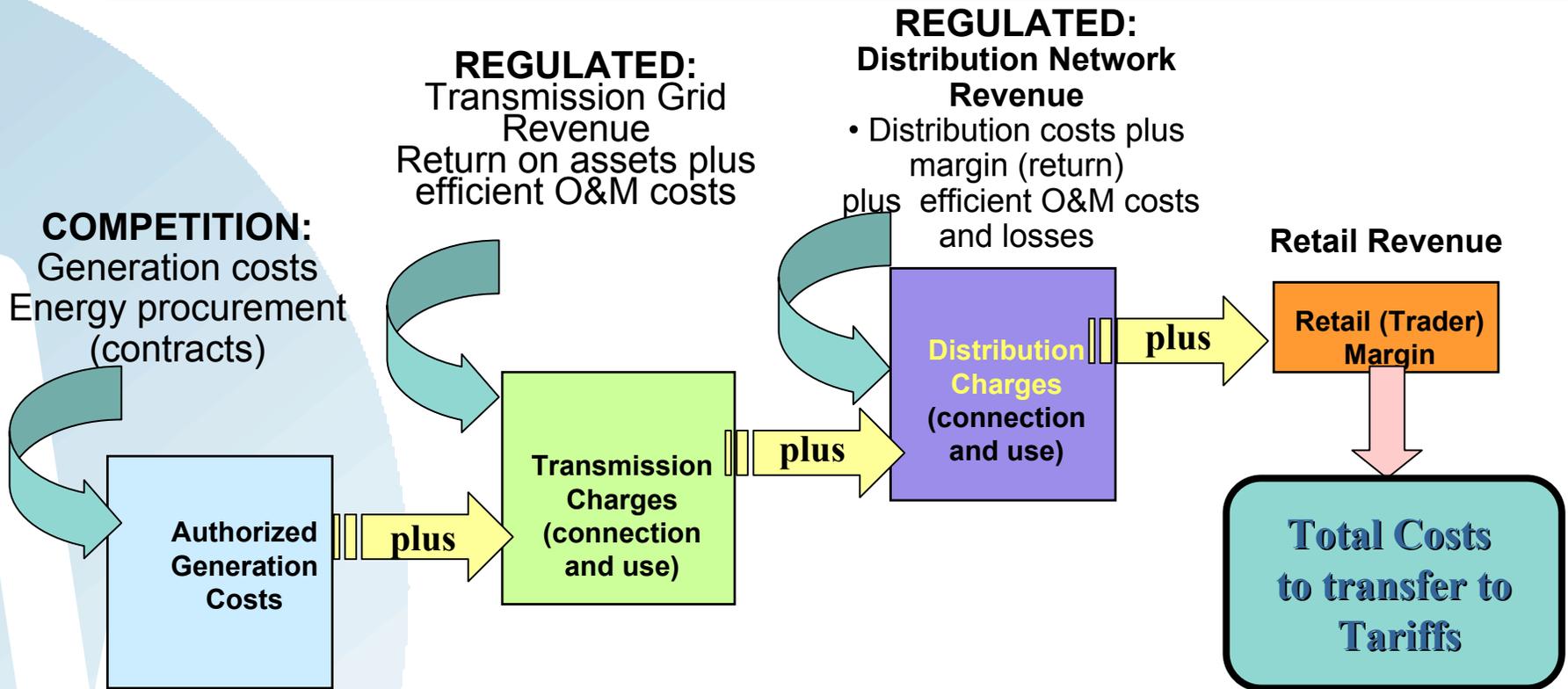

Nigeria: Regulation and Power Sector Reform

Power Sector Reform Restructuring and Regulation Implementation Module

Abuja, May 22 and 23 2003

Unbundling Tariffs : Pass Through of Costs in Consumer Supply Chain



The Electricity Law and Tariffs

- ◆ Law identifies the following tariff regulation for monopoly services:
 - Transmission, system operation and distribution
- ◆ Law also provides that generation and trading may have tariff regulation when necessary (no Market conditions)
- ◆ Law is open to tariff methodologies, and only set general principles:
 - Allow recovery of efficient costs including a reasonable rate of return
 - Incentives to improve efficiency and quality
 - Efficient signals to consumers
 - Phase out or reduce cross subsidies
 - May differentiate by consumer class or location, but must not unduly discriminate
- ◆ NERC free to choose and design methodology within general principles established in Law
 - But Consultant have designed and proposed tariff regulation for TransCo and DistCo

The two faces of the problem

Design and implementation of tariff regime for wires business requires answering following two questions

1st: How will the regulated revenues of the wires business be calculated / decided?

