

The Nigerian Power Sector- Post Privatization Challenges and Prospects

By

Dr. A. T. Atiku

Deputy Managing Director

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Objectives of Reforms and Privatization of Power Sector

- ✓ Ensure Rapid growth in stable power supply on a reliable and sustainable basis
- ✓ Lower cost of production and enable Nigeria's manufacturing sector to compete favourably internationally
- ✓ Reduce FGN's expenditure profile
- ✓ Fuel the growth and development of other economic and social activities and become the engine driving job creation



Privatization Update

- ✓ After a Two years and Five months of rigorous and complex transaction process, successful preferred bidders paid for the Generation and Distribution companies on August 21 2013
- ✓ The 14 Companies were handed over to the new owners on November 1, 2013
- ✓ Kaduna Disco and Afam Genco already have preferred bidders



Privatization Update cont'

- ✓ RFP's were harvested on 8th November 2013 for the 10 NIPP plants privatization
- ✓ A total 40668 Workers of PHCN have been paid their severances, gratuity and pension in full
- ✓ This signals a new dawn for the transformation of the power sector in Nigeria



Privatization Update cont'

- TCN is at the forefront of achieving the overall well planned privatization programme by the federal Government . Hence as part of the privatization process TCN management was decided to be contracted out.
- Manitoba Hydro International (MHI) of Canada and Grid Co. of India submitted their bids for the Management Contract

Management Contracting



The appointment after international competitive bidding process of MHI as Management Contractor of TCN was particularly to;

- Inject expertise in capital programme planning and delivery
- Bring in experience on market development and the evolution of the MO, SO and TSP functions
- Leading to ring fencing and unbundling of TCN into the three Business Entities.
- Enable knowledge transfer to, and development of, Nigerians to manage the Transmission Business

Goals and Objectives of TCN Management



- To transition TCN into a financially sustainable, stable, self-sufficient and market driven company that transmits generated energy throughout Nigeria and that is available 24 hours a day, 365 days a year
- *A key prerequisite in attaining this goal is to **develop the capacity of local personnel** such that, by the end of the contract period, Nigerians can take over efficiently and effectively the Management and Operation of the Company*



Goals and Objectives cont'

- to ensure a reliable, cost effective network for the supply of electrical energy and help facilitate the increased availability of electricity throughout Nigeria
- to develop the Company's capability to build for its long-term future and sustainability.
- to separate the activities of the three principal functions of the Company (MO, SO and TSP) to enable them operate as distinct viable business units and prepare them for concession in future

An overview of Transmission Company of Nigeria



- TCN is among the 18 successor companies ‘unbundled’ from PHCN; set up as a corporate entity in 2006
- Performs three principal functions namely: Market Operations (MO), System Operations (SO) and Transmission services Provider(TSP)
- TCN is a strategic National asset, retained in state ownership
- TCN is responsible for its efficient operation, maintenance, expansion and reinforcement of the National Grid that ensures system stability and reliability.



Core TCN Functions

SO

- Efficient scheduling and dispatch
- Demand forecasting, system and operational planning
- Grid Code compliance
- Fault management and restoration
- Security and Reliability

MO

- Settlements (energy and cash balancing)
- Payments (collections from Discos, payments to Gencos and other market participants)
- Bulk metering

TSP

- Design, specification, commissioning, construction of assets**
- Inspection, preventive and planned maintenance**
- Connections**
- Field workforce**
- Project management**

Function



The task of Transmission Company of Nigeria entails the development and maintenance of a reliable transmission grid in order to:

- Provide Equal Access for power evacuation to all participants at all times
- Ensure full evacuation capability and reliability at minimum technical loss
- Ensure equitable load allocation to consumers

Transmission System Data



MAXIMUM VOLTAGE	330KV
STATUTORY LIMITS	313.5KV – 346.5KV
NOMINAL FREQUENCY	50HZ
STATUTORY LIMITS	49.75HZ – 50.25HZ

PEAK DEMAND FORECAST	10,200MW
MAXIMUM GENERATION CAPABILITY	5781MW
PEAK GENERATION TO DATE	4321MW
MAXIMUM INSTALLED CAPACITY	9,915.4MW
MAXIMUM ENERGY GENERATED	96,768.53MWH

