ACE SOAS Consortium Anti-Corruption Evidence Making Anti-Corruption Real

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Breaking the cycle of corruption in Nigeria's electricity sector: a political settlements analysis

Pallavi Roy[1], Kelechi. C. Iwuamadi[2] and Jibrin Ibrahim[3]

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[1]Centre for International Studies and Diplomacy, SOAS University of London (pr16@soas.ac.uk)

[2]Centre for Democracy and Development, Abuja, Nigeria (iwuamadikc@yahoo.com)

[3]Centre for Democracy and Development, Abuja, Nigeria (jibrinibrahim891@gmail.com)

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Acronyms and abbreviations

ACE	Anti-Corruption Evidence
BPE	Bureau of Public Enterprises
CPP	Captive Power Plant
DisCos	Distribution companies
EEDC	Enugu Electricity Distribution Company
FCT	Federal Capital Territory
FGD	Focus group discussion
FGN	Federal Government of Nigeria
GenCos	Generating companies
GDP	Gross domestic product
kWh	Kilowatt/hour
KW	Kilowatts
MW	Megawatts
MWh/h	Megawatt hours
MSMEs	Micro, small and medium enterprises
N	Naira
NBET	Nigeria Bulk Electricity Trader
NELMCO	Nigeria Electricity Liability Management Company
NEPA	National Electric Power Authority
NERC	Nigeria Electricity Regulatory Commission
O&M	Operations and Maintenance
PAG	Payment Assurance Guarantee
PRGs	Partial risk guarantees
PHCN	Power Holding Corporation of Nigeria
SMEs	Small and medium-sized enterprises
SPV	Special Purpose Vehicle
TCN	Transmission Corporation of Nigeria

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Executive summary

The privatisation of the Nigerian electricity sector was a much-anticipated reform exercise. Launched in 2010, the exercise was intended to modernise the sector and cater to the country's growing demand for electricity. However, a decade on, the desired outcomes have still not materialised and the electricity available on the national grid to light homes and power the economy has stayed at an almost constant 4,500 megawatts (MW), well below the 8,400 MW projected for 2018. One reason for this is the technical inefficiency of the grid, beginning with inefficient gas supplies, the inability of the transmission system to deploy adequate electricity, and poor collection of user tariffs by distribution companies. Revenue shortfalls have resulted in extensive government bailouts.

Such inefficiencies in the sector are compounded by 'legacy' corruption that has led to poor maintenance of the transmission network during state-ownership and to the presence of politically connected bidders in the recent privatisation efforts. The design of contracts and lack of regulatory oversight has further deterred credible and technically competent investors during the bidding process. The politically connected nature of many of the acquisitions also mean the government is reluctant to take any tough decisions with regard to the sector.

The conditions in which consumers lack supply and firms are unable to make profits have given rise to a host of interdependent corruption mechanisms. As the sector moves deeper into loss, the space for formal earnings becomes narrower, and the perverse incentives to be corrupt deepens. This has now pushed the sector into a state of low-level equilibrium, with significant restructuring needed in order to turn things around.

Our analysis of the political settlement in the sector suggests anti-corruption-related solutions for Nigeria's power sector should follow a two-track approach – one for the short-to-medium term, and one for the long term. The latter strategy includes capital investment and debt restructuring but this is not going to be easy to achieve. The medium-term strategy is focused on the most vulnerable segment of Nigeria's economy, namely small and medium-sized enterprises (SMEs).

Inclusive, diversified growth in the country depends on growth of the SME sector. Hence, the short-to-medium-term solution must focus on easing power-supply constraints for this sector in particular. Our research recommends a disaggregated, embedded power-generating solution using natural gas as feedstock for existing SME clusters whose chief constraint to achieving competitiveness is inadequate electricity supply. SMEs should be incentivised to support the recommended strategy, however solutions must be developed with local political-economy considerations in mind, not only in a technocratic manner.

1. Introduction

The programme to privatise Nigeria's power sector was one of the most ambitious market reforms attempted in Africa. The process began with the Electric Power Sector Reform Act of 2005, but bids to take over utilities in the sector were only formally launched in 2012. Policy-makers in the country were hoping to emulate the success of the privatisation exercise in the telecommunication sector that took place in 2001. Along with increasing power generation, they were also hoping to reduce corruption by making the sector more transparent and compliant and by breaking up the government's monopoly.

In the years since 2012, rated or installed capacity increased from 9,900 megawatts (MW) to 12,522 MW in 2015 (Advisory Power Team, 2015). However, average generation in August 2019 was just 3,578 MW (Asu, 2020) and hasn't risen above 5,300 MW since the privatisation process began.

More pressingly, a recent report by the French development agency *Agence Française de Développement* (AFD) highlights accumulated losses of Naira (N) 474 billion in the sector (cited by Nnodim, 2019). A similar report on the financial status of the sector states that the monthly shortfall between costs and income in the electricity value chain – which essentially includes the national grid covering generation, transmission and distribution – was N40 billion a month in 2018 (SDN, 2018). Grid connectivity was not available to close to 55% of the country in 2015 (Advisory Power Team, 2015, although other sources provide higher figures). In Western Africa more is spent on the fuel for back up generation via distributed diesel and gasoline generators than on electricity from the grid—with Nigeria having the largest number of such generators in the region (IFC, 2019).

At the same time, it is important to note that Nigeria has one of the highest levels of economic output in terms of gross domestic product (GDP) measured for every installed unit (watt) of power from grid-based generation (ibid.) This means the grid is pushed to capacity and is entirely unable to meet the demand for electricity in the productive sectors. It is clear that Nigeria's power sector is unsustainable, which has repercussions for inclusive growth in Africa's largest economy.

In the light of this evidence, it is worthwhile analysing the reasons behind the disappointing performance in the power sector. The current crisis is a liquidity crisis as a result of deep structural distortions. A few interdependent issues stand out:

- *The design of contracts post-privatisation has led to adverse selection* with only politically connected bidders participating in the process rather than technically competent ones. These bidders used Nigerian banks for financing, which have ended up assuming much of the systemic risk.
- *The financial health of the sector was based on tariffs and projections that could never be politically implemented.* Projections for the performance of the sector were based on distribution and generation companies (which are not publicly listed) reinvesting in the sector to build technical capacity. Instead the companies started paying themselves

dividends from the first year of operations as well as paying off their loans to banks. Therefore, quality improvements did not take place and supply did not increase as much as projected.

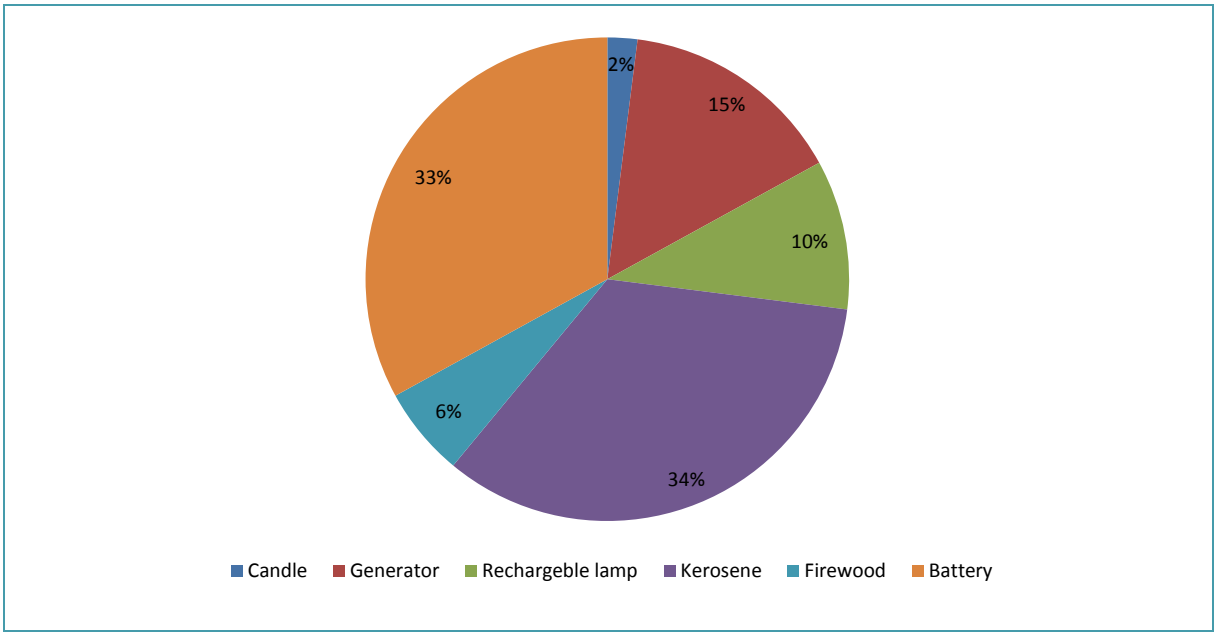
- *The sector is technically inefficient owing to years of underinvestment in transmission infrastructure.* The transmission sector wasn't privatised in 2012 while the generation and distribution sectors were. One of the reasons for this underinvestment has been high levels of political corruption within the Transmission Company of Nigeria (TCN), a state-owned utility, despite attempts to reform it (Ogunleye, 2016). As a result, even if Nigerian power stations were operating at full capacity, the transmission network would be able to 'wheel' or transmit no more than 7,000 MW due to ailing infrastructure. This is according to official statements. However, most industry analysts say actual wheeling capacity is no more than 3,000 to 4,000 MW.
- *New agencies have not been as effective post-privatisation* and haven't changed matters much within the sector. For instance, the Nigeria Bulk Electricity Trader (NBET) was meant to be a government-owned Special Purpose Vehicle (SPV) that pooled the electricity generated and acted as an institutional backstop. This agency was meant to inject confidence in the sector but is now facing liquidity challenges.
- *Distribution companies are unable to provide enough power to meet demand.* Subsequently they cannot charge tariffs that are reflective of the costs incurred along the grid, so returns are very low in the sector and costs are high. This discourages genuine investors and leaves only politically connected ones who can hope to recoup their investments through distortionary means.