- Performance standards
- Recognized costs (investment, operation, maintenance, administration) to provide the service with the required standards

2nd: How will the approved revenues of a wires business be allocated among users of the wires service?

Balancing Objectives

◆ The Wires Business

- Economic Efficiency
- Fairness and transparency
- Sustainability
 - Adequate to system realities
- Revenue Stability
- Consistency
- Simplicity

◆ The user of the service

- Efficient economic signals
- Non discrimination
 - Adequate to economic and social conditionalities
- Smooth cost changes / reduce tariff volatility
- Predictability
- Simplicity

Types of Revenue Regulation

- ◆ Cost plus return on assets: may create incentives to over invest
 - More assets = higher revenues
 - Requires Regulator review and approval of each investment
 - Not necessarily reflects reasonable cost of service
- ◆ Performance Incentives
 - Actual revenue is associated to service performance
 - Users pay according to actual quality of service measured by regulated performance standards
 - Simulates competitive environment
 - Risk of lower revenue if cannot perform accordingly
 - Issue = design of good and reasonable performance parameters and targets
 - Depends on existing initial performance

Objectives of Tariff Transition Management

- ◆ Manage costs that will be transferred to tariffs and the prices to be paid by or paid to the new business units
 - Manage regulated end consumers' tariffs
 - smooth tariff transition to efficient cost reflective, fair and reasonable values

AND

- Manage cash flow of Generation and Distribution Successor Companies
 - sustainable companies that can attract private participation
- ◆ Vesting contracts at start up to restructure
 - Establish trading prices and reciprocal rights and obligations between new Generators, Bulk Trader and/or DistCos
 - Do not involve negotiation between parties or competitive procurement
- ◆ Predictability:
 - Government: expected tariffs and value of new Companies
 - Successor DistCo: cost of generation to supply customers; and
 - Successor GenCos: expected income

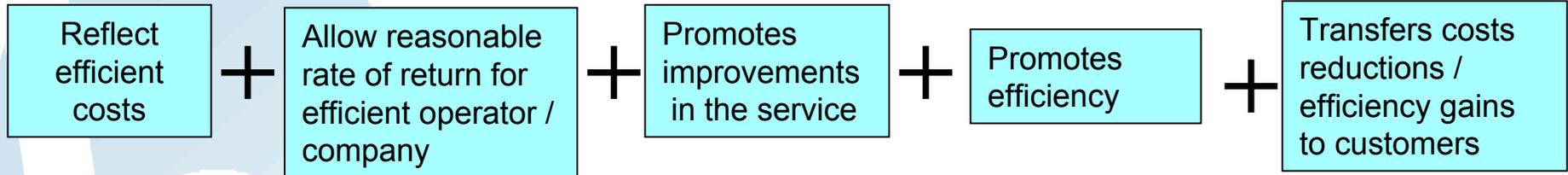
Nigeria: Regulation and Power Sector Reform

Implementation Module Review of Implementation Proposals Distribution Network Regulation, Revenues and Tariffs

Abuja, May 22 and 23 2003

The objectives of Regulating distribution networks...

To obtain a tariffs regime that:



◆ Performance based regulation = A company that does not reduce costs or improve efficiency in providing the service will see profits decline

Tariff objectives in Nigeria

- ◆ Fair and reasonable
 - Reflect efficient and/or competitive prices
 - Economically efficient = result of rules and regulation based on economic principles and actual realities of the system
- ◆ Tariffs paid by consumers support the sustainability of the sector
 - Sufficient revenue stream and recovery of efficient costs for quality, operation and existing and new investment.
- ◆ Affordability and efficient or reasonable subsidies.
- ◆ Predictable = ex ante established formula and mechanisms to determine, review, adjust and calculate tariffs
- ◆ Foster economically efficient and competitive power sector
- ◆ Facilitate private participation in the sector and increase of electrification
- ◆ Promote efficiency production and consumption of electricity