Transmission Data



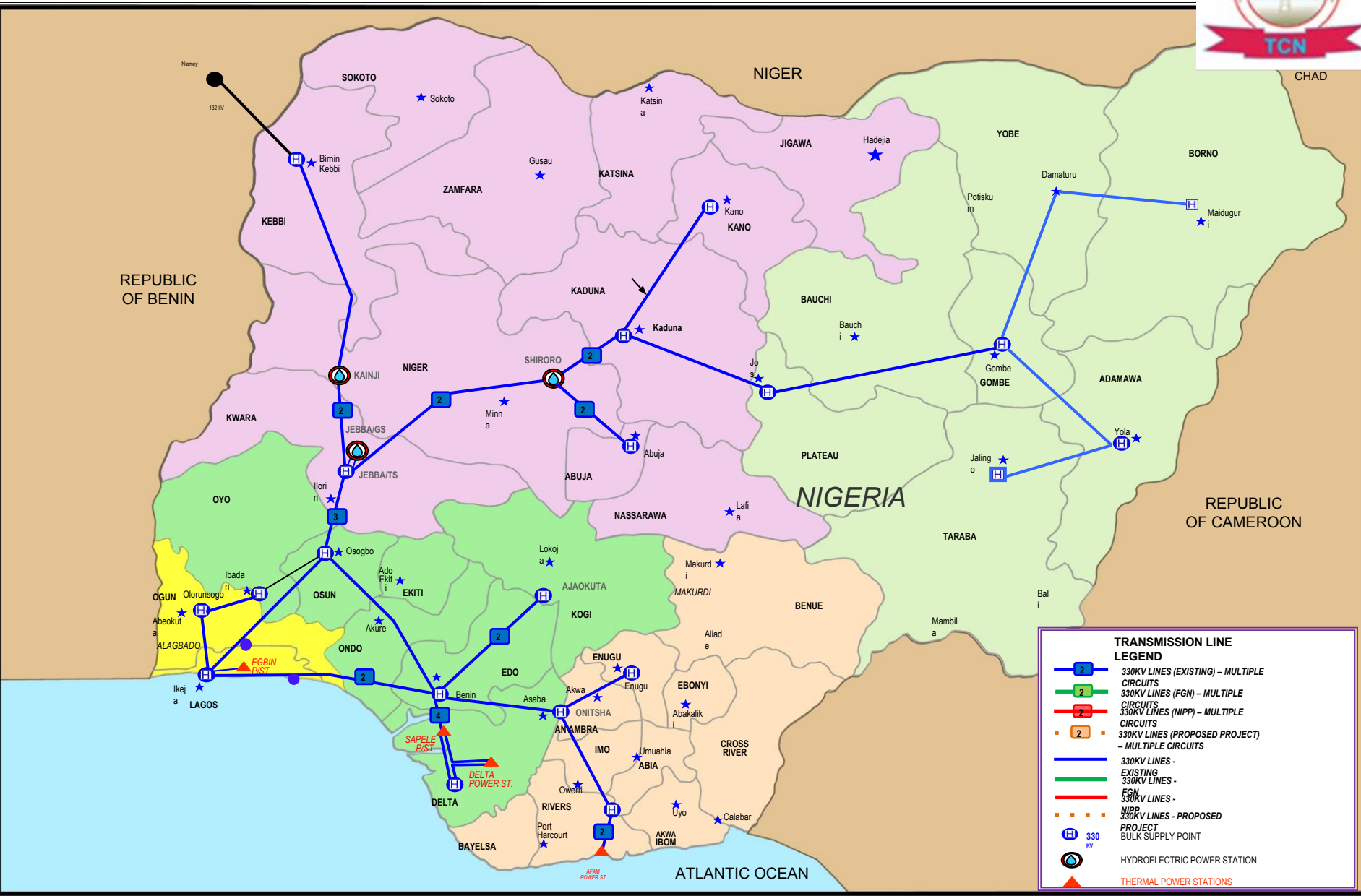
1	Capacity 330/132kV (MVA)	8,138
2	Capacity 132/33kV (MVA)	10,162
3	Number of 330kV Substations	28
4	Number of 132kV Substations	119
5	Total Number of 330kV circuits	60
6	Total Number of 132kV circuits	153
7	Length of 330kV lines (kM)	5,650
8	Length of 132kV lines (kM)	6,687
9	Work Centres	34
10	National Control Centre	1
11	Supplementary National Control Centre	1

GEOGRAPHICAL STRUCTURE OF THE TRANSMISSION COMPANY OF NIGERIA, TCN

TCN is comprised of eight Transmission Regions each headed by a General Manager (Transmission) who are responsible for running and maintenance of transmission and transformation facilities in their areas of operation as shown in the following map of Nigeria:



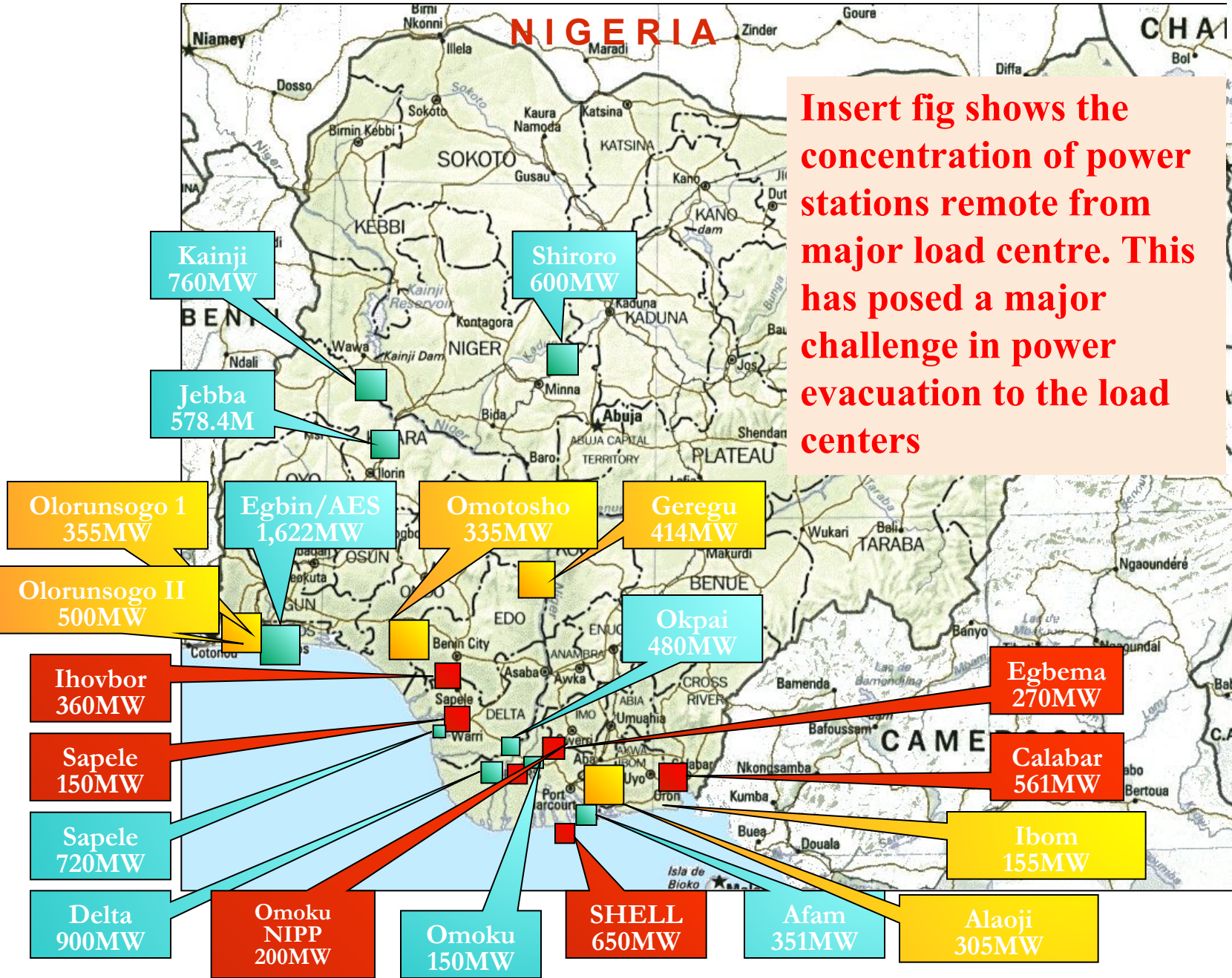
Nigerian Power Grid: Existing 330KV Lines Network



TRANSMISSION LINE LEGEND

- 330KV LINES (EXISTING) - MULTIPLE CIRCUITS
- 330KV LINES (FGN) - MULTIPLE CIRCUITS
- 330KV LINES (NIPP) - MULTIPLE CIRCUITS
- 330KV LINES (PROPOSED PROJECT) - MULTIPLE CIRCUITS
- 330KV LINES - EXISTING
- 330KV LINES - FGN
- 330KV LINES - NIPP
- 330KV LINES - PROPOSED
- PROJECT BULK SUPPLY POINT
- HYDROELECTRIC POWER STATION
- THERMAL POWER STATIONS

Power Station Spread in Nigeria



Insert fig shows the concentration of power stations remote from major load centre. This has posed a major challenge in power evacuation to the load centers

System Operation Practice



The System Operator (SO)

The responsibility of SO includes the following:

- allocating available generating capacity to Bulk Supply Points (BSPs)/distribution entities/ bulk customers (these may be large industrial and commercial users in country, or other countries).
- ensure the National Control Centre (NCC), together with the Supplementary National Control Centre (SNCC) and the Eight Regional Control Centres, perform their 'despatch' function on a day to day basis and
- ensure conformance with the terms of the Grid Code
- Coordinate the preparation of the 20yr Nigerian Power Sector Master Plan



System Operation Practice

Generators Objectives

- Maximize Profit
- Meet Demand Contracts
- Get More Customers

Transmission Objectives

- Meet Transaction Contracts
- Maximize Profit

System Operator's objectives

- Ensure Network Security and Reliability



Market Management Practice

The Market Operator (MO).