We can describe the sector as being stuck in a low-level equilibrium where incentives to invest in and upgrade the grid are absent.

In sectors where demand is high and supply is severely constrained, there are strong perverse incentives for corrupt behaviour. This is true of the power sector in Nigeria. Consumers – whether residential, commercial or industrial – frequently resort to stealing electricity from distribution lines (known as 'tapping'). This is common practice across most developing countries and Nigeria is no exception. However, due to the failure of grid-based supply, Nigeria has one of the largest proportions of self-generation in the developing world, whereby generators and other means such as inverters are used to produce power. Indeed, over 80% of small and medium-sized enterprises (SMEs) own or use a generator in Nigeria (Scott et al., 2014), and the easy availability of diesel diverted from official sources in the country means there is a thriving black market for fuel (SDN, 2018). This practice was exacerbated during the fuel shortage in 2017.

The use of diesel sourced from the black market has obvious revenue implications for the formal economy. It also has significantly high social costs in terms of externalities linked to environmental pollution and health concerns, and even security in the Niger Delta. This results in cumulative causation that moves the sector further away from the desired outcome of higher social welfare.

Figure 1: Main sources of lighting in households not connected to the grid



Source: World Bank (2018).

Our analysis of the Nigerian power sector is based on the SOAS University of London Anti-Corruption Evidence (ACE) framework that identifies the rents being allocated in the sector and their distortion, the beneficiaries associated with these rents, and the configuration of organisational power in the sector. This analysis suggests two reform trajectories, one over the short-to-medium term and the other over the long term.

The first reform trajectory takes into account the seemingly intractable levels of corruption in the national grid, especially with regard to the historical operations of the TCN. This 'legacy' corruption along with contractual uncertainty has ensured that credible investors are staying away. The electricity value chain is both highly interconnected between players and has high capital costs. In developing countries there is also an important element of cross subsidy in the sector between rural and urban consumers or industrial and residential consumers of electricity. As a result, operational risks are high in the absence of clear institutional mechanisms that signal financial stability and returns. Confidence in the sector requires a mechanism for contractual clarity that provides credible commitment, and this usually comes from the government. These conditions are as yet unfulfilled in the Nigerian electricity sector. This has led to such high levels of risk premia that credible investors are staying away.

The above conditions point towards a short-to-medium-term strategy that entails looking for solutions outside the national grid via investors who are willing to explore off-grid and disaggregated generation solutions, or small generating units directly connected to a distribution system. Our research in the power sector has identified the SME sector in the country as having adequate willingness to pay for electricity through such an alternative network. SMEs account for 96% of businesses in Nigeria (PwC, n.d.) and, given the nature of their operations, they are most vulnerable to losses from lack of electricity supply. In a Nigeria Enterprise Survey from 2007, quoted by Scott et al. (2014), 75.9% of SMEs said lack of

electricity was a 'major constraint' for them. A reform policy focused on SMEs has the potential to be developmental in a manner that is both impactful and feasible. Helping SMEs achieve greater competitiveness has obvious benefits in terms of inclusive economic growth and for moving the economy away from oil and gas. It is also feasible, as our ACE strategy of incentive alignment (Khan et al., 2019) finds strong support from SMEs as well as from recent policy statements made by the Federal Government of Nigeria (FGN) (see section 5). Research conducted with a sample of 40 SMEs in the manufacturing clusters of Nnewi, Onitsha and Aba, as well as the Federal Capital Territory (FCT) where the capital Abuja is located, has provided further evidence to support this strategy, as have interviews with 15 key informants with close and intensive knowledge of the sector and the privatisation process.

The second reform trajectory entails a long-term strategy of financial restructuring of the national grid to reduce risks so it becomes viable and can expand. Our analysis of the political settlement of the sector suggests it will be difficult to enforce policies that will enable financing to flow through the grid more fluidly or to resolve the political corruption in the sector in the short-to-medium term. However, a disaggregated solution cannot be a permanent one for Nigeria. The country reports one of the lowest consumptions of electricity per capita in Africa (see Table 1 for selected African countries) and, at a macro level, achieving structural transformation requires a stable and efficient grid that can supply the productive sectors. While there have been some successes post-privatisation – like the addition of some new grid capacity, the push towards renewables, a clear policy roadmap for off-grid solutions and fulfilment of the country's electricity export obligations to Benin and Togo – this is clearly not enough for the Nigerian economy as the figures below suggest.

Table 1: Per capita electricity consumption in selected African countries

Nigeria	Ghana	Côte d'Ivoire	Angola	Kenya	South Africa
145kWh	351kWh	275kWh	312kWh	164kWh	4198kWh

Notes: Per capita electricity consumption calculated as power distributed (kilowatts, KW) x 24 x 365/total population. kWh = kilowatt hours.
Source: World Bank (2014a).

Table 2: Percentage of grid-connected households in selected African countries

Nigeria	Ghana	Cote d'Ivoire	Senegal	Sierra Leone	South Africa
0–33%	34–74%	34–74%	34–74%	0–33%	75–80%

Note: Due to variation in populations among the countries, percentage of households connected to grid is preferred to number of households.
Source: Afrobarometer data 2014/15 in Blimpo and Cosgrove-Davies (2019).

The remainder of the paper is structured as follows. Section 2 briefly outlines the ACE approach to anti-corruption that informs our analysis of the power sector in Nigeria. Section 3 describes privatisation efforts in the country and the corruption in the power sector identified by our research, while Section 4 presents the losses incurred by the sector. Section 5 sets out the proposed ACE approach for the sector and the evidence that we have generated to support this strategy. We also deliberate in Section 5 on some additional institutional arrangements linked to our proposed solution and recommendations for future reform. We conclude briefly in Section 6.

2. Interdependencies and the analysis of corruption: the ACE approach

One of the many reasons why anti-corruption reforms fail is because they tend to overlook the many interdependencies that exist in the relevant sector.

The first interdependency exists between the micro and the macro levels. The micro level includes corruption driven by greed and the discretion of individual public officials. Most standard anti-corruption efforts based on enforcement are aimed at this level. However, this corruption is embedded in the macro systemic level that comprises the social and political order within a country (Khan et al., 2019). The second interdependency is the interaction between anti-corruption policies that target specific distortions and other wider policy interventions already in place (Johnsøn et al., 2012; DFID, 2015).

The third crucial interdependence that needs to be addressed is the relevance of a policy within a particular distribution of power, or the political settlement within a country or context. A political settlement is a specific configuration of the distribution of power and the distribution of benefits (or policies) (Khan 2010, 2012b, 2018). For instance, privatisation in Nigeria was meant to make the power sector more efficient by introducing competition and transparency and thereby reducing the discretion of government officials, especially in the distribution sub-sector. However, this did little to address corruption in other parts of the grid. Indeed, there are reports of petty corruption even in the privatised distribution sector with regard to billing and metering. Privatisation in Nigeria was modelled on two Indian examples, but the models chosen were not compatible with the political settlement of the Nigerian power sector (SDN, 2018). One distribution model was from the Indian state of Odisha and this was deemed unsuccessful even in the Indian context (Sioshansi, 506, 2013).

The main utility, the Power Holding Corporation of Nigeria (PHCN), had an installed capacity of 6199.2 MW at the time of privatisation. It was also the only utility authorised to generate, transmit and distribute. In India, privatisation happened within a very different configuration of organisational power. Here, privatisation was spurred by the fact that the State Electricity Boards (SEBs) – the agencies charged with coordinating generation, transmission and distribution in each Indian state – were in deep financial crisis due to mismanagement and rent-seeking. Many SEBs defaulted on payments to the central government for coal which is the fuel most commonly used in India for power generation. This motivated the central government to bring in private investment (Kale, 2004). The major public-sector generator was the National Thermal Power Corporation (NTPC), a near monopoly, which is still the single largest producer of India's electricity, contributing about 25% of power generated with an installed capacity of 57,356 MW. Privatising such a huge corporation would have been difficult but NTPC was also profitable, and paradoxically this made it politically difficult to sell off. The emerging private sector within power generation therefore operated next to

a large and profitable public sector that set the yardstick for performance. It also constrained the power of private companies to negotiate informal deals that would let them get away with inefficient performance. Subsequently, the enforcement costs for policy in the sector were lower in India than in Nigeria.

Due to historical reasons, the manufacturing sector in India was also more developed than in Nigeria, with powerful interests demanding electricity at reasonable prices. Industry set up its own huge Captive Power Plant (CPP) programme and after privatisation these were also allowed to feed into grids (Tongia, 2003). CPPs with a generation capacity above 1 MW currently have an installed capacity of over 40,000 MW. The CPP cluster put pressure on public-sector generators and distributors in terms of pricing, particularly if they attempted to expropriate too much from business interests. In the industrially advanced western state of Gujarat, clusters of SMEs also contested the state electricity board which was passing on suspiciously high prices to them (Hansen and Bower, 2003). Such horizontal checks and balances across different types of organisations were only possible because there was a broader and more diversified base of productive capabilities in both the private and public sectors in India. Finally, the private-sector firms that went into generation were politically connected in India but also had high enough technical capabilities to be able to generate electricity efficiently when under pressure to do so.

Although the Indian public and private players were no less willing to engage in informal modifications of their contracts and prices than in Nigeria, they were constrained by a different distribution of organisational power that enabled more productive outcomes. In both countries, formal institutions were informally modified, but in different ways – modifications vary in different contexts and are connected to how power is distributed as well as the relative power between political and economic organisations. This is why a set of reforms may work in one context but do not work in another.

While the Nigerian power sector required extensive reform, the outcome of privatisation suggests the set of policies intended to drive it were in the main not appropriate for the prevailing institutional conditions. One broader lesson from privatisation in developing countries not limited to Nigeria is that corruption seems to remain entrenched despite reforms introducing a formal structure of competition and freer markets (Van de Walle, 2006; Fritz and Menocal, 2007). This is because the distribution of benefits remains narrow when politically connected bidders are in the fray and existing extractive interests are further entrenched with privatisation. During privatisation in Nigeria, the productive capabilities of the firms were low, with most lacking much or any experience in the sector.