Interpretation of General Objectives (1)

- ◆ Signals to Efficiency
 - In consumption and costs
- ◆ Consistent with
 - Regulated performance targets and technical standards
 - Realities in the network and feasible improvements
 - Connection and public service obligations
- ◆ Fairness is subjective
 - Not uniform costs but what happens with Uniform Tariff?
 - Cross subsidies?
- ◆ Equal rights to connect and access
- ◆ Predictability and transparency
 - Attract private participation in distribution business
 - Large Customers may make investment decisions based on tariffs
 - Company makes investment decisions based on expected revenues (risk on return of investment)

Interpretation of General Objectives (2)

◆ Sustainability versus Tariff Volatility

● Revenue Risk

- Adequate revenue to provide the service
- Predictable cash flow
- Financial cost if lag between change in costs and tariff adjustment (may affect viability)

◆ Simplicity / ease of implementation

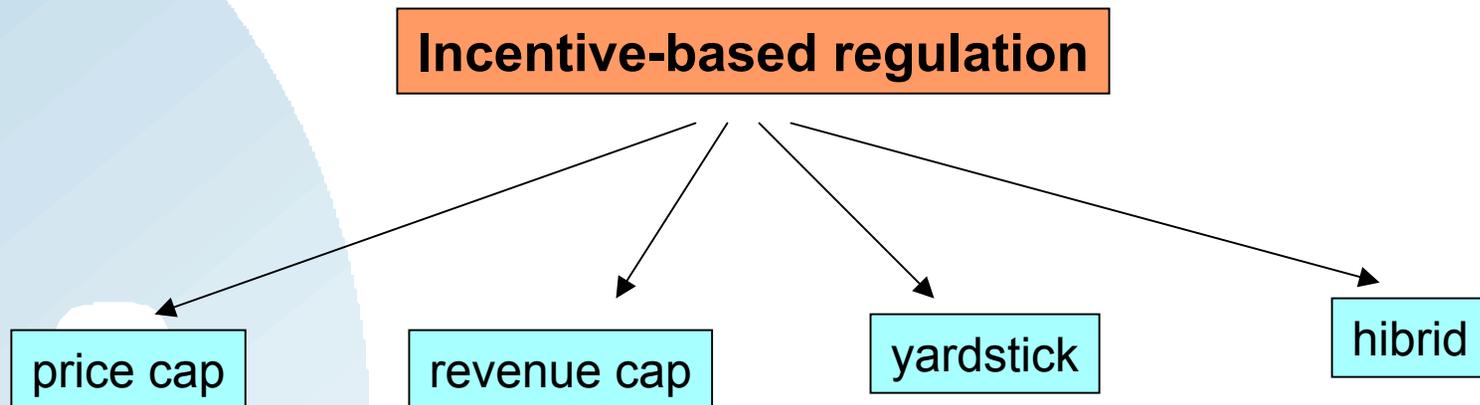
- But not affect efficiency
- Information systems
- Type of regulation
- Administration and regulation costs

◆ Performance Incentives

- Related to aspects which can be managed / improved

Performance Based Regulation

- ◆ There are various performance and incentive based regulation models and experiences in the world:



Principles on Distribution Revenues and Tariffs

What is a reasonable and fair revenue for Distribution network services?

- ◆ What is the approved rate of return?
 - To achieve efficient service, requires adequate return on recognized cost of service
 - Rate of return consistent with inherent risks
 - May be based on local and international comparisons
 - Higher performance = higher costs need to be recognised
 - Higher risks allocated to DistCo = higher rate of return
- ◆ How do you value assets / cost of service
 - Objective: Approximate a “competitive and efficient” cost of service
 - Different alternatives:
 - Return on assets (US, Australia, New Zealand)
 - New replacement value
 - Distribution Added Value (DAV) (Latin)

