

MEMORANDUM FOR THE FIRST NATIONAL COUNCIL OF POWER

THE ROLE OF THE REGULATOR IN AN EMERGING ELECTRICITY MARKET

PREAMBLE

An emerging electricity market, as is the case with the Nigerian Electricity Supply Industry (**NESI**), is mainly characterized by weak infrastructure, poor customer/consumer service, consumer apathy, unreliable power provision, increasing private sector participation/investments and poor adherence to codes and standards amongst others.

One of the many characters of an emerging electricity market is its liberalization; where it is expected that consumers will mostly pay for services consumed and provided while service providers strive for quality operations to boost revenue generation and capacity expansion. For these interplaying reactions in the market to play out the burden of striking a beneficial balance for the sector has to be met by an impartial and forward looking Regulator who is responsible for stabilizing behaviors of participants in the emerging electricity market, amongst other responsibilities, through its various legally recognized regulatory tools. The proactive management of expectations in the emerging electricity market is fundamental in stabilizing, and yet leading, the pace of upgrade and expansion of the markets' capacities to meet the expectations of the various classes of its stakeholders.

Managing the Challenges Interestingly, NERC has enunciated its expectations from stakeholders in the emerging power sector to include, strict adherence to industry codes and regulations, such as the grid, distribution and metering codes, market rules, methodology in MYTO, the tariff orders as well as regulations on embedded generation, bulk power procurement and of course connection charges methodology. The Regulator in an emerging electricity market must be in tune with global trends, challenges and best practices.

Global Trends

Across the globe, the power sector—and regulation of it—is undergoing profound change. Regulators are, as always, tasked with balancing a multitude of objectives in order to optimize for least-cost service delivery, ensuring high quality and reliability. Yet, as social awareness, policy directives and technology continue to evolve, they increasingly face pressure to address environmental and social goals, namely via increased incorporation of clean energy technologies. Furthermore, small producers, responsive consumers, and variable renewable resources continue to permeate many electric systems, creating a fundamental shift in how power systems operate, and therefore how the sector must be regulated. While these new technologies present new challenges for regulators, they also present new opportunities to address social and environmental goals.

The key challenge of modern-day power sector regulation is reconciling the new regulatory objectives of this evolving landscape with the already difficult task of balancing existing objectives. This Memo is tailored toward the theme of the meeting “**Achieving Sustainability of Power Supply in the New Electricity Market**”. This paper aims to catalogue the various objectives of power sector regulators, highlighting challenges, opportunities, and interdependencies.

The Regulator in an emerging market would need to frequently consider competing conditions such as:

- ✓ Poverty vs. Affordability
- ✓ Balancing Private Interest and public Interest
- ✓ Infrastructure imbalance and Political Economy
- ✓ Government (safety for vulnerable group) vs. market driven sector/market competitiveness
- ✓ Necessity vs Being Popular

For instance, when considering tariff structure, the Regulator would ask if low contract prices will shift costs to other consumers or weaken the operators’ finances.

The choices may be hard but the Regulator in an emerging electricity market must hold a long term perspective and be guided by principal positions while making such hard decisions.

- a) What is popular but undermines the market in the long run?
- b) What is right but needful or enhances the market in the long run?

The first time a decision has to be made, the Regulator should make the right decision.

To ensure the sustainability of the emerging market to a developed market, the regulator shall go beyond the act of balancing positions to **Leading the Development of the Market**.

THE ROLE OF THE REGULATOR IN AN EMERGING ELECTRICITY MARKET

The Regulator in an emerging electricity market should lead the market, moving from an emerging electricity market to a developed electricity market (from short term to long). From the onset the Regulator can determine its present and future. This memo will therefore present the role of the efficient regulator by considering its role in the short term and its role in the long term.