Anti-corruption strategies like privatisation reforms often fail in developing countries because they typically assume corrupt acts are deviations from a rule of law driven more by the discretion of government officials at the micro level. If that were so, improvements in transparency and accountability would be effective and that would be all the policies needed. In contrast, developing countries have high levels of informality and 'rule by law' – many institutions and laws are enforced, but often not on the powerful and that includes players in the private sector. Enforcement is therefore selective and most often not impartial (Khan, 2010, 2018). Most powerful and politically connected private-sector players break the rules in order to accumulate wealth and assets, and it is therefore not in their interests to be

rule-following. In other words, the incentive structure to be rule-following does not exist. The brief comparison with India also demonstrates how similar policies have different outcomes owing to variations in configurations of organisational power.

The challenge is to create conditions where incentives can be restructured such that agents will no longer resort to corruption in their self-interest. Any policy also has to be self-enforcing in order for it to be sustainable. This requires mapping the relevant political settlement, which includes identifying the powerful organisations and the rents that drive activity in the sector. It also requires identifying the types of corruption in order to target anti-corruption policy effectively. Cross-country evidence has shown that some rents can lead to developmental social outcomes (Stiglitz, 1996; Khan, 2006, 2009; Meisel and Ould Aoudia, 2007; North et al., 2009; DiJohn, 2011; Booth, 2012). Equally, informal networks of patron–client politics can be damaging for growth (Hodges, 2004; Rocha Menocal, 2005; Khan, 2006, 2010, 2012a; Roy, 2012). It is therefore imperative to recognise the outcomes of the rent-seeking process as a net effect rather than just through the rent-seeking costs (Khan, 2009).

It is useful to identify types of corruption as established in Khan (2006, 2009) and Khan et al. (2019) as these can help to identify policies that can be feasible as well as likely to have high impact. The two-step method outlined earlier that uses the political-settlements approach and identifies the key rents in the sector has helped us suggest policy combinations that target constituencies in the power sector who are likely to support the attempted reform. Identifying the different kinds of corruption, whether market-restricting, policy-distorting, political or predatory, can help us provide a general assessment of the right mix of feasible and high-impact reforms that can provide a developmental outcome (Khan, 2006; Khan et al., 2019). And interdependencies matter here too. The same sector can have multiple players subject to many different policies. Large politically connected firms in Nigeria were able to distort potentially useful policies using their political connections in a manner that left the power sector deeply entrenched in debt and unable to function. For instance, the initial guidelines for privatisation stated that local entities could bid without having a technical background as long as they had international partners who were technically competent. In many cases, local entities with no background in the sector bid in partnership with technically competent international companies, but the latter's equity participation remained too low to be decisive. This sort of corruption has mixed characteristics of both policy distortion and political corruption.

At the same time, both the end customers and distributing companies were often accusing each other of either not paying their bills or of overcharging, respectively. One policy that remains deeply contested is that of 'estimated billing' where bills are not based on meter usage but where commercial losses are passed on to customers (Adeniyi, 2019). This was initially allowed as most connections in Nigeria were not metered and distribution companies needed some metric. However, post-privatisation, there were reports of distribution companies misusing this policy to over-charge. Equally, there were reports that customers who received the right estimate refused to pay as there was no proof of their usage. In other cases, users 'settled' with officials from distribution companies at a rate much less than billed. This can be characterised as market restriction-driven corruption as

distortion by companies and evasion by customers is due to a policy that cannot be enforced. And nor is the underlying rent from this policy broadly socially useful.

We also make a careful distinction between rules that are violated for different reasons. For instance, we need to distinguish between those who are violating rules because they have no option and those who are violating deliberately in order to cheat. We therefore have to identify strategies that may enable some productive insiders, in our case SME owners in existing clusters, to become more rule-following and support the enforcement of socially desirable rules in their own interest at least at the level of specific activities and sectors. This is where we deploy SOAS ACE's bottom-up strategies and strategy clusters to identify possible solutions (Khan et al., 2019). The key here is to design policies that are self-sustaining in order to ensure compliance and enforcement. Vertical or top-down policies that rely only on external (to the level of the relevant sector) enforcement are unlikely to be successful and this is where policy solutions have to identify opportunities for horizontal buy-in, that is, where interested actors follow rules in their own benefit. Horizontal enforcement is therefore needed in order to nudge behaviour to move in more rule-following directions.

The anti-corruption strategy set out in this paper is based on a close reading of the above analysis.

3. The privatisation process, rent capture and the power sector

The privatisation of public enterprises in Nigeria can be traced to 1988 following the promulgation of the Privatization and Commercialization Decree No. 25 of 1988. However, the privatisation exercise was only given impetus by the enactment of the Privatization Act No. 28 of 1999. Subsequently, the National Council on Privatization was inaugurated and the Bureau of Public Enterprises (BPE) was established to provide the legal, methodological and institutional framework for the privatisation programme. Reform and privatisation of the power sector specifically started in 2000 with the formation of the Electric Power Implementation Committee (EPIC), which prepared the National Electric Power Policy (NEPP) in 2001 and the Electric Power Sector Reform (EPSR) Act in 2005. These provided the legal backing for power-sector reform. Specifically, the NEPP provided a legal framework for commercialisation and liberalisation of the electricity industry in Nigeria following the return to civil rule in 1999. It attempted to bring an end to public-sector monopoly in the area of electricity generation, transmission and distribution by allowing private participation.

Essentially, the reform had two components – restructuring and privatisation. The reform package set out to change the structure of the industry in order to stimulate competition and promote financial accountability. The decision taken was to unbundle the sector into its constituent parts (generation, distribution and transmission), to establish commercial trading arrangements (of electricity), and finally, to change the control and ownership of the National Electric Power Authority (NEPA). In line with the goals of the power-sector reform, NEPA was incorporated as the Power Holding Corporation of Nigeria (PHCN) by the BPE with the support of donor agencies in 2005. Following the successful incorporation, all the functions, assets, liabilities and staff of NEPA were transferred to PHCN. The PHCN was further unbundled into 6 generating, 11 distribution and 1 transmission organisations. The Nigeria Electricity Regulatory Commission (NERC) was established as an independent regulator. A Canadian company called Manitoba was chosen through a bidding process to manage the grid, but its contract expired in 2016 and wasn't renewed leading to questions as to why this was allowed to happen (SDN, 2018). TCN and NBET were left as the only players in the transmission sector.

Table 3: Power generation in Nigeria

Generator name	Fuel type	Theoretical capacity	Capacity available	Average capacity generating (MW)			
				2013	2014	2015	2017 First quarter
PHCN successor Gencos							
EGBIN	GAS	1320	1030	604	473	584	580
AFAM IV-V	GAS	600	178	38	25	1	60
SAPELE	GAS	1020	135	46	47	64	39
TRANSCORP POWER	GAS	972	373	188	319	322	353
GEREGUI	GAS	414	284	113	102	124	71
OMOTOSHO	GAS	335	168	60	104	166	97
OLORUNSOGO	GAS	335	168	57	129	175	88
SHIRORO	HYDRO	600	565	283	223	207	256
JEBBA	HYDRO	570	570	303	285	232	219
KAINJI	HYDRO	760	199	100	67	199	196
SUB-TOTAL		**6,926.00**	**3,670.00**	**1,792.00**	**1,774.00**	**2,074.00**	**1,959.00**
OPERATIONAL NIPPS							
ALAOJI NIPP	GAS	1074	497	3	1	86	121
OLORUNSOGO NIPP	GAS	675	462	100	127	131	6
SAPELE NIPP	GAS	450	249	136	95	104	85
IHOVBOR NIPP	GAS	450	360	71	175	129	84
GEREGU II (NIPP)	GAS	434	434	102	127	133	130
OMOTOSHO NIPP	GAS	450	268	195	130	149	125
OMOKU	GAS	250	120	0	0	0	13
GBARAIN	GAS	225	113	0	0	0	60
ODUKPANI NIPP (Calabar)	GAS	561	120	0	0	35	53
SUB-TOTAL		**4,569.00**	**2,623.00**	**607.00**	**655.00**	**767.00**	**677.00**
IPPs (on-grid)							
IBOM POWER	GAS	190	170	4	47	55	120
AES	GAS	270	250	152	41	0	0
AGIP (OKPAI)	GAS	450	450	320	360	302	355
SHELL	GAS	650	650	366	391	346	385
TRANS-AMADI	GAS	60	0	0	0	0	60
SUB-TOTAL		**1,620.00**	**1,520.00**	**842.00**	**839.00**	**703.00**	**920.00**
ON-GRID TOTAL		**13,115.00**	**7,813.00**	**3,241.00**	**3,268.00**	**3,544.00**	**3,556.00**
IPPs (off-grid)							
OMOKO UPP	GAS	150	150	78	53	0	23
TRANS-AMADI	GAS	60	24	1	0	0	0
GEOMETRIC POWER (ABA)	GAS	132	0	0	0	0	0
NESCO (Jos) - Island	HYDRO	30	21	24	24	18	12
OFF-GRID TOTAL		**372**	**195**	**103**	**77**	**18**	**35**

Note: The big capacity addition since 2017 Q1 has been the 461 MW Azura plant in Edo state which has a proposed capacity of 1,500 MW.
Source: SDN (2018: 23, Table 3).