Proposed for Nigeria: Price Cap

- ◆ Distribution costs: approved cost of investment plus rate of return, O&M
 - ◆ Multi year tariff with PBR
 - ◆ Tariff capped by values, formula and parameters set by the Regulator for a fixed period of time.
 - Periodic reviews (typically five years).
 - Efficiency (Price Index – x), but difficulty in setting x
 - Price reviews may require benchmarking
 - ◆ Advantage: Low level of regulatory involvement between reviews.
 - ◆ Disadvantage:
 - Complex review process: DistCo tries to justify costs
 - Higher rate of return because higher risk
- Profit of DistCo depends on performance - lower costs the greater percentage of (capped) tariff is profit.*
- ◆ Needs to be complemented with a performance regime (established in each tariff review)
 - Recognised costs should be consistent with performance required of the service

Distribution Added Value

- ◆ A variation of PBR
- ◆ Key issue = Methodology for efficient system / service
 - May require crucial assumptions
- ◆ Methodology to calculate efficient network
 - Calculate annual cost required to provide service with required efficiency (performance) standard and for expected load (density, profile)
 - For an efficient network within geographical and density realities
 - May be different to actual network
- ◆ Less intrusive and lower dependency on information provided by the Distribution company
 - Lower information asymmetry for Regulator e.g. no need for life of assets or amortization

Allocation of Authorized Distribution Costs

