

From Megawatts to Actual Delivery: bottlenecks and Solutions

Text of a Lecture Delivered by Dr. Sam Amadi, Chairman and Chief Executive of the Nigerian Electricity Regulatory Commission (NERC) at the NAPE Specialized Change Workshop on Tuesday, July 14, 2015 at Eko Hotel and Suites, Lagos

The title of my lecture seems to have been chosen to take us away from the distressing game in town: the reading of megawatts. Each time I am asked how many megawatts the Nigerian electricity industry is generating I usually feel sad. I feel sad for two reasons. First, whatever answer I give is a miserable answer. Even if I report that we have increased megawatts to 6,000 overnight, that remains a far cry from what we need as a population of about 170million people. Again, even if I report now joyfully that we have increased megawatts the question will be are you sure that Nigerians are enjoying longer hours of electricity. Because it amounts to nothing for Nigerians how much megawatts have been added to the grid if they can't turn the switch and get light, no matter whatever the reason. So, moving away from megawatts and talking about actual delivery of electricity is a much more usual discussion.

As expected, the journey to a competitive and efficient private sector-led electricity market in Nigeria is full of challenges. Today, we are not able to generate more than 4,000MW daily. In December 2012 and between March and August, 2014 we generated above the 4,000MW mark. Even worse, we are not able to effectively distribute even the paltry generation due to grid challenges. This scandal has tarnished the achievements of the power sector reform. It has resulted in the tendency to overlook the robust regulatory framework that NERC has established which is defined by transparency, professionalism and effectiveness.

It must be noted that the major challenges which have hindered Nigeria from generating up to 6,000mw have little or nothing to do with the regulatory activities of NERC. Recently, there have been sponsored campaigns against NERC to wrongly suggest that the failure to significantly

improve power supply is due to NERC's weak leadership of the sector. This is far from the truth. It is actually NERC's strong defence of public interest, especially its refusal to pass on the inefficiency of operators to consumers, which has mobilized this recent campaign against it.

The truth is that the reason we are not able to generate up to 6,000MW is largely due to a lack of a coherent gas to power policy and corruption and incompetence in project management. NERC is now courageously and creatively using regulatory tools to address this problem.

The major problem today is that we are able to generate up to 6,000mw. At less than 6,000mw the electricity market in Nigeria is unstable and supply will remain poor. The chronic low generation is largely a result of problems associated with the gas supply. These problems range from incoherence in gas-to-power policy, low commerciality in gas supply to power and very poor gas to power infrastructure. The lack of gas supply necessary to fire available generating plants is the main reason we don't have at least 5,500MW of daily generation. We know from experience that with constant daily generation of 5,000MW, Nigerians will experience a major relief from irregular power until the major improvements are delivered. The problem of gas supply has manifested in two main forms - vandalism of gas pipelines and poor project management of gas facilities.

If the problem of gas vandalism is solved now and there is a modest increase in gas supply, the country's power supply will improve by about 50%. Recently we have seen modest improvement in gas supply. This has resulted in improvement in power supply. We have moved from around 2,500mw we got during the week of inauguration to about 4,300mw today. We believe that with more improvement in gas supply arising from containment of vandalization of gas infrastructure on Trans Forcados and ELPS gas pipelines, generation may grow to about 5,500mw in a couple of months. We have been informed that some of the reasons for increased vandalism in the last months before the elections and immediately after the elections related to rival militancy and nefarious actions of some contractors who are allegedly damaging the pipelines in order to get fresh contracts. Due to incessant repairs of the pipelines, there is now an issue of

technical integrity of these pipelines, further constraining supply of gas to power plants.

Even without vandalism of gas pipelines, we will not be able to supply gas to fire all the available capacity. This is so because although Nigeria is blessed with abundant gas molecules we lack adequate capacity to process gas and facilities to transport gas to power plants. This inadequacy is itself a result of structured disconnection between power generation and gas business. Gas policy and regulatory framework until recently were not consciously focused on power generation. So, the gas market did not process enough gas for the power sector. Much of the gas produced goes to the export market and other domestic industrial users. Additionally, there has been manifest project failure with regards to gas transport facilities. Project failure results from both corruption and lack of managerial competence. Both corruption in award of contract and the lack of integrity in project funding has resulted in delayed completion of the East-West gas pipelines causing low generation from power plants in the western axis.