The NBET – known as the 'bulk trader' or aggregator of power – was incorporated on 29 July 2010 as the SPV for carrying out, under license from NERC, the bulk purchase of generated power from the generating companies (GenCos) and its resale to the distribution companies (DisCos). In August 2010, the federal government released its *Road map for power sector reform* (FGN, 2010), which outlined the following stages for privatisation of the unbundled PHCN:

- Submission of bids: July 2012
- National Council on Privatization approval of bids: October 2012
- Completion of negotiations: January 2013
- Completion of industry agreements: February 2013
- Payment of 25% share sale purchase: March 2013
- Payment of 75% share sale purchase: August 2013

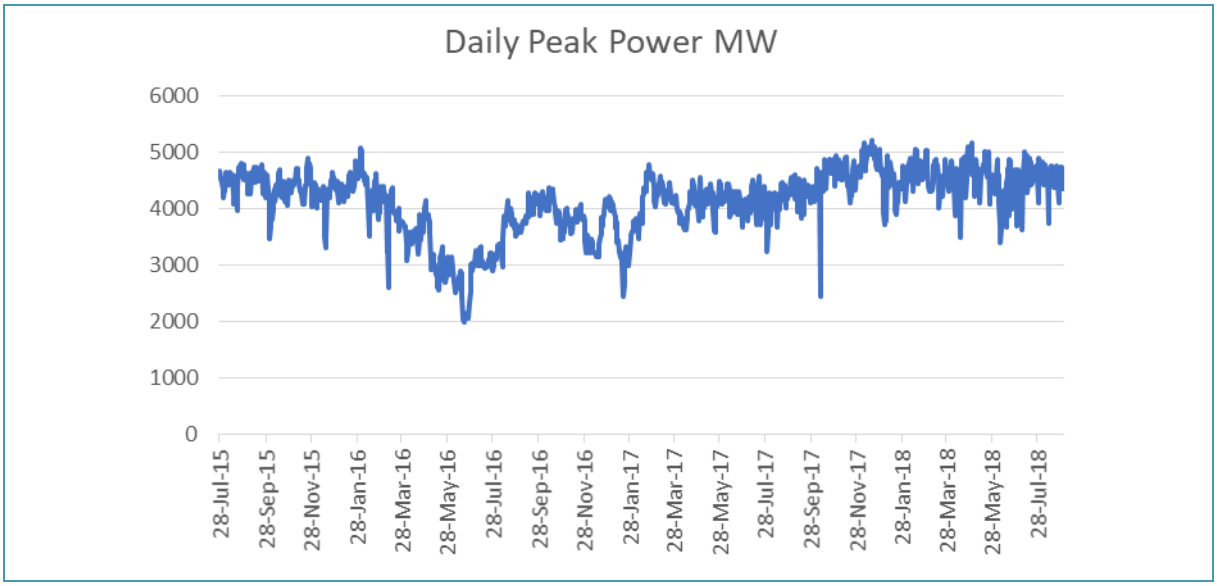
With the successful completion of the basic requirements for transfer of ownership, the federal government handed over the 11 DisCos and 6 GenCos to private investors on 1 November 2013. The GenCos were sold for $1.269 billion while the DisCos were sold for $1.256 billion.

The breakdown of the preferred bidders for the DisCos, as IseOlorunkanmi (2014) reiterated based on data from the National Council of Privatization, is as follows: Kann Consortium won Abuja Distribution Company at $164 million; Vigeo Power Consortium for Benin at $129 million; West Power & Gas for Eko at $135 million; Interstate Electrics Limited for Enugu at $126 million; Integrated Energy for Ibadan at $169 million; NEDC/ KEPCO for Ikeja at $131 million; Aura Energy Limited for Jos at $82 million; Sahelian Power SPV Limited for Kano at $137 million; 4Power Consortium for Port Harcourt at $124 million; and Integrated Energy Distribution and Marketing for Yola at $59 million.

IseOlorunkanmi (2014) further noted that for the GenCos, the preferred bidders included Amperion for the Geregu Plant at $132 million; Mainstream for the Kainji Plant at $50.76 million with a commencement fee of $237,870; North-South for Shiroro Plant at $23.6 million with a commencement fee of $111 million; Transcorp/Woodwork for Ughelli Plant at $300 million; and CMEC/Eurafric for Sapele Plant at $201 million.

However, despite the successful privatisation of the DisCos and GenCos, Amadi (2017) contends that the privatisation was problematic because it occurred before the regulatory framework for the new electricity market was fully established. This had severe implications for efficient service delivery in the power sector after privatisation, as we see in the next section. Figure 2 illustrates that power generation hasn't improved since 2015.

Figure 2: Average generation in Nigeria post-privatisation



Source: Nextier Power Advisory from NERC (unpublished data)

3.1. Technical shortcomings

According to a member of the senior management of NERC during the period of privatisation, the country was far from ready for the privatisation model that was chosen for Nigeria. The first among many problems was that the power sector had not received significant investment for decades. This led to high levels of technical inefficiency and there were regular instances of system collapse. There were also, in his view, 'political variables' to consider. Secondly, there should have been a transition from government control to commercialisation before taking the plunge to privatise, so that stakeholders could understand that electricity could be traded in a market structure. In other words, the three different parts of the electricity value chain – or the national grid – of generation, transmission and distribution should have been restructured in a manner that allowed them to operate at a profit and improve management systems before being turned over to the private sector. This has some parallels with the Indian experience outlined earlier. Thirdly, and even more seriously, there was no electricity to sell. The project document had recommended that electricity supply should be at least 18,000 MW before privatisation so that there would be a real market to sell in. However, supply was between 3,000 to 4,000 MW when the industry was privatised. New generating plants had been built but had no gas supply, so they added nothing to electricity generation. The fourth challenge our key informant recounted was that when the request for proposals (RFP) went out, there were no competent firms in Nigeria with the capacity to deliver so the standards set in the guidelines were lowered to allow the privatisation process to proceed. This lack of 'fit and proper investors', he argued, was the fatal blow that led to the complete failure of the exercise. Our key informant concluded that there was no economic or commercial basis for the privatisation given the poor quality of infrastructure.

Table 4 shows how Nigeria lags behind South Africa, Botswana and Kenya in terms of transmission infrastructure. These three countries have higher transmission voltages, and this translates into lower system losses.

Table 4: Comparison of transmission infrastructure (high voltage transmission lines)

Nigeria	South Africa	Ghana	Botswana	Kenya
Voltage transmission lines: 330kV, 132kV and 33kV	Main transmission lines: 132kv, 275kv, 400kv, and 765kv	Three main voltage transmission lines: 69 kV, 161 kV and 330 kV	Main voltage transmission lines: 33kv, 132kv, 220kv, 330kv, and 400kv	Main voltage transmission lines: 132kv, 220kv, 400kv, and 500kv

Sources: Ketraco (n.d.); Nigerian Finder (n.d.); Global Transmission Report (2018); Republic of Ghana (2019).

According to another industry player closely connected to the privatisation reforms, the technical work for privatisation was simply not taken seriously. The level of electricity loss in the system was too high – 47% to 11% transmission losses, 14% distribution losses due to poor wiring, and 22% non-technical losses due to electricity theft. The FGN should have invested to address these problems before proceeding with the privatisation, he argued. The other problem, according to him, was that all the investors took commercial bank loans to finance their acquisitions at very high interest rates and were therefore burdened with bank loans they were unable to service. This also meant that the firms became overleveraged and unable to borrow more for additional investments in the sector. Expert opinion is that the investors should have been allowed recourse to long-term development financing. However, given that most of them did not have the technical and managerial qualifications to bid as electricity companies, it is highly unlikely that they would have passed the due diligence requirements for access to development finance.

The chief executive officer of one of the largest DisCos from the North Central region, and one of our key informants, confirms the financial difficulties they ran into. He said they took a bank loan at a rate of 18.75% to raise the funds of $82 million to buy the company. There was a gap of 11 months between when they paid and when they took over the business, while in the meantime bank charges were running from the first day they took the loan. This means that they had already accumulated unserviceable bank charges from the day they started running the DisCo. He added that the government reneged on their promise to allow a commercial tariff (though that remains politically difficult across developing countries and Nigeria is no exception). The DisCos also did not know that the losses in the industry were much higher than disclosed in the bidding documents – closer to 60% than the projected 40%. In addition, government and security agencies simply refused to pay their power bills and there are no legal means to force payment so huge unpaid bills crippled the financial status of the companies. Our key informant also explained that the generating companies were not providing them enough electricity to sell. He argued that the distributing companies suffer the most, because government provision of an intervention fund has been unhelpful for them. This is because the Central Bank pays the money directly to the generating companies and the accounts of the distributing companies are debited for funds that have not come to them, thereby worsening their debt levels with their bankers.

The DisCos have openly admitted that their companies are not viable. The *Punch* newspaper reported that: 'In a joint press conference organised by the 11 companies, the Chief Executive Officer of the Jos DisCo, Tukur Modibbo, announced that they were ready to give up their licence if the federal government could refund the money invested in the utility. He said: "We bought Jos DisCo for $82 million. We are ready to give it away for $72 million if we see buyers now. If government refunds the investors their money, we will quit the business."' At the same meeting, John Ayodele, the Chief Operating Officer of Ibadan Electricity Distribution Company, said the DisCos they were sold were a product of unknown value. 'We could not embark on physical due diligence of the privatised power entities before taking over the assets. There was no accurate technical, physical due diligence on what DisCos bought' (*Punch*, 2018).

3.2. Overlapping corruption in the sector post-privatisation

It is useful to break down the various interdependent processes of corruption in the Nigerian power sector. In Nigeria, the 6 privatised generation plants and the 11 distribution companies were acquired by politically connected businessmen. In at least a few cases the GenCos and DisCos were owned by the same politically connected investor. For instance, Integrated Energy – which acquired the Ibadan and Yola DisCos – was promoted by General Abdulsalami Abubakar, a former military head of state. Colonel Sani Bello, who is the chairman of Mainstream Energy, the company that acquired the Kainji and Jebba hydel power plants, is a former military administrator of Kano state. Yusuf Hamisu Abubakar, the managing director of Sahelian Power that bought Kano Electricity Distribution Company, was a commissioner at the Nigerian Communications Commission, the government agency regulating the telecom sector.