SHORT TERM	LONG TERM
Designing and Managing Tariffs	Market Driven Contract.
Maintain and Expand Reliable Electricity Access	Reduce Health and Environmental Impact of Power Systems Operations
Financial Health of Operators	Support Development/Investment in Renewable and Alternative Power Sources
Facilitate Private Investment/Cost Recovery	Incentivize Energy Efficiency, Demand side management and Smart Grid Technologies Distributed Generation and Renewable Energy integration to the grid
Protect Vulnerable Groups	Environmental Impact
Technical Safety and Reliability of Power System	Consumer participation in markets
Security of Infrastructure	Cyber security, patent and privacy rights and utilize microgrid technologies
Capacity (Human Capital) Development	Stakeholder Interaction/relation with other sectors
Meet growing demand of product	Development of Electricity (commodity) market driven trades

SHORT TERM ROLES OF THE REGULATOR IN AN EMERGING ELECTRICITY MARKET

Design and Manage Electricity Tariffs

A core regulatory task is to design fair and equitable electricity tariffs for numerous customer classes and periodically review and redesign those tariffs considering a variety of objectives this is reflected in the NERC Multi Year Tariff Order 2. Inherent to this process is the balancing of costs, benefits, and risk among ratepayers, utilities, and private investors, as well as aligning tariffs with public policy objectives. Tariffs must be designed at rates high enough to maintain the financial and operational health of the utility, attract private investment, meet growing demand, minimize outages, and address a variety of other capital-intensive objectives. Yet, consumer costs must be low enough to promote continued

economic growth and productivity, protect the interests of low-income populations, and prevent ratepayers from providing windfall profits to utilities and private investors. Tariffs for one rate class may be subsidized by other rate classes or government budgets. Raising rates to reflect the true cost of delivered electricity may be necessary in many settings to ensure the financial health of the utility, but this option may be politically or economically unattractive. NERC's Multi Year Tariff Order 2 structure is reflective of the above (for the residential category we have R1, R2, R3 while the commercial category comprises C1, C2, C3, Industrial Category D1,D2,D3 and special category S1 and S2).

Maintain and Expand Reliable Electricity Access

Electricity disruptions and supply shortages can have significant economic costs to a jurisdiction as a whole (Balducci et al. 2002; Sanghvi 1982). As a result of power shortage utilities rely on load shedding, industrial load response, or expensive emergency power while consumers rely on inefficient sources to bridge the shortage. Coordinated planning efforts, large capital expenditures, and associated rate increases are often required to meet demand growth and maintain system reliability, particularly in the context of rapid economic growth. Emerging markets experience deteriorating infrastructure, unmet demand, power quality issues, power scarcity, and large technical and non-technical losses; raising financing under these conditions may pose difficulties. Expanding access to unserved customers has historically required significant capital investment; however, those without electricity are often poor and living in sparsely populated regions. Without a sizable, financially equipped customer base to expand service to, such projects on a stand-alone basis may not be financially viable. The regulator is tasked with assigning costs across rate classes to pay for such projects, as well as coordinating with government and international development efforts to optimally execute electrification efforts. NERC is poised to ensuring reliable access to support the size of the Nigerian economy.

Financial Health of Operators

In the short term the Regulator in an emerging market should ensure utilities are financially healthy and are able to invest in system improvement and to borrow capital from private institutions at lower interest rates, reducing debt service costs to ratepayers. Financial health also reduces uncertainty that a utility will be able to honor power purchase contracts from independent power producers. Regulators must establish a regulatory framework that ensures the financial health of utilities while incentivizing operational efficiency. Tariffs must be designed such that utilities are able to recover costs with a reasonable rate of return, maintain the technical health of the electricity system, retain and expand necessary staff, expand infrastructure to meet growing and unmet demand.

Facilitate Private Investment/ Cost Recovery

Private investments help to take strain off of utility balance sheets or government budgets as capital expenditures and associated financing costs are avoided. To the extent that a power sector is open to private investment, and perhaps aims to increase such investment, the regulator must create a stable investment ecosystem. The Regulator approves Power Purchase Agreements and reviews Use of Transmission System Agreements to provide private investors with certainty that those contracts will be honored. Avoiding erratic and non-transparent decision making helps to reduce investors' perceived regulatory risk and contributes to keeping the utilities' cost of capital low. NERC has put in place Interim Rules for the Transitional Electricity Market and is working closely with Nigerian Bulk Electricity Trader (**NBET**) to give confidence to investors and financiers.