- ◆ Tariff = define methodology to allocate authorized costs of distribution service among consumers, to ensure (or guarantee with a reasonable risk) that wires business will recover from users approved costs
- ◆ Decisions may be arbitrary, but to make the “correct” decision it is very important to understand the impact
- ◆ Fixed charges versus variable charges
 - Fixed charges guarantee recovery of costs with certainty
 - Variable charges introduce a risk as recovery will depend on actual physical energy (results of the system)
 - Consumption / generation higher than expected = recover more than authorized revenue
 - Consumption / generation lower than expected = recover less than authorized revenue
 - May require a compensation mechanism, to compensate differences periodically

Nigeria: Regulation and Power Sector Reform

Implementation Module Transmission Grid Regulation, Revenues and Tariffs

Abuja, May 22 and 23 2003

Principles on Transmission Revenues

Issues in Transmission Pricing

◆ Quality of service

- Technical standards
- Performance indexes

◆ Promote and facilitate efficient competition in the Market

Pricing mechanism: two sides that must complement

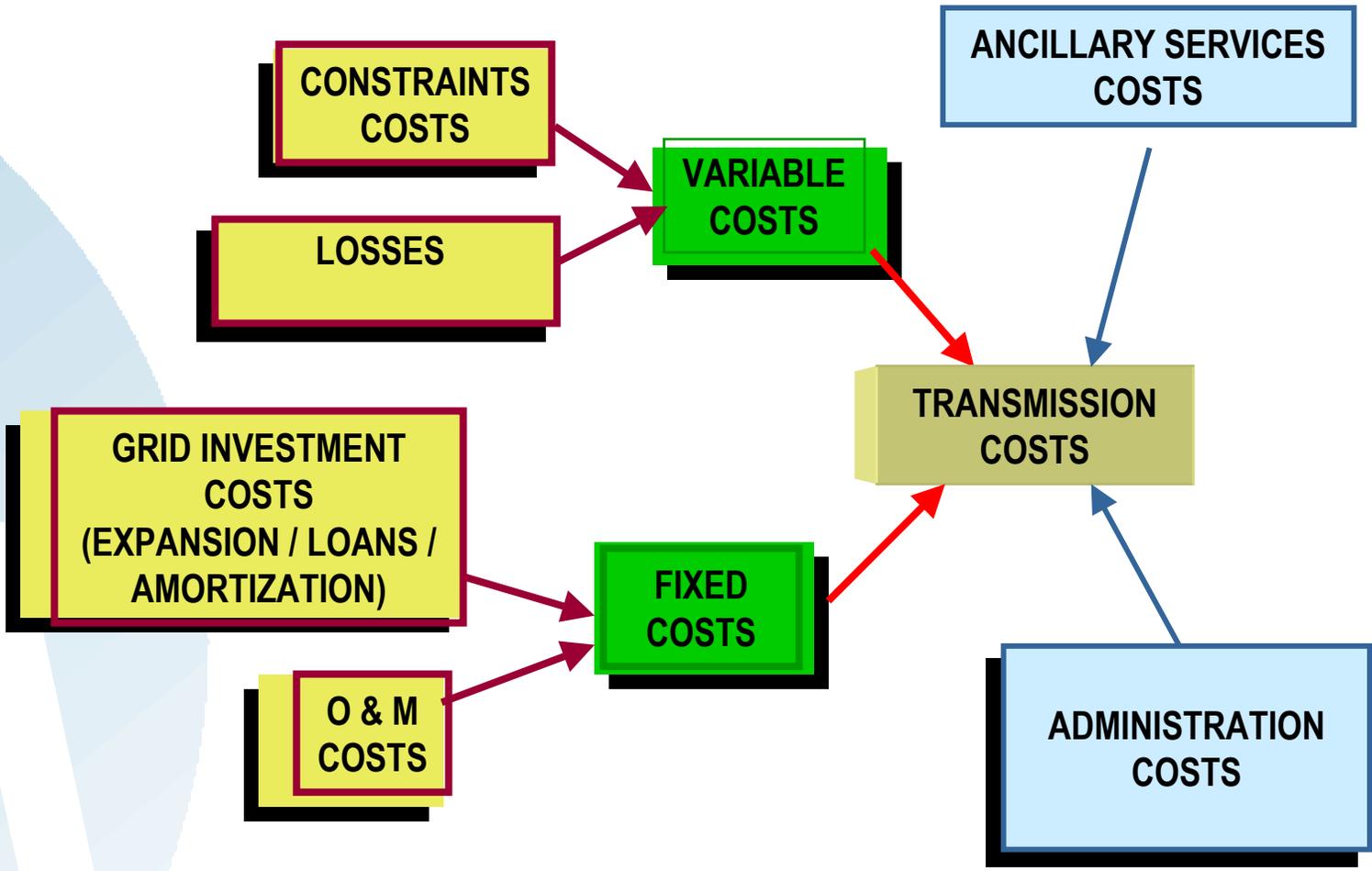
- ★ Allowed revenue of Transmission for required technical, quality and performance standards (authorized costs)
 - Costs of an efficient transmission service
- ★ Allocation of authorized costs between Transmission Users (transmission tariffs or charges)
 - Recover the total costs approved