As outlined in Section 2, rent capture and corruption are almost always the outcome of interdependent institutions and organisations. In a sector like electricity, where sunk costs are high, policy capture is a likely outcome. Equally, in a supply constrained sector with very high demand, off-market and corrupt transactions will emerge to cater to demand and to capture rents. In the Nigerian case, the issue is compounded as, first, TCN is widely regarded as being subject to political capture (Ogunleye, 2016; Papaefstratiou, 2019) and, second, the companies involved in the privatisation process had strong political connections rather than strong technical capabilities. The presence of technically qualified partner companies was marginal (Energy Mix Report, n.d.). The privatisation process was such (no permission for bidding companies to conduct due diligence, lack of sovereign guarantees, etc.) that it was not attractive for genuine private investors, especially technically capable international ones. This led to adverse selection where only politically connected companies were confident of bidding and consequently Nigerian banks absorbed all the risk, as mentioned earlier.

The above is in contrast with the successful privatisation of Nigeria's telecom sector in 2001. This was one reason why investors and donors were keen to push privatisation of the electricity sector and with good reason. Telecommunications has been the sector driving growth in services and GDP, while the electricity sector has had little appreciable impact on the economy (Table 5). In fact, it would be safe to say the falling growth rates in the last two quarters are indicative of further stresses building up in the sector.

Table 5: Growth rates (%) of the electricity and telecom sector, 2018–2019

Quarter/Year	Q1 2018	Q2	Q3	Q4	Total	Q1 2019	Q2	Q3
Electricity, gas, steam and air conditioning supply	4.93	7.59	18.27	0.95	7.30	8.47	0.43	-11.81
Telecommunications and information services	1.88	11.54	14.97	16.67	11.33	12.18	11.34	12.16

Source: NBS (2019: 94).

The bidders in the telecom sector were also politically connected (Usman, 2019), yet the outcome of the reform process was very different from that in the electricity sector. From our analysis, a set of related reasons stand out as to why this may be. The first relates to the historical corruption referred to earlier with regard to the workings of the TCN and the deep-seated technical inefficiencies this led to. The private players in the telecom sector did not have to deal with a pivotal but inefficient public-sector entity in order to become profitable. Instead, their profitability depended on the ability to invest in the network and scale up to decrease operating costs and increase average revenue per user. The technological intensity of the telecom sector is also higher than in the electricity sector (at least for generation). Telecom is an oligopolistic sector, and this makes the time horizon for learning and catching up relatively short as it has to contend with other large players. This creates compulsions to create rents in a productive manner through innovative technology or service provision as opposed to capturing rents (though the process of getting licences for spectrum might well be politically captured). In the electricity sector, which has more mature or standardised technology, innovation does not drive productivity growth in the same way and rents have to be captured by other means. In the distribution sector, most of the companies were monopolies as there was one company per region. The nature of the electricity value chain is also one that requires many discrete processes and firms, all of which have to function in step and seamlessly, beginning with the sourcing and pricing of gas at one end to metering of usage at the other. This is also unlike the telecom sector where the value chain is structured differently and firms usually own processes and assets in the value chain such as telecom towers.

The configuration of organisational power that is relevant for understanding Nigeria's electricity sector includes powerful but not technically capable private-sector organisations in generation and distribution. Institutions do not have linear effects – they are always interactive (Khan, 2010). An institution – in this case the set of privatisation reforms that worked in a different configuration of power (i.e. the telecom sector) – introduced in a political settlement where the likelihood of enforcement is low, will lead to adverse outcomes. In the Nigerian electricity sector, privatisation gave these organisations significant new rents that increased their already high relative power. On the other side were relatively weak and fragmented political and state organisations that had large rents to distribute from oil revenues, as well as a weak manufacturing sector and a politically weak retail consumer base. If reformers in Nigeria and the international financial institutions had understood the implications of privatising within this configuration of power, it may have given them pause for thought. In a context of weak adherence to a rule of law that is typical in developing countries, we should expect the powerful to attempt to distort formal institutions in ways

that give them additional rents. The relative power of other organisations tells us in what direction and how far they are likely to go. The question should have been whether, in the specific conditions of Nigeria, countervailing forces existed to check these attempts at informal rent capture (Roy, 2017). If not, a more gradual privatisation strategy should be followed, that only privatises parts of the chain where productive capabilities, competition or pressures from other constituencies could limit the informal rent capture.

The dramatic increase in rent capture in the electricity sector after privatisation was a consequence of a significant change in types of informality. There was a reversal of patron–client relationships as business 'clients' to politicians switched to become the dominant partner in rent-capture relationships, sometimes because erstwhile politicians became businessmen. Patron–client relationships operate on a spectrum and are indeed often reversible (Roy, 2013). This is because, unlike with well-defined formal rights, informal institutions are malleable. This is particularly the case when the bargaining power of some individuals or organisations is changed as a result of changes in formal institutions, for instance as a result of privatisation or primitive accumulation. Further changes in informal modifications that then follow can result in unexpected spikes in unproductive rent capture, as radically new types of informality emerge. In developing-country political settlements where a generalised rule of law is absent, dramatic reversals in patron–client relationships reflect changes in the relative power of politicians and businesses in informal networks. But these reversals do not necessarily result in an improvement in economic outcomes just because business becomes more dominant. The reverse may be the case, as in the Nigerian electricity sector.

A consequence of such mechanisms can be exemplified in the operations of the major players in the grid. While some of the concerns, outlined earlier, raised by players about the privatisation process were genuine, the architects of the privatisation programme had at least tried to hand over the privatised assets with relative low liability. This was done through the Nigeria Electricity Liability Management Company (NELMCO), which was set up as a part of the privatisation process to take over legacy debts of the PHCN and had even taken over the pension liabilities of the old state owned-companies in the sector. While NELMCO has frequently run into controversy regarding settling pension claims, these were no longer the remit of the privatised entities in the electricity sector. With their books relatively clean, the GenCos and DisCos were expected to therefore start making investments to the existing infrastructure once they started making operating profits. However, they ended up paying themselves dividends and paying off their own bank loans that they used to purchase the companies and there was no compulsion from regulators to check this.

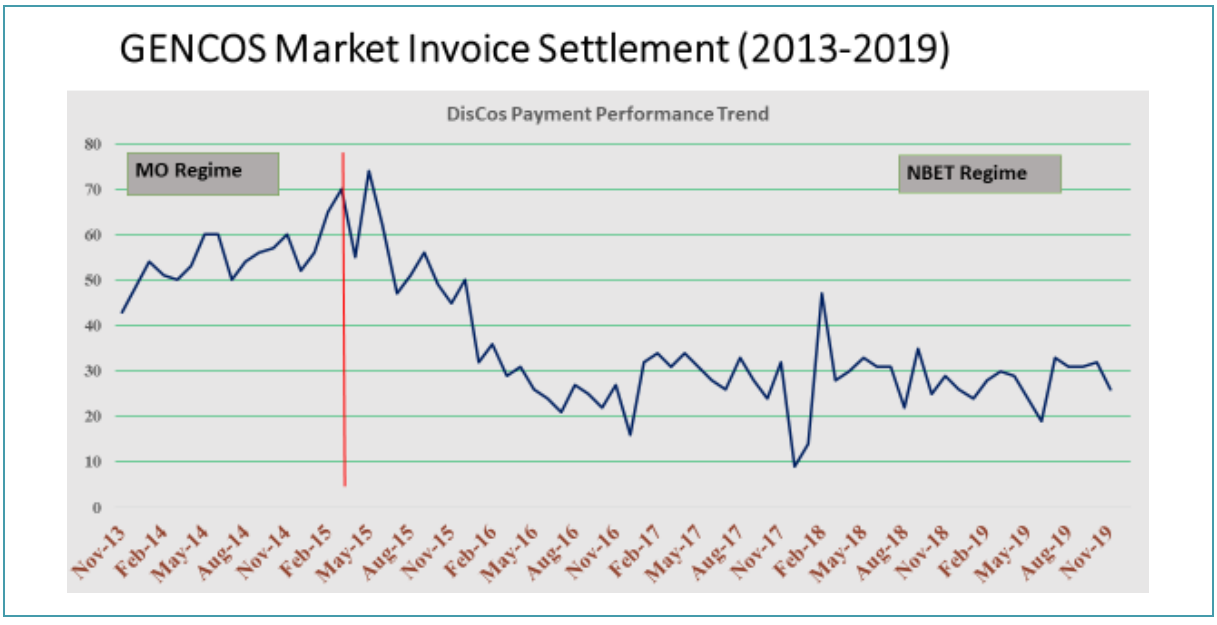
A similar lack of oversight can be identified in the functioning of the DisCos. The government owns 40% in every DisCo, giving them enough stake to intervene in matters of compliance. But, so far, there have been little attempts to introduce checks and balances into a very critical link in the electricity supply system. This is significant as the DisCos are the only part of the grid with access to large sums of liquidity as they are responsible for collecting payments from customers. Active government oversight as a result of this stake could have helped ensure the DisCos were collecting payments from customers and remitting enough

payments to the rest of the grid, but this has not been forthcoming. The failure of government to effectively exercise its responsibility over DisCos has led to the Nigeria Senate requesting the government to sell its 40 percent stake to foreign investors though this is being resisted by the Discos.

Both DisCos and GenCos often evacuate power, keeping in sight commercial considerations at the expense of equitable supply. For instance, DisCos often do not provide power to economically poorer areas in their region as they know collections from these areas will be low (or that they will find it relatively difficult to get their customers to pay) and prefer supplying power to areas with better-off customers who are more able to pay their bills. It does not help that that the amount DisCos charge (this is a percentage of the total retail tariff) is weighted according to the population density of the region it covers. This means that the charges are higher in areas that are less densely populated and resistance to paying bills is also higher. GenCos sometimes evacuate power to the grid even when there is not enough requirement so that they can bill this to NBET. These processes are distortionary but arise due to the uncertain and high-risk nature of the sector where players often have to resort to playing outside the rules in order to operate.