There is also the problem of poor coordination between gas and electricity in Nigeria. The gas and power grids run on different tracks in Nigeria. This means that the electricity market runs on predictions of gas supply that may be reliable since it is subject to contexts that it does control. Although we are witnessing greater coordination and collaboration, this divergence has bequeathed a legacy of inadequate gas supply and consequently, poor electricity supply. The absence of this convergence or strong congruence between these two sectors has made projections on generation capacity growth theoretical. In MYTO 1, NERC built the market model on a generation of 9,000MW based on assurance from NNPC and Ministry of Petroleum in 2008 that they would produce sufficient gas to fire 10 NIPP plants that were expected to be completed before the end of MYTO 1.

Because of the inability of the NNPC to deliver on promise of gas availability, NERC has continued to build the financial model of subsequent tariff orders on very pessimistic expectations of capacity growth in generation. We benchmark generation capacity on less than 4,000MW to secure the integrity of the model in the face of NNPC's inability to increase gas supply to power plants. Project failure and lapses in gas processing and

infrastructure development has cost the power sector about 2,000MW. It has also resulted in higher tariff because of increase in unit cost without a commensurate growth in the total quantity of available generation. The urgency of solving the gas supply problem is evident.

Reversing the spate of gas pipelines vandalism requires more of policy than regulatory responses. A combination of better community response, anticorruption measures and new technology will drastically reduce pipeline vandalism. Changing the incentive for militant groups to attack the pipelines by reforming the contract regime of pipeline management and improving public trust of those communities will provide longer lasting solutions. Thankfully, the new government comes with huge political and social capital that can be leveraged to this end.

NERC's main responsibility will be to pass the reasonable and prudently incurred, and fully disclosed cost of deploying high-grade technology and first-class counter-vandalism intelligence to consumers on a fair and reasonable basis. Thankfully, NERC has built a robust regulatory framework to incentivize such investment in pipeline protection.

There are short-term and medium-long term solutions to the problem of inadequate gas supply to power plants. In the short term, the solution is to fast-track the funding and completion of some of the new gas projects in the western axis which is closer to load demand. These include the Escravos 360 MMscf/d, the Utorogu 270 MMscf/d, Oredo 65 MMscf/d, Oben 120MMscf/d and Pan-Ocean 130 MMscf/d. These projects will add 945 MMscf/d of gas to the power plants. The new government may need to constantly monitor and follow-through on these projects to ensure that there are no further slippages.

In the medium to long term, many projects are planned to make more gas molecules available to the power plants and link-up the western and the eastern axes of the gas supply to power. These new projects should be quickly commissioned and executed. Final Investment Decision (FID) should be reached on time. New infrastructure should be commissioned in line with projections in capacity growth based on NERC licenses and Nigerian Bulk Trading Company (NBET) projected Power Purchase Agreement (PPA) sign-off.

NERC is providing regulatory backstopping for new supply of gas through a regulatory framework that ensures full commerciality in gas supply to power. First, the major problem of development of gas infrastructure has been the lack of creditworthiness of the power sector. Because of suppressed tariff and previous poor corporate governance of the electricity market, generators were not paying gas suppliers as due. This debt overhang discourages supply of gas to power plants and further investment in gas processing and infrastructure. NERC has initiated the Nigerian electricity market stabilization fund and worked with the Central Bank of Nigeria (CBN) and the Ministries of Power and Petroleum to create the fund that will pay off the old debt in a structured manner without public funding. This intervention is resuscitating the commitment of gas suppliers to supply gas to the power sector.

More than debt pay off is required to ensure the creditworthiness of the gas-to-power value chain. At the heart of securing continuous investment is ensuring recovery of investment costs. NERC has worked out a cost-reflective tariff for gas supply and gas transportation. We have approved \$2.50 as cost of gas supply and a maximum of \$0.80 as transportation cost. The gas industry has accepted this new pricing regime as a sufficient spur to investment. The transportation tariff of \$0.80 is to attract private sector investment towards the prompt completion of the east-west gas pipelines which will enable more gas to power plants in the western axis of the country.