Protect Vulnerable Groups

As earlier noted the Regulator in an emerging electricity market employs tariff structure in ensuring access to various consumer classes. To achieve this, the regular structures tariff system that subsidizes the cost of electricity to economically disadvantaged consumer by passing some or significant portion of cost to other classes of consumers. In addition, the Regulator may promote subsidies by the government as well as other schemes such as regulation on rural electrification. NERC is currently developing the frame work for the Power Consumer Assistance Fund to ensure that economically disadvantaged persons have access to power.

Technical Safety and Reliability of Power System

Regulators must work with system operators, utilities, and standards bodies to develop and enforce standards for the safe interconnection to and operation of the power system. This task includes, but is not limited to: establishing technical requirements for transmission and distribution (**T&D**) expansion and power system components, rules for interconnection of utility-scale and Embedded Generation (**EG**) systems, and standards for maintenance practices and data collection systems. Having adopted international best practices NERC has developed Codes and Regulations in this respect namely the Grid Code, Metering Code and the Health and Safety Manual. NERC has an existing Memorandum of Understanding with Standard Organization of Nigeria to ensure compliance with Standards at the port of entry.

Security of Infrastructure

The Regulator in coordination with other governmental institutions, play a key role in facilitating the security of power infrastructure; typically no singular institution is usually

positioned to ensure the security of the infrastructure. However, the Regulator in an emerging electricity market create frameworks to promote long-term security of supply for fuels used at generation facilities, minimize the frequency of fuel scarcity events, and insulate captive consumers from fuel price volatility and scarcity-related spikes. The one thing the Regular must do is to consider natural resource endowments and geospatial disparity in natural resource availability, geopolitical considerations and associated imported fuel delivery risks, and potential fuel price volatilities and hedging strategies. Facilitating utilization of a diverse portfolio of domestically produced energy sources is a key strategy to mitigating the risk of abrupt supply disruptions or fuel price spikes (Bahgat 2011; Lee et al. 2012). The Regulator must therefore be positioned to factor in the impact of diverse source of fuel in the market.

LONG TERM

Against this backdrop of existing short term objectives, the regulator must also be prepared to face emerging/long term objectives, driven by technological change, economic growth/development, evolving social priorities, and global events. Some of these objectives are new while others represent evolutions of existing objectives. These objectives include:

Reduce Health and Environmental Impacts of Power System Operation

As the market evolves, the Regulator in the long term would be required to take very serious the environmental impact of operations. In mitigating the environmental impact, the Regulator, typically, would require operators to invest in technologies that lower environmental impact thus increase the overall cost of power. The Regulator in the emerging electricity would therefore need to balance the environmental objectives (Energy Efficiency) with other with other objectives such as planning and financial sustainability of the operators.

Support Development/Investment in Renewable and Alternative Power Sources

There has been an intensified interest in accelerating renewable energy (RE) deployment in Nigeria. Regulator is responsible for designing RE incentives and regulating their integration into T&D systems. Incentives such as feed-in-tariffs (Couture et al. 2010), adders (Tongsopit and Greacen 2013), or auctioned long-term contracts (Maurer and Barroso 2011) aim to achieve desired levels of renewable development while appropriately limiting the costs to consumers. While conventional technology costs change relatively slowly, a key challenge of RE regulation is setting tariffs in the context of declining RE technology costs. The

Regulator in the emerging market must be forward looking and thus bare mind on this trend. NERC has designed the Feed in Tariff Methodology for the NESI.