The initial design for privatisation had also envisaged that DisCos would provide revolving bank guarantees to NBET to back their payments contracts. These were to be used in case they failed to pay their collections (from bill payments). In early 2015 the DisCos were settling close to 80% of the amount invoiced to them but these soon started dropping to their current lows (see Figure 3). Some say the initial high payments were due to the bank guarantees but as it became clear that these were not going to be called upon, there was little compulsion to maintain high levels of payments.

Figure 3: Payments by DisCos to the sector

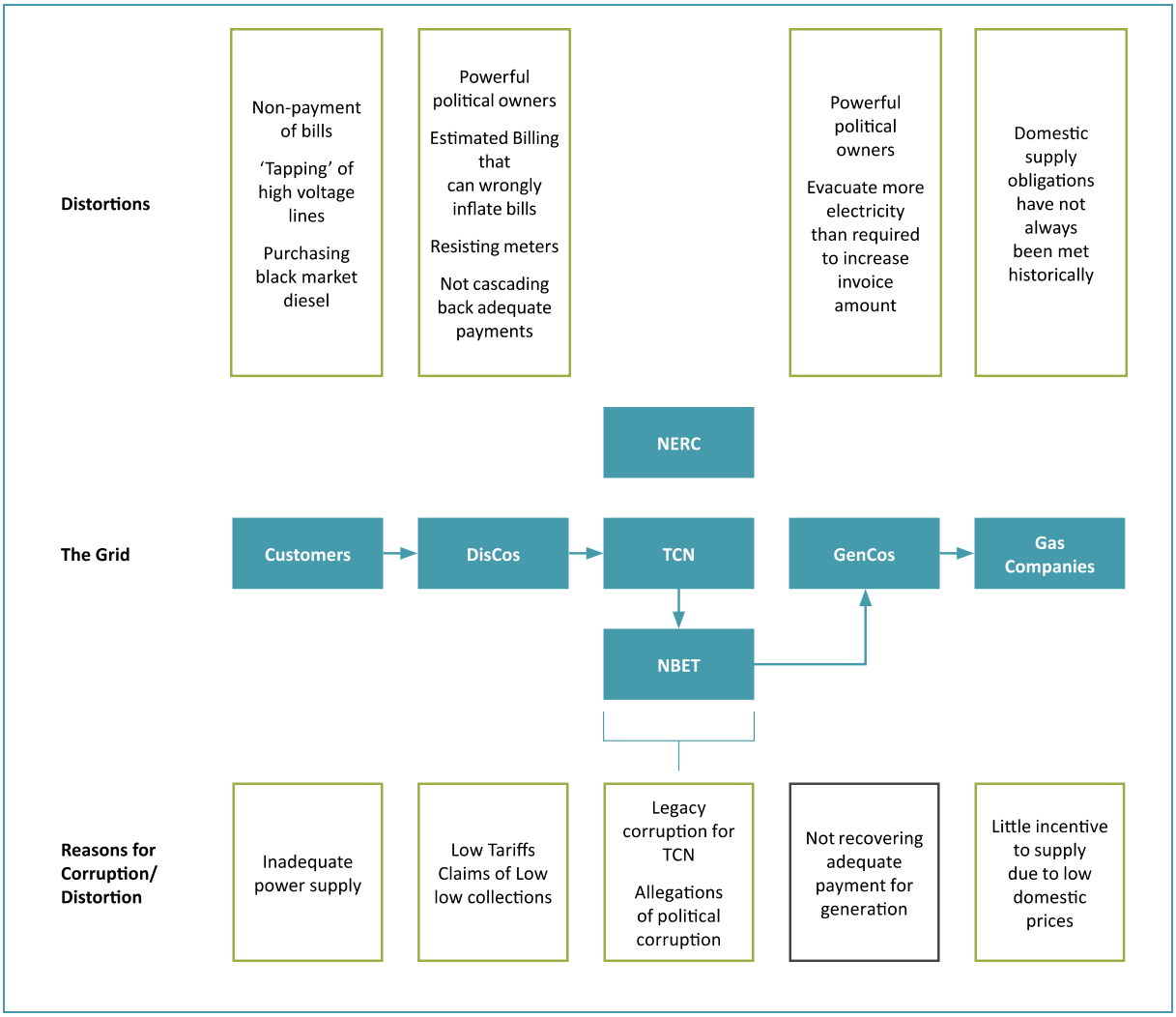


Source: Association of Power Generation Companies, Nigeria (2019) (unpublished data)

There are some signs now that the sector is moving towards a period of consolidation as some GenCos are looking to buy DisCos. This may well be a future solution where GenCos move towards becoming mini utilities with their own sub-feeders connected to the transmission network and this consolidation may provide the incentive structure for rule-following behaviour (economies of scale could provide higher revenue). However, given the constraints in other parts of the grid, for now the incentive to buy a DisCo still primarily remains the fact that they are the only entities that bring in ready liquidity to their operations. The government is unlikely to take any decision on sectoral restructuring that disturbs current ownership patterns given the high levels of political connectedness in the sector. This therefore makes the sector politically 'too big to fail' where, for now, saving it might mean maintaining the status quo.

Figure 4 summarises the distortions in the sector and the underlying drivers of these.

Figure 4: Sectoral map of distortions



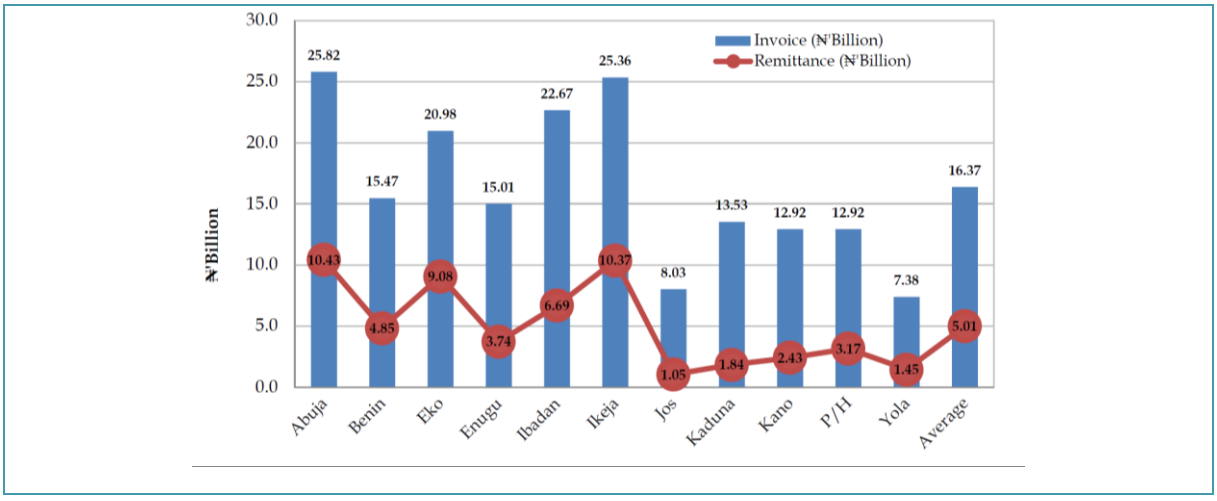
Source: Authors
Note: The blue arrow denotes payments made up the chain.

4. Escalating economic and social costs

The confluence of factors described in previous sections has led to mounting costs for the Nigerian economy with potentially damaging implications for productivity and employment growth. The direct costs to the exchequer are also consequential and are the result of accruing losses in the electricity sector. The country lost N11 trillion through corruption-related practices in the electricity sector from 1999 to 2017 (SERAP, 2017). Monthly losses in the sector, or the shortfall between income and costs, is N40 billion and accrues mainly due to four factors – low generation, low billing collections, skewed tariffs and forex valuations (SDN, 2018). The first two are obvious enough. In terms of the third factor, tariffs are skewed because states with a more reliable customer base have lower tariffs, and those that have fewer customers have a higher tariff burden. Hence, in states where tariffs could be higher due to higher potential to pay as a result of greater industrial or commercial activity (like Ikeja or Abuja), the tariffs are lower. And states that could benefit from lower tariffs end up with higher tariffs, lower usage and low revenue (ibid.). Interestingly, NERC mandates that government-owned agencies in the sector like TCN and NBET should be paid 100% of sectoral revenues before any other dues are settled, which leaves the private sector even more cash-strapped (Ade, 2019).

The fourth factor that leads to the shortfall is the assumption of the Naira's (N) exchange rate with the dollar. A significant portion of the industry's costs is indexed to the US dollar. But this value remains pegged to the value of the dollar in 2012 and the current value of the Naira is lower. The NERC is well aware of the situation as it highlights the commercial viability of the sector as a 'major challenge' in its report for the second quarter of 2019 (NERC, 2019: 10). The report goes on to highlight that of every N10 worth of energy sold, N3.09 remained as dues and uncollected (ibid.). For a detailed discussion of technical losses in the distribution sector and regulatory architecture see Adeniyi (2019).

Figure 5: Shortfall between what DisCos pay and what they owe in Q2 2019



Source: NERC (2019: 40, Figure 9).

We can now start to identify how processes were not in lockstep from the start of privatisation.

One issue is the contractual mechanism for gas supplies. And supply is often disrupted due to vandalism of gas pipelines (SDN, 2018). The gas companies who supply the GenCos have to fulfil a domestic supply obligation in order to export as electricity is a priority sector, but domestic prices are lower than export prices. Hence, these companies have little incentive to supply higher amounts to GenCos, who are also unable to pay for the gas that they receive. This is despite the creation of the government-owned Gas Aggregation Company of Nigeria which is supposed to be the intermediary between gas production companies and GenCos. A related area of concern is that the Payment Assurance Guarantee (PAG) by the FGN runs out in April this year and GenCos will find it even more difficult to meet their gas procurement payments.