Characteristics of Costs

- ◆ Majority of transmission costs are fixed (do not depend of extent of usage)
 - Capital costs, including rate of return
 - Operations and maintenance
 - administration and overheads

- ◆ Variable costs are related to operation of the system, and relatively are low
 - Cost of losses
 - Costs of transmission constraints (congestion cost)
 - Costs of Ancillary services

Costs in Transmission and System Operation



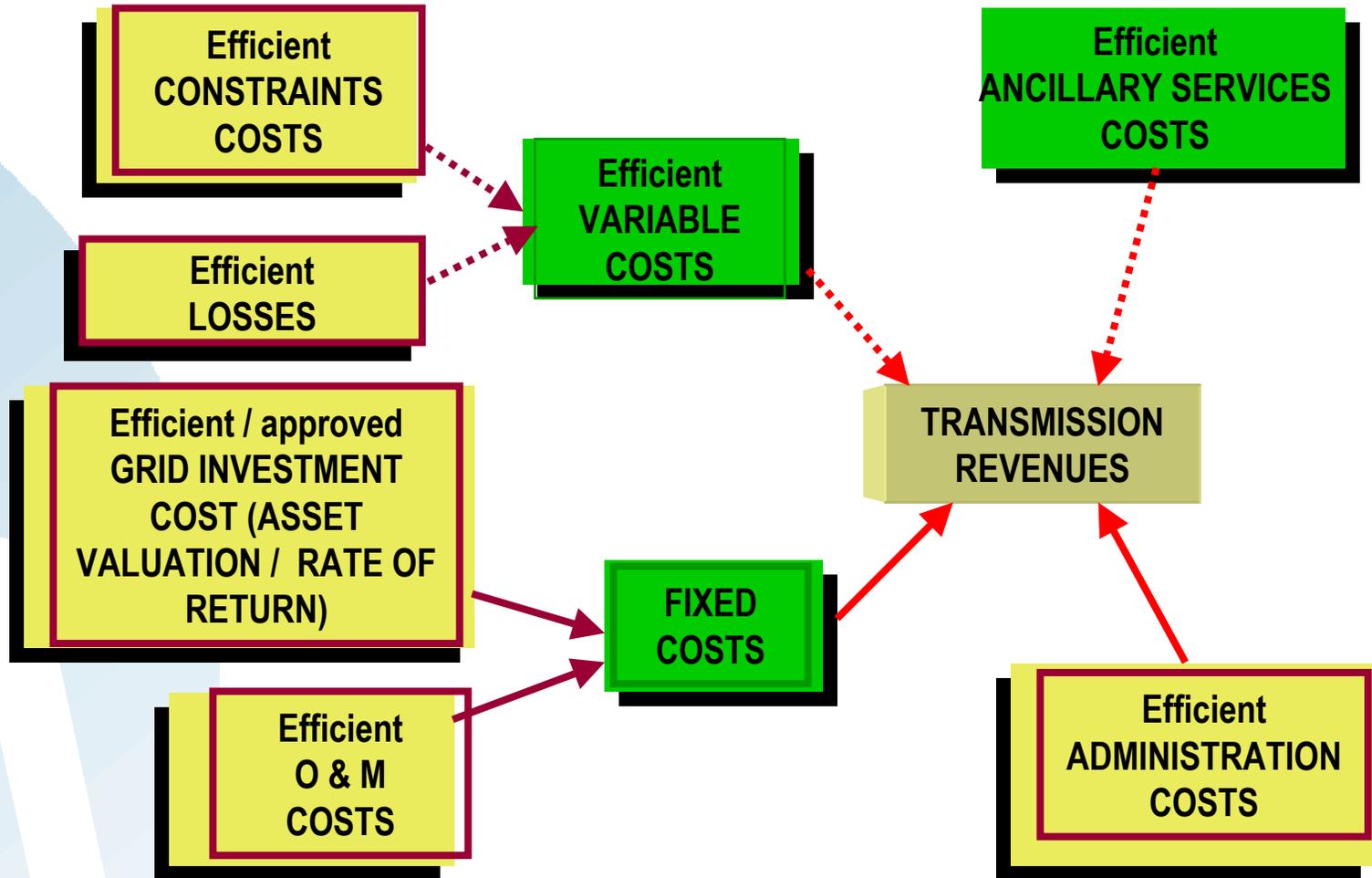
Proposed mechanism in Nigeria: Return on Assets

- ◆ Revenue: approved cost of investment plus rate of return, O&M
- ◆ Based on assets: criteria to define assets
 - All assets or only does that are “useful”?
- ◆ Methodology to calculate asset value is the key issue
 - May be different to book value
- ◆ Rate of return adequate to risk, equity and debt
- ◆ Maintains service potential of assets
 - Lower risk for investors?
- ◆ May require intrusive and information extensive regulation
 - Depreciation calculated based on life of asset
 - Regulator exposed to information asymmetry

Authorized Revenues

- ◆ Recognised transmission facilities?
 - All facilities
 - Adapted (efficient) grid
- ◆ Valuation methodology of recognised facilities
 - Replacement cost
 - Replacement cost plus competitive expansion cost
 - Book value
 - Some sunk investments (e.g. Transfer assets at no cost)
- ◆ Recovery of fixed costs determines revenue
 - r = Rate of Capital Recovery (regulated)
 - Asset Cost = Methodology
- ◆ Depending on type of transmission company, will include or not variable system operation costs:
 - If owns generation to provide Ancillary Service, may include also a fixed cost

Regulation Costs for Transmission Revenue



Principles on Transmission Tariffs for Transmission Users

Implementation Module

Transmission Users Costs

- ◆ Transmission system composed of:
 - A principal system of shared facilities
 - A secondary system, with facilities dedicated to the connection of one or more Transmission User to the principal (shared) system
- ◆ Transmission charges designed to allocate and recover authorized transmission revenues
- ◆ Connections costs allocated to connected users
- ◆ Use of shared system costs (use of system charge)
 - Any allocation is to an extent arbitrary and may respond to special policies
 - Which side of the Market should pay
 - Only Generators
 - Only Loads (Distribution / Retailer / end customers)
 - Both: in what proportion?
 - Efficiency : signals to induce best overall use of system
 - Fair and reasonable
 - Simple and predictable