Another problem of gas supply is the weak contractual commitments of gas suppliers. Gas supply to power plants has been on the principle of 'best endeavour'. This means that the gas supplier could refuse to meet its commitment to a generator once there are other intervening circumstances. This leaves the power sector carrying the empty bag in the event of any minor crisis in the gas sector. This discriminatory treatment arises from the lack of enforceable gas supply and gas transportation contracts in the sector. As part of initiating the Transitional Electricity Market (TEM), generators are signing bankable and enforceable gas supply and transportation agreements with gas suppliers such that gas suppliers are under clear and enforceable obligations to provide alternative fuel or

pay compensation in the event that they cannot supply contracted quantities of gas.

Overall, the solution to the problem of gas supply to power is two-pronged. Better project management and monitoring and the creation of a reliable electricity and gas market. NERC is fully engaged in the creation of such a market through the development of a robust framework that passes through the cost of gas supply and transportation to the customer in a clear and transparent framework.

We urge the government to invest more effort in building the capacity of the Ministry of Petroleum to fast-track project execution and create a transparent and effective policy and regulatory regime of gas supply to power plants.

If we solve the gas problem we will have enough generation in some years to come to guarantee our people better supply of electricity. But the assumption here is that such huge harvest of increased generation would be easily evacuated to the grid and later distributed to homes and businesses. But today, we lack such capacity. Our transmission network is weak and radial such that if we get to 6,000mw without major improvement in the transmission network. The problem of transmission is two-fold. First, the transmission network is weak and radial arising from both corruption and inefficient project management. The major problem is that if we don't quickly improve the transmission network, we may not have the ability to wheel out power when we attain steady generation of over 6,000MW. Historically, Nigerian transmission grid has been problematic because of the large expanse of land and the radial nature of the network. The centralized nature of the grid and the geopolitics of electricity generation also compound the problem. The cost of transporting power from the south to the north in a centralized grid is significant. Again, under government ownership, corruption and inefficient procurement policies led to underdevelopment of the transmission network. However, if the on-going NIPP transmission projects are completed on schedule, the transmission network will be reinforced to wheel up 7,000MW.

The major challenge now is how to provide financial resources for TCN to expand and reinforce transmission services in the face of limited public

sector funding. It is actually low budget funding for transmission services that contributed over the years to weak transmission services. Low funding was compounded by corruption which reduced value for money where funding was made available. Traditionally, transmission projects are funded from the budget submitted by the Ministry of Power and approved by the National Assembly. Oftentimes the Ministry has halved the budget submitted by TCN and increased its own administrative and capital budget. Together with irregular releases, this ensured that TCN could not complete some of its critical projects. In the course of its monitoring of transmission services, NERC has discovered that some system collapses are as a result of failure of network arising from non-execution of critical maintenance and project upgrades which were on TCN's work plan due to poor budgeting.

Usually, transmission companies across the world derive their revenue largely from fixed charges based on their capacity to deliver electricity to distribution companies. This allows them to plan and execute capital projects. In Nigeria, unfortunately, TCN's tariff is based on energy delivered to distribution companies. Because such energy fluctuates, TCN's revenues are highly unpredictable and mainly dependent on the performance of gas suppliers and electricity generators.

Part of the reasons for arranging a private sector management contractor for TCN is to improve corporate governance as the entire sector is improved. TCN was not privatized based on the belief that its "public good" function could not be carried out immediately by the private sector. In order to ensure quality corporate governance for TCN and other regulated companies, NERC issued a Code of Corporate Governance Regulation titled "Guidelines and Assessment Criteria for Fit and Proper Persons for Corporate and Individual Participation in Regulated Electricity Undertakings". But the Ministry of Power has continued to interfere in the management of TCN in a way that has undermined the best corporate practice that would optimize resources management and encourage private sector investment.