Formally referred to as the Operator of the Nigerian Electricity Market (ONEM).

- Administration of bulk metering at the interface between generators/
TCN; and TCN /the distributors/bulk users;
- Ensure conformity with the Market Rules
- Settlements; payments and equalisation
- Contribute in the major review of the Multi Year Tariff Order (MYTO) and
planned changes to the Market Rules.



Transmission Planning Practice

The Transmission Service Provider (TSP)

Key responsibilities include:

- To manage, operate and maintain the transmission network
- To ensure accurate energy metering at the transaction points
- ensuring the transmission network is extended and upgraded
- Guarantee stability and security of the transmission facilities
- to enable the efficient evacuation of power from generators to the distributor and large industrial/commercial users.



Transmission

- Evacuation Bottlenecks
- Menace of Erosion of Tower bases
- Violation of Transmission Right of Ways
- Ageing Workforce
- Lack of adequate technical manpower at various work centres
- Old and Obsolete Equipment
- Overloaded transmission lines and Substations
- Control of the Grid is still largely manual
- Inadequate Infrastructure coverage
- Inadequate Funding
- Vandalism



Generation and Distribution

- Inadequate Infrastructure coverage
- Limited Funds for Development projects
- Inadequate supply of Gas for Thermal Stations
- Low Water level in the Hydros
- Ageing Workforce
- Lack of adequate technical manpower at various stations
- Old and Obsolete Equipment
- unhealthy distribution networks (33kV, 11kV and 0.415kV)



- Inadequate funding of the power sector
- Slow performance by contractors
- Unpredictable energy sources (water and gas pose serious operation planning problems.
- Large disparity between energy supply and demand.
- Inadequate telecommunication facilities and control aids limit operational effectiveness .
- Low voltage in the North due to concentration of Power Stations in the South

Evacuation Bottlenecks



- ➔ Generation -Transmission interface constraints
- ➔ Transmission Substation capacity constraints
- ➔ Transmission lines and wheeling constraints
- ➔ Transmission - Distribution interface constraints

Effects of Evacuation Bottlenecks



➔ Load Shedding

➔ *Voltage/Frequency instability*

➔ *Stranded power*

➔ *System Collapse due to inadequate generation and spinning reserves and lack of redundancies in transmission*

Way Forward



Encourage investment in Transmission by:

- ❖ Contractor-Financing
- ❖ Foreign Loans (Euro Bond, AFDB, World Bank, ABD, JICA and China Nexxim Bank etc). Recently, a conference was organized on Financing Power Projects in Nigeria where about 300 participants attended and about 12 MOUs signed between potential investors and TCN.
- ❖ Another potential investment is from NDPHC from sales of its 10 Power Plants to upgrade the transmission infrastructure.



Way Forward cont'

- ❖ Create Adequate network redundancies to meet up with N-1 Contingency / security criterion
- ❖ Reduce Transmission Loss to comply with NERC requirements on the 4.5GW existing Transmission network as soon as possible.
- ❖ MHI has come up with a blueprint on system improvement over the next 5 years with corresponding financial requirements which aligns with 10GW, 16GW and 20GW transmission capabilities to be achieved.

GRID BEST PRACTICE



DEMAND FORECAST AND INSTALLED CAPACITY

Transmission Expansion Plan

Expansion strategy should include the following

- ❖ All 330kV Transmission corridors to have alternative evacuation routes
- ❖ All 132kV Transmission Lines to have alternative evacuation routes
- ❖ Substation Automation should be pursued.
- ❖ State Capitals to have 330/132kV Transmission Substation
- ❖ Local Govt. Headquarters to have at least 2x40MVA 132/33kV Transmission Substation



Power System Stability Issues

- ❖ Frequent review of powers system studies
- ❖ Dynamic system stability studies and mitigation procedures to minimise system collapse
- ❖ Insulation coordination studies for avoiding chattering of substation equipment
- ❖ Protection coordination particularly at the interface connection points

Conclusion



- TCN as a critical component of the Power Sector Value Chain which should not be the weak-link for the Power Sector Reform to achieve its aim.
- Sustained and Adequate funding mechanism must be in place for TCN to enable it cope with the increased generation and improved distribution facilities to be realised from the privatized Gencos and Discos
- Federal Government of Nigeria needs to concentrate its financial investment in Power in the Transmission Sector which is still publicly owned to ensure the success of the Reforms and Transformation agenda

**Thank You
for listening**