Connections

- ◆ Issue : Differentiate facilities that are connection from those that conform the shared transmission
 - Shallow or deep connections
 - Deep connection: includes radial transmission lines
 - New generation will pay for line to connect to shared system
- ◆ Issue : when and how a facility that initially qualifies as a connection becomes a part of the shared system?
 - In time others may connect to same facility (loads and generation)
 - In developing system, a new line attracts new connections and encourages the development of electrification
 - Could mesh and develop to a part of the shared principal system
- ◆ Connection charges (fixed charge) regulation
 - By type of connection e.g. by Voltage level
 - If connection shared by more than one user, cost allocated among them (e.g. proportional to connected capacity)
 - Performance (e.g. availability)

Two Views of the same Problem

- ◆ Calculation of Transmission charges is the mechanism used to:
 - recover the authorized revenue of the TransCo
 - provide economic signals to Transmission Users (requires different charges per location)
- ◆ Transmission charges methodology:
 - A cost allocation process in which Transmission Users are charged the costs of the transmission system which has been developed to supply or sell; or
 - A price signals methodology based on actual or future transmission costs to support an economic dispatch and balance generation with consumption (meet load growth at each location)

Alternatives for System Use Charge

- ◆ System use: Tries to be proportional to economic benefit
 - Related to variable use: energy production / consumption
 - Related to connected capacity / peak demand = signal on future expansion to meet capacity growth
 - Advantages:
 - Easy to understand by engineers
 - May be perceived as “fair” by Transmission Users
 - Disadvantages:
 - Weaker economic justification
 - Requires more calculation to process use
- ◆ Charges depend or not on locational
 - Average (STAMP)
 - each node (NODAL - DISTANCE) or each area (ZONAL)
 - Advantages:
 - Fair: Allocates costs of a region to those that benefit
 - Disadvantages:
 - More complex, different charges leads to different tariffs by region

What has to be designed and decided?

**Implementation Module:
Questions and Approaches
for Transmission and Distribution**

- ◆ Consultant prepared draft Licence forms
- ◆ Agree final regulatory design of each activity / operator
- ◆ Agree revenue and tariff methodology and mechanisms
- ◆ Review each licence and adjust to final design
 - Technical and quality parameter
 - Public service obligations
 - Provisions for changes in different stages of the Market
 - Tariff or price regulation
- ◆ Licence for Bulk Trader?
- ◆ Trader Licence for DistCo?

Implementation of Transmission Revenue and Transmission Charges / Tariffs

- ◆ Design methodology and criteria to value assets and authorized transmission costs and quality of service / performance for the transmission service
 - Which is the asset base criteria
 - Frequency of transmission costs (revenue) review
- ◆ Calculate and approve initial authorized costs
 - Can investment / upgrades be recovered through tariffs, or need special funding?
- ◆ Design detail of methodology and calculate transmission charges for Transmission Users.
 - Analyse impact
 - Design if necessary transition that administers start up costs and gradual implementation of the performance and quality of service
- ◆ Calculate and approve initial TransCo revenue and transmission charges

Implementation of Distribution Revenue and Distribution Network Tariffs

- ◆ Criteria and pass through formula
 - Criteria for Generation costs, vesting contracts
 - Frequency of update
- ◆ Approve methodology to calculate and review authorized distribution costs, rate of return and quality of service / performance for the distribution service
 - Design transition of the performance and quality of service
- ◆ Design tariff structure (consumers classes) and evaluate typical characteristics (maximum load, consumption, profile)
- ◆ Design subsidy / incentive policy
- ◆ Calculate and approve initial costs, parameters and rate of return, performance and quality regime and distribution tariff
 - Analyse impact
 - Design if necessary transition
- ◆ Calculate and approve initial tariffs for each DistCo

Questions to be answered

Main Topics to be covered

Type of Regulation

Contestability of network markets

Conte

Obligation to connect

Trader / Retailer

Subsidies

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Specifically:

- ◆ Franchise: “exclusivity” in an area
 - ◆ What characteristics and extension in relation to existing network?
- ◆ How can the exclusivity area be expanded?
- ◆ Competition for areas? Important where expanding electrification is a main objective

Questions to be answered

Main Topics to be covered

Type of Regulation

Contestability of network markets

Conte

Obligation to connect

Trader / Retailer

Subsidies

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Specifically:

- ◆ Will the DistCo at a certain stage have to separate distribution activity from trader / retailer business?
- ◆ Will there be retail competition (eligible customers)?
 - ◆ If yes, how will it be implemented and develop in time?
- ◆ Assignment of responsibilities for metering and billing?