The problems of weak and unreliable transmission services can be solved with a combination of policy and regulatory actions. NERC has started interventions to improve transmission capabilities. In the past the problem

of poor project execution arose both from poor funding and lack of regulation. Today, as TCN is expected to derive the bulk of its revenue from wheeling charges that are part of the final customer tariff, NERC now maintains close monitoring of these projects. As part of its Key Performance Indicators (KPIs) the TCN is required to provide quarterly updates of its projects. This project management safeguard was not available in the past, hence many projects were abandoned or poorly executed. Furthermore, as a licensed entity, the TCN has to undergo a rigorous procurement process beginning with a clear value proposition on how the project will strengthen TCN's capacity to evacuate power and maintain reliable transmission network. The recent regulations from NERC limit the possibility of project failure by encouraging timely oversight.

The future of a financially viable transmission network is private sector participation in transmission service in Nigeria. At the heart of Public Private Partnership (PPP) is a regulated framework that allows for cost recovery. Before now, the lack of transparency in tariff regime inhibited private sector investment in transmission services. But since 2012, with the release of the MYTO 2, several investors, including international institutional investors have expressed interest in funding different transmission projects. NERC has issued connection agreements that encourage even generators to construct transmission networks and recover their revenue through the tariff. The major outcome of the efficient and transparent tariff regime that NERC has institutionalized is that it encourages sustainable investment in the value chains, including transmission. What is required now is for the new government to indicate strong commitment to maintain transparent and policy continuity in transmission.

The contract management proposed for the TCN has not worked. The structuring of the board and the crisis arising from the execution of the management contract with Manitoba Hydro International have not enhanced the faith of would be investors in the transmission company. NERC has attempted to address this governance through its Code of Conduct for the industry. But government has not maintained discipline by complying with the regulations on appointment and management of the Transmission Company of Nigeria. The new government, with its

commitment to rule of law and discipline, will find in these regulations the strong support to reform the corporate practices of the TCN and rebuild confidence of private investors.

NERC has issued a consultation paper soliciting comments from stakeholders on tariff review application by the TCN. This is to enable TCN get a cost-reflective tariff that will enable it earn enough revenue to invest in expansion and maintenance programmes. NERC is working with the management of TCN to approve a new tariff regime that guarantees return on investment for investors in transmission services. The result of the new work of approving Transmission Use of Network Services Charges for the TCN is that it ensures that the TCN will be able to finance required expansion and upgrades as and when required without resort to public funding.

On the distribution side, the major problem is the obnoxious estimation of unmetered consumers. Because of the decay of the sector before the reform, the old NEPA and the subsequent PHCN did not meter its customers. By the time the new leadership in NERC was established, the metering gap was more than 70 percent. This means that more than 70% of the consumers do not have any metering device to measure their consumption of electricity. With the suppressed tariff and corruption in the sector it meant that it was difficult to quickly bridge the widening metering gap in the sector. Under government ownership, the Discos could not raise revenue or funding to pre-finance aggressive metering plans. When they collected money from consumers, they failed to supply meters.

In 2012 NERC commissioned a study of the metering problem in Nigeria. The report of the committee chaired by leading human rights lawyer, late Bamidele Aturu, confirmed the abysmal level of metering across the various distribution networks. As a result of this report, NERC introduced the Credited Advanced Payment for Metering Implementation (CAPMI) to crowd-source funding for metering from willing consumers.

Low metering has resulted in exploitation of consumers through estimation. Discos now resort to estimating the consumption of unmetered consumers. Of course, the incentive will be to use these unfortunate

consumers to cover the inefficiencies in the system. NERC has tried to address the issue of low metering through various interventions that have not produced optimal results because of other factors outside its regulatory control.

First, as part of MYTO 2, NERC mandated DISCOs to ensure full metering of unmetered consumers within 18 months of the commencement of the new tariff. The assumptions in the tariff included keeping the personnel costs in the financial model constant and that the cost of metering of every consumer had been included in the tariff. NERC therefore prohibited the collection of fees for metering from consumers. This initiative was undermined by the negotiation of 50% increase in salaries and allowances of electricity workers as part of the negotiations with labour unions to enable privatization. The result of the unjustified increase in the salaries of all workers is to increase operational costs by over 50%. This destroyed the financial framework of metering. The discos declared financial inability to implement the 18 months meter roll-out plan. The plan failed because of inappropriate policy intervention by government, not as a result of regulatory failure.