Further to this, the payment mechanism is such that DisCos are supposed to collect payments for the entire sector and then pass them back up the chain to the various components (SDN, 2018). This mechanism is a key reason for the underperformance of the sector. As GenCos do not have policy certainty, they often demand less gas and produce less electricity. For instance, GenCos have a performance target but this is not streamlined with the DisCos' performance targets (ibid.). As a result, the GenCos are producing electricity sub-optimally, which is exacerbated by the lack of transmission capacity in the system. In turn, DisCos have less power to evacuate to end consumers and cannot increase tariffs in a scenario where consumers do not have enough power. In fact, the TCN often despatches higher electricity than what DisCos end up distributing, and this is because the DisCos want to reduce their losses (Adeniyi, 2019).

The tariffs, called Multi-Year Tariff Orders, were set according to assumptions based on exchange rates, inflation, cost of capital, expansion of generation and transmission networks etc. So far none of these have held out and the values of each have moved in a way that has made tariffs more expensive than they are currently (Gershon and Ezurum, 2017). This means the sector goes into deeper loss for every unit of electricity generated.

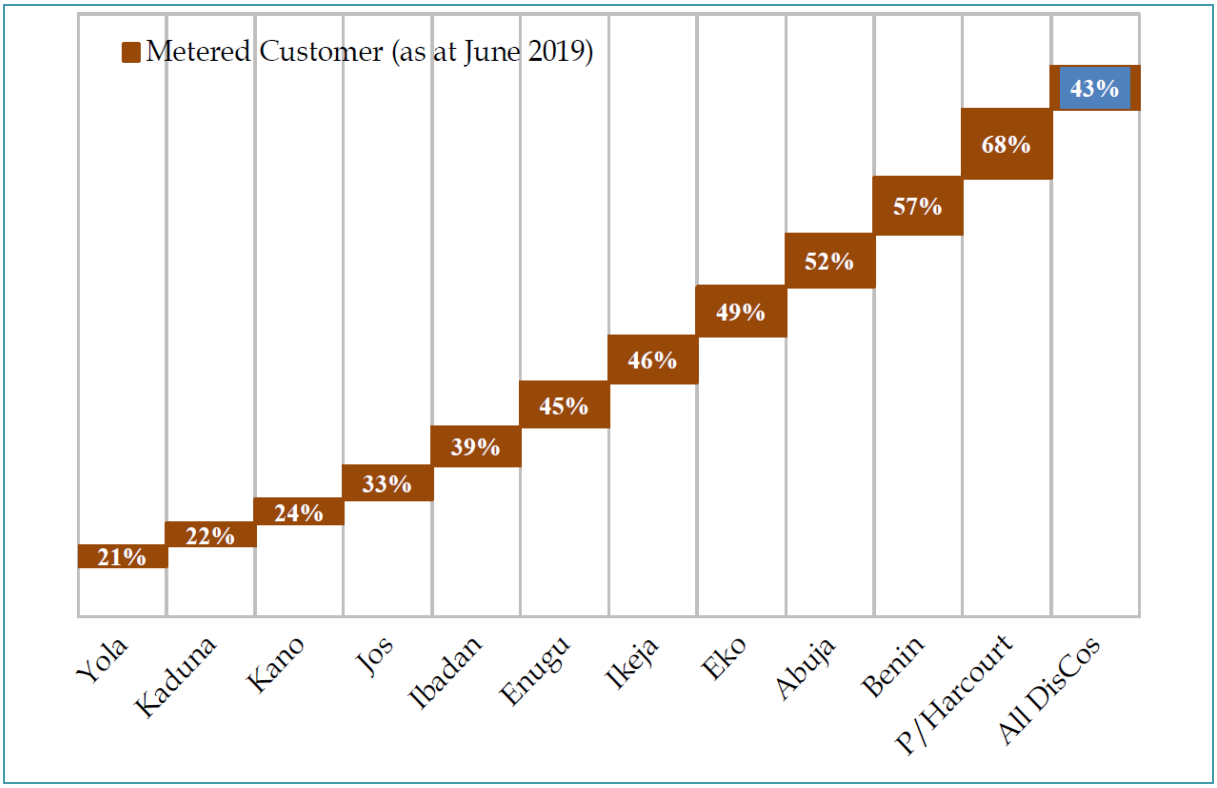
This is not to say that the electricity sector in most developing countries is profitable with the market reflective of cost structures. On the contrary, most are loss-making and heavily subsidised as the determination of a tariff is usually a political decision. While industrial and urban sectors can subsidise agricultural or rural sectors, for instance, only some countries have the fiscal space to accommodate these subsidies while also possessing higher-quality assets in the sector. Given the magnitude of the growing debt, this is not the case in Nigeria.

In fact, many of the DisCos in Nigeria are technically bankrupt and, since they are responsible for payments further up the chain, the sector is cash-strapped as a whole. This has led to a financing model such that the losses of existing players are not covered, and the legacy debt overhang will not attract fresh investors. The under-payment of invoices by DisCos is also leading to accumulation of debt. Assets in the sector are now in danger of being termed 'stranded' – that is, their investment costs cannot be recovered. Subsequently, the DisCos resorted to the practice of 'estimated billing' (described earlier) to recoup some of the losses.

In the absence of meters, many customers were presented with bills that were supposed to be estimates of their electricity consumption and there were reports of significant overcharging. However, in their defence, DisCos have said that some of their biggest debtors are government ministries and agencies (Peng and Poudineh, 2017). DisCos have been reluctant to install smart meters, but thanks to a push by NERC, the number of metered connections is slowly increasing. Additionally, there has been a move by Nigerian legislators to criminalise estimated billing but, given that DisCos have genuine technical constraints too, it is likely that such legislation will only compound their operational problems.

The NERC has however recently relaxed its methodology for charging estimated billings as well as cancelled estimated billings for unmetered customers. This will hopefully act as a catalyst for installation of meters. The NERC has also announced a hike in electricity tariffs from April this year. Much will depend on the ability to implement the hike in the face of resistance from retail consumers. A policy called Meter Asset Provider has also been announced to facilitate suppliers of meters to customers but a recent 35 percent hike on imported meters, ostensibly to help domestic manufacturers, has led to uncertainty around consistent supply of meters.

Figure 6: Percentage of metered customers



Source: NERC (2019: 16, Figure C).

The FGN has meanwhile spent considerable amounts on the sector. The N701 billion PAG is a recent intervention by the Central Bank of Nigeria (CBN). Other CBN interventions are the N300 billion Power and Aviation Intervention Facility (PAIF) and the N213 billion Nigeria Electricity Market Stabilisation Facility (NEMSF). The new budget has also announced support of N59.44 billion for the NBET. An issue of recent contention is the partial risk

guarantees (PRGs) that the FGN has provided to two entities linked to power projects, Azura and Accugas. Azura is a private power producer, while Accugas is a private gas supplier. PRGs are sanctioned by the World Bank and disbursed to applying countries to provide a credible commitment mechanism for the private sector in situations where confidence to invest might be low and the perception of political risk is high. In the case of Azura, the FGN is committed to paying the company between $30 million to $33 million a month for power generated, even if it cannot be despatched due to inefficiencies in the transmission system referred to earlier. In the case of Accugas, the gas supply deal to the government-owned Calabar Electricity Generation Company has actually not materialised but because of the specific terms of the contract the FGN is still having to pay Accugas close to $10 million every month (Adebulu, 2019). The fear is if the FGN is unable to keep making these payments, the risk of default on the PRGs – which is essentially a loan – rises. Officials have started questioning why these guarantees were provided at a time when the country's transmission infrastructure is inadequate. However, it also needs to be noted that Azura had a first mover's advantage and this is a learning process for the FGN. It also demonstrates that given watertight contracts, private financing is possible in the sector.

Despite these significant outlays, 55% of the population had no access to the grid in 2015 (Advisory Power Team, 2015) and not much has changed since then. The 'tapping' of distribution lines – where electricity is drawn illegally – is a common practice across developing countries, including in Nigeria. Both consumers and employees of distribution companies are complicit in this theft. Common too is the use of generators and illegal markets for fuel. A recent article in *Nature Sustainability* calculates the 'mean net cost of electricity' from diesel generators in Nigeria at $1.6 billion per year (Farquharson et al., 2018). The fuel for these generators is often bought on the black market, especially during fuel shortages. Diesel is the most produced item in illegal artisanal mining refineries in the Niger Delta and it finds its way into the black market for generator fuel, adding to the heightened insecurity in the region (SDN, 2018). Once the environmental and security impact of diesel generators is considered too, the full social costs are much higher. For a detailed study on pollution-related effects of self-generation via generators in low- and middle-income countries, see IFC (2019). The report also refers to a study by Eloise and Weidinmyer (2016) on combustion emissions in Africa, where generators for back up production are a key source of dangerous ozone formation in the lower atmosphere, particularly in Nigeria.

Some recent estimates suggest that Nigeria needs between 30 gigawatts (GW) to 175 GW of electricity at a cost of $40 billion to $200 billion (Adugbo, 2019). Given the increasing losses and the growing risk premium in the sector, these gaps are likely to remain unmet in the medium term. In 2008, the Nigerian Energy Commission estimated that Nigerians spent $975 million on alternative sources of energy (PwC, 2012) and this number will have only gone up as demand has grown and the economy has become more complex.

4.1. The impact on (M)SMEs in particular

Arguably the segment of the economy most disadvantaged by this mismatch between supply and demand for power is the Nigerian micro, small and medium enterprises (MSMEs)

sector. According to a PwC (2016) report, MSMEs account for 96% of all businesses in the country. A survey of the sector by the Nigerian Bureau of Statistics (NBS, 2013: Table 38) estimated that in 2013 MSMEs contributed to almost 97% of the agriculture sector's input to GDP and 55.53% for manufacturing. However, close to a majority of them received between just one and five hours a day of electricity (ibid: Table 35). The same survey highlighted that access to power was one of the three key constraints to growth identified by MSMEs. A study by Urbanisation Research Nigeria (Bloch et al., 2015) also reported power as the most important constraints for manufacturing clusters in urban areas. Much of the relevant literature on MSMEs evidences a consensus on lack of power as a key reason for high operating costs among such firms (Adenikinju, 2005; Arnold et al., 2006; Escribano et al., 2009; Moyo, 2012; Scott et al., 2014; Bloch et al., 2015).