Questions to be answered

Main Topics to be covered

Type of Regulation

Contestability of network markets

Conte

Obligation to connect

Trader / Retailer

Subsidies

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Specifically:

- ◆ Within which area is there an obligation to connect?
- ◆ How will expansions outside this area be paid / financed?
 - ◆ Reimbursable contributions by end customer?

Questions to be answered

Main Topics to be covered

Type of Regulation

Contestability of network markets

Conte

Obligation to connect

Trader / Retailer

Subsidies

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Specifically:

- ◆ Can the DistCo sell to Eligible Customers in other areas (not connected to DistCo network)
- ◆ How many retailers are required for effective retail competition?
- ◆ Is there a need to protect Eligible Customers with regulated tariffs?

Questions to be answered

Main Topics to be covered

Type of Regulation

Contestability of network markets

Conte

Obligation to connect

Existence of the retailer

Subsidies

Specifically:

- ◆ Subsidy policy: definition of a clear, efficient and transparent mechanism for allocating the funds
- ◆ What mechanisms / subsidies included to finance increase in access to low density or rural areas?
- ◆ Use of funds?
 - ◆ Contributions, allocation

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Tariff methodology

Main Topics to be covered

Debt -Capital structure,
Rate of return

Cost of capital evaluation

Recognized
costs

Treatment of losses
and performance

Multi Year Tariffs

Specifically:

- ◆ Should the capital base (structure) be described in the regulation?
- ◆ How should the rate of return to capital be treated and determined?
- ◆ What flexibility could be provided to update the methodology for regulating the rate of return?



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Tariff methodology

Main Topics to be covered

Debt -Capital structure,
Rate of return

Cost of capital evaluation

Recognized
costs

Treatment of losses
and performance

Multi Year Tariffs

Specifically:

- ◆ What level of investments will be remunerated (recognized/accepted)
- ◆ Are the investments considered directly or indirectly?
- ◆ How are the different investments evaluated?
- ◆ By competition?
 - typical areas,
 - benchmarking,
 - International comparisons,
 - Efficiency coefficients



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Tariff methodology

Main Topics to be covered

Debt -Capital structure,
Rate of return

Cost of capital evaluation

Recognized
costs

Treatment of losses
and performance

Multi Year Tariffs

Specifically:

- ◆ What level of costs will be remunerated (recognized/accepted)? Efficient O&M?
- ◆ How are the different costs evaluated?
- ◆ By competition?
 - typical areas,
 - benchmarking,
 - International comparisons,
 - Efficiency coefficients
- ◆ Or based on studies of costs of each DistCo?

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Tariff methodology

Main Topics to be covered

Debt -Capital structure,
Rate of return

Cost of capital evaluation

Recognized
costs

Treatment of losses
and performance

Multi Year Tariffs

Specifically:

- ◆ How will initial technical and non-technical losses and performance be determined?
- ◆ Criteria for future review and/or plan of future increase in performance requirements?
- ◆ How will losses and quality (performance) be calculated and monitored?



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Tariff methodology

Main Topics to be covered

Debt -Capital structure,
Rate of return

Cost of capital evaluation

Recognized operating
costs and evaluation

Treatment of losses
and performance

Multi Year Tariffs

Specifically:

- ◆ Duration of each multi year period?
- ◆ How will costs / parameters / targets be reviewed at the end of each multi year period?
- ◆ Will there be an efficiency parameter?
 - ◆ If yes, how will they be treated? (X factor?)



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Energy Procurement and Pass-through mechanisms

- ◆ Incentives for efficient procurement
 - Should expected demand be contracted fully in the wholesale market? Or just partially?
 - Competitive procurement?
 - Level of regulation: detailed procedures and standard contract or efficient guidelines (greater flexibility)?
 - Pass through for contract prices?
 - Bilateral negotiated contracts?
 - Which prices should be recognized in the regulated tariffs?
Benchmark
- ◆ Risks allocated are reasonable (can be controlled)?
 - Avoid creating barriers to new entry
- ◆ How and when should prices be adjusted (updated)?
- ◆ What signals do prices create?

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