After review the progress of metering 10 months after the release of MYTO 2, NERC realised that the Discos have not significantly metered consumers because of financial bankruptcy as a result of increased salaries and allowances for electricity workers in order to secure smooth privatization. In order to quickly address the huge metering challenge, NERC introduced CAPMI which is an innovative initiative to enable Discos source funding from consumers to meter them. This initiative is resulting in more metering. CAPMI and the new tariff will enhance the Discos' capacity to meter their customers. As part of the TEM, every Disco has sent a metering plan to NERC which will ensure that it closes the metering gap in the shortest possible time. NERC's responsibility is to guarantee the recovery of the cost of metering and effectively monitor the roll-out of meter in line with each Disco's investment plan.

The Commission has moved to protect unmetered consumers who have been exposed to outrageous billing. First we have designed an estimated methodology that provides a formula for billing unmetered consumers. This

regulation requires Discos to follow this formula so that unmetered consumers, as much as possible, pay close to what they would have paid if they were metered. This methodology has a reporting requirement that enables the Commission review the outrageous billing of unmetered consumers.

To further strengthen protection of unmetered consumers, the Commission is attacking the economic incentive behind the Discos' half-hearted effort at metering consumers. We are recommending the capping of the amount that a Disco can charge an unmetered consumer. The idea is to place the cap at a level lower than what a metered customer will pay. This innovation is to put the pressure to meter consumers on the Disco and not on the consumer. If the consumer pays less, the Disco will lose revenue and have the financial incentive to meter that consumer. This new initiative is a result of monitoring activities carried out by the Commission and review of field experiences of the CAPMI scheme.

Conclusion:

The problem is the electricity market in Nigeria is that legacy problems are being mapped upon inefficient models of privatization. From hindsight we could have structured the privatization process in a manner that would have first dealt with these legacy issues before handover to private owners. The handover to private firms has created unrealistic expectation that electricity will improve immediately because of the presumed magic wand that the private sector. But there is no magic wand. What you have is only hard work and strategic initiatives to address these legacy issues. This will take some time and also some degrees of cultural and institutional changes. Since 2000 we have embarked on these institutional change without embracing the full rigor of transformation. We have been halfhearted to the implementation of the cultural components of this transformation. We have refused to address the cultural and value components of this reform even as we apply technical solution. This is an error. Because the causes of collapse of the electricity sector in Nigeria before the reform are not just technical. They are adaptive. Adaptive challenges require full-blown cultural change. This is why the concept of disciplines is very important.

When I became Chairman/CEO of NERC I studied the system and identified features of the system that defined the crisis of electricity supply in Nigeria. These negative features I described as disciplines. I identified 7 of such disciplines. For the purpose of this lecture I will focus on two of these disciplines. The first is the discipline of inefficient project management. And the second is like the first, the discipline of prudent public sector investment. The absence of these two disciplines are the main reason we are not able to generate more than 9,000mw. If we were efficient in project management since 2000 when we issued the National Electric Power Policy (NEPP) by the National Council on Privatization (NCP), or since we established the Nigerian Integrated Power Project (NIPPs), we should have harvested the full capacity of the NIPPs and we would have overcome the present acute shortage. But we were very inefficient in project management. And the result is what we have today. No matter what model anyone prescribes for the country, it must run on the grid of efficient project management.

The absence of the second discipline has also hindered us from converting potential to reality in power generation and supply. That is the discipline of prudent public sector investment. Oftentimes we hear stories of how much has been spent on the power sector and yet we still have epileptic power supply. Those who make such statements should stop and ponder how much of these taunted billions were prudently spent on relevant power projects. Prudent public sector investment in the network starts from subjecting investment in the network to regulatory control. The Nigerian government generally lacks the discipline to subject itself to the full rigor of regulatory control. For every investment made in network the licensee ought to first obtain the approval of the regulator. This approval process helps to control investment by making it both relevant and prudent. The regulator will disallow any investment that is not relevant and prudent. This prudency review would have saved Nigeria so much money.

The historical unwillingness of the Nigerian government to fit its investment in the power sector within the regulator framework for prudent procurement is the main reasons we don't have value for money in power projects. All this can change drastically if the new government commits irrevocably to regulatory control of public sector investment. This will give

us a big bang for any investment in any of the value chains of the electricity market.