Embedded Generation (EG) Resources to the Grid

Though emerging, the NESI is already at the verge of full implementation of Embedded Generation (EG). The Regulator must create interconnection protocols which address distribution and transmission infrastructure limitations, voltage regulation, and other power quality issues. They are also involved in facilitating financial arrangements between generators and utilities, including setting network tariffs, infrastructure connection charges, and system utilization charges. NERC is ensuring that the EG system does not clash with traditional utility business models and financial arrangements so as to balance the costs and benefits of EG across various stakeholders. As a forward looking regulator NERC anticipated the need to allow EG. It is worthy to note that as EG penetration levels increase, more active planning, management, and oversight of distribution networks will be required of regulators (Lopes et al. 2007).

Smart Grid Technologies

In the short term NERC has layed emphasis on metering. Moving forward the Regulator expects that the Smart grid systems would ease integration of distributed generation. This advanced metering systems are key to enabling time-of-use tariffs or dynamic pricing to help manage demand and impact consumer behavior (Marques, Bento, and Costa 2014; Agrell, Bogetoft, and Mikkers 2013). However, these systems may clash with legacy utility business and regulatory models, which rely on increased sales volumes to increase revenues. Regulators would need to balance issues of costs, benefits and energy efficiency.

Facilitate Consumer Participation in Power Markets

In many developed electricity markets, due to new technologies and business models, consumers are now able to directly participate in power markets. This is one of the most rapidly changing aspects of the power sector in many jurisdictions, and the benefits of participation are significant for individual consumers as well as the power system as a whole (Gelazanskas and Gamage 2014; Zehir and Bagriyanik 2012). A more active and participatory demand side brings new challenges for regulators in managing risk, revenues, reliability, and quality of supply. In order to facilitate increased demand-side participation, new tariff structures, dynamic market pricing schemes, demand aggregation guidelines, and market-bidding rules are likely required.

The Regulator must also position to protect the consumer; ensure consumers have/enjoy options, choices and security of services, if not on favorable terms, at least not on unfavorable terms.

Enhance Cybersecurity and Protect Privacy

As more complex information and communication technology (ICT) systems are being deployed in modern grids, new cybersecurity challenges and privacy concerns are arising as well (Cárdenas and Safavi-Naini 2012). Regulators, in conjunction with other government actors, are increasingly being asked to incorporate cybersecurity considerations into their reliability planning (Pearson 2011; Kumar, Pandey, and Punia 2014). Furthermore, as ICT systems generate more consumer data, regulators may be asked to issue regulations which preserve the privacy of consumers (Malashenko et al. 2013).

Manage Increased Interactions with Other Sectors

As earlier indicated, the NESI needs to be positioned to support the emergence of the Nigerian Economy, being the largest economy in Africa. In developed electricity markets and economies, interactions with other sectors of the economy are widening the traditional scope of power regulation. These include growing interaction with water and food systems, transport infrastructure (for example electric vehicles), and relationships between RE and natural gas markets (Lee et al. 2012; Bazilian et al. 2011; Richardson 2013; Cochran et al. 2014). These energy system integration or “nexus” issues are gaining traction in international and country-level policy dialogues and will likely be increasingly incorporated into power sector decision making. The Regulator in an emerging economy must therefore be forward looking and bare the political economy of the nation in mind in planning.

CONCLUSION

The complexities of the evolving role of power sector regulation in an emerging electricity market require a forward looking regulator. In this context, a thoughtful examination of the current landscape and more importantly, building confidence in stakeholders and electricity institutions.

While the Regulator in an emerging electricity market must be conscious of its political economy, the Regulator must also bear in mind global trends. The key success factors for transiting from the short term objective of the regulator to the long term are

1. The forward thinking nature of the Regulator.

2. Efficient regulation in the short term characterized by leading the market as against presiding amongst/over the operators.

Although many aspects of regulation will evolve by fine-tuning regulations or trial and error; it is vital the Regulator ensures that this evolution occurs in a transparent, open, and non-erratic manner—under clear regulatory principles—in order to reduce perceptions of risk, maximize learning opportunities and facilitate a healthy environment for clean energy investment.

Finally, though the Regular derives its powers from Legislation, the Regulator in an Emerging Electricity Market would be evaluated by the quality of service delivery by the market operators and the long term sustainability of institutions.