While residential and commercial consumers also suffer, most residential users and at least some commercial customers are able to use alternative sources (to grid-based electricity), like generators and battery packs to fulfil their demand. Residential and commercial users should also be encouraged to adopt renewable energy, and the FGN has been at the forefront of that. Of late, off-grid solar power is also being used successfully by such consumers in Nigeria, for instance to power Ariaria market in Abia state or Sabon Gari in Kano. For an excellent overview of the effects of electricity supply constraints on SME productivity in six developing countries including Nigeria, see Scott et al. (2015), and specifically for Nigeria, see Adenikinju (2005).

Such alternative sources are, as yet, inadequate to meet the demand of SMEs, however, especially in the manufacturing sector where firms require what is called 'motive power' to operate machinery. This has implications for economy-wide productivity growth as well as job creation. Workers in the MSME sector made up 84.02% of the country's labour force in 2013. Manufacturing businesses in the SME sector employed 27.72% of the entire workforce, the highest share of any sub-sector (NBS, 2013: Table 26). In terms of ownership, in the same year, female entrepreneurs accounted for 43.32% of micro enterprises and 23.75% of SMEs. Youth ownership was also very high in this segment in 2012 (NBS, 2013). Both of these are important demographics in terms of inclusive and broad-based growth and lack of electricity is bound to affect these developmental outcomes.

The World Bank's Enterprise Survey (2014b) reported that 70% of firms owned a generator at the time of the survey. This has financial consequences, with significant negative effects on cost-competitiveness and productive growth, as the firms reported that electrical outages cost them 15.6% of annual sales. Our own research conducted in existing SME clusters in the FCT, Aba in Abia state, Nnewi and Onitsha in Anambra backs these findings (see Section 5). The last three are well-known manufacturing clusters in Nigeria in leather products and clothing, auto parts and polythene, respectively. The clusters have already well-developed linkages with local markets for both inputs and outputs (Bloch et al., 2015), as well as informal, private mechanisms for dealing with market failures like access to water, inadequate road connectivity and even power supply (more on which is detailed later). Manufacturing firms also make up close to 30% of businesses in Onitsha and Aba, making these clusters a relevant choice for the research (ibid.).

A comparison of data from 2007 and 2014 reveals that the number of SMEs grew significantly in this period and that more firms were exporting (Igwe et al., 2018). Yet the industrial sector's contribution to GDP has remained mostly static (NBS, 2019). The manufacturing growth rate was in negative territory in the second quarter of 2019 (-0.13%) and has only recovered in the third quarter (1.1%). But this is still lower than the growth rate the sector achieved in Q1 2018 of 3.39%. As outlined earlier, lack of adequate electricity supply is a key contributor to why the SME sector lags in contributing to GDP growth. Given our analysis of the intractable corruption in the electricity value chain and the damage that this could potentially inflict on the SME sector, we decided to focus on feasible strategies that would increase supply to this sector in particular. Our results are outlined in the next section.

5. Evidence to support the proposed ACE strategy

The analysis in the preceding sections points us to a two-pronged approach we think would work optimally for the electricity sector. The first requires a short-to-medium-term strategy that would help ease power constraints in established SME clusters. The second is a longer-term strategy that has to include capital infusion to overhaul the efficiency parameters of the grid from gas supply to distribution as well as debt restructuring to improve the liquidity situation in the sector. This will allow players to continue operations and take a long-term investment view. This could range from write-offs or bond issuances (that were once announced but later shelved) to cover the legacy debt.

Our anti-corruption strategy is a bottom-up approach to identify feasible and implementable solutions that work within the constraints of the specific distribution of power (Khan et al., 2019). The characteristics of corruption in the Nigerian power sector are such that the sector has been pushed to a financially unsustainable position. The interests of government-owned agencies in the sector for a big-bang restructuring solution is as yet questionable. Donors have no doubt set out ambitious plans, but these are long-term in nature.

Our policy solution addresses the short-to-medium-term time horizon and has two aspects. The first is easing supply constraints for existing SME clusters and the second is to provide off-grid solutions for them. The World Bank has plans for a programme to finance mini grids for hospitals and universities, and commercial markets like Ariaria in Aba are already connected via mini grids. However, no policy exists for established SME clusters. We firmly believe that generation and transmission through the grid must remain a key policy target, but a grid-based solution will not have a turnaround time short enough for SMEs.

Not surprisingly, our focus groups discussions (FGDs) and interviews identified high demand for electricity in the SME hubs of Nnewi, Onitsha and Aba, and also in the FCT. However, on average, most of the SMEs in the FCT area received more electricity from the grid than those in the South East and, hence, for the second round of interviews we decided to focus on the South East. Two factors helped us to narrow down our choice. Firstly, SMEs in the South Eastern clusters were already sourcing power through 'informally formal' mechanisms like 'pay-as-you-go electricity'. These are entrepreneurs who invest in large generators to supply electricity to SME units located in a close radius. And secondly, almost 100% of South Eastern respondents reported they had cut down on production due to power shortages. One large SME involved in aluminium fabrication had even outsourced production to nearby Asaba, the capital city of Delta state in the South South region; a large shoemaker who used to export to Togo and Ghana cannot anymore because of electricity-related production constraints; and in South Aba, a large education service provider and exam centre had no grid connectivity at all and depended entirely on generators. However, almost all of the SMEs we interviewed in the FCT reported that they would increase production if they had more power. One of the reasons for this is that the FCT is an emerging SME hub, while the

South East is an established one and the risk of deindustrialisation is therefore greater in that region.

These two factors were also key in helping us determine the choice of the anti-corruption strategy cluster for the sector – namely, aligning incentives (Khan et al., 2019). The crux of the ACE framework is to identify a sectoral, incremental and bottom-up strategy that is likely to have localised support. First, the SMEs in our clusters were facing severe production constraints and the lack of adequate electricity supply was one key reason for this. Second, they had also already devised collective mechanisms to address the problem. While the mechanism of pay-as-you-go power is obviously inadequate, it does evidence support for a collectivised solution for power supply among a broadly powerful community who can be mobilised in their self-interest to support alternative policies. The business owners in our sample, who can be considered representative, have an average of 13.4 years of experience running their operations – this means that they have significant stakes in keeping their businesses running productively and they are also powerful enough as a collective.

The SMEs in the three locations are already clustered into plastics and polythene-making and metal fabrication (Onitsha), shoe-making and tailoring (Aba), and auto part-making (Nnewi). The firms are a mix of formal and informal, and the clusters number between over 85 firms (directly in manufacturing) and 10,000 (indirectly through allied services) in the case of Nnewi and 7,000 in the case of the footwear cluster in Aba (Nwosu, 2017). The leather clusters in Abia state have long been considered productive with historically well-developed inter-firm organisational networks (see Meagher, 2006 for more) and are also export competitive. They also have a strong local market. The polymer and polythene cluster is an emerging one and has the advantage of having access to petro-chemical plants nearby for raw materials. The Nnewi cluster is the most developed (Nwosu, 2017). The advantage of a power generation and distribution strategy targeting existing and productive clusters such as these is that sustained demand for electricity is already likely to exist.

Anti-corruption measures will only be feasible if the suggested policy succeeds in aligning the interests of a sufficient number of powerful and productive organisations to support the enforcement of rules that enable developmental outcomes. Secondary research has revealed that conditions exist to support our suggested measure. A key component of our research was also primary research, based on a series of FGDs and key informant interviews to ascertain the levels of support for a disaggregated generation strategy that would supply power only to nearby clusters. Box 1 outlines the profiles of SMEs that took part in the FGDs. Our findings are encouraging in that all of our respondents reported they would support such a system. Box 2 further outlines some of the major cross-cutting findings from our FGDs, including a very positive response to our strategy suggestion of disaggregated generation.

Box 1: Business profiles of round-one FGD participants

Thirty individuals participated in the first three FGDs organised in May 2018 with Aba and Nnewi/Onitsha business communities (10 participants per FGD). The profile and nature of the participants' businesses consisted of the following:

1 Computer, graphics and printing companies (computer-based test (CBT) centres)

2 Shoe manufacturers

3 Fabricators (welding technicians)

4 Plastic and polythene manufacturers

5 Tailors, cold rooms and ice-block producers

6 Alumaco constructors (aluminium designers)

7 Engine block reborers

8 Laundry services

9 Wood/furniture designers

Box 2: Key cross-cutting findings from FGDs

1 There was a general consensus among FGD participants that the privatisation of NEPA into PHCN and the Enugu Electricity Distribution Company (EEDC) as part of PHCN has been in name only. The view from the business community is that there has not been any positive or visible change in terms of improvement in power supply since the privatisation in 2013. For instance, the power supply from PHCN in Aba, Nnewi and Onitsha has remained the same since privatisation. The only thing that has changed that participants felt strongly about is the continuous increase in tariffs and the significant decrease in power supply.

2 All the businesses in Aba, Nnewi and Onitsha depend on high consumption and stable electricity consumption for operations. Power supply is the single most expensive item in the production process. On average, power supply constitutes 35% of the cost of production of manufacturers.

3 There is enthusiasm for an embedded, disaggregated power supply but participants were clear that they wouldn't pay more than what they currently pay (to EEDC and for generator maintenance and diesel supplies) even if it meant consistent supply.

We decided to extend our research based on the third finding in Box 2 to compare current costs for SMEs with what costs ought to be with grid-based electricity, as well as extrapolating costs by combining various scenarios of electricity usage (i.e., grid-based, legal and illegal, for instance through tapping and legal and black market diesel for generators). For the second round of research we set up interviews with 32 SME owners, as we were probing not just costs but also how the entrepreneurs sourced electricity (which typically also included informal means). Almost all of them provided answers to the three key financial questions for our extrapolation exercise: 1) monthly expenditure on their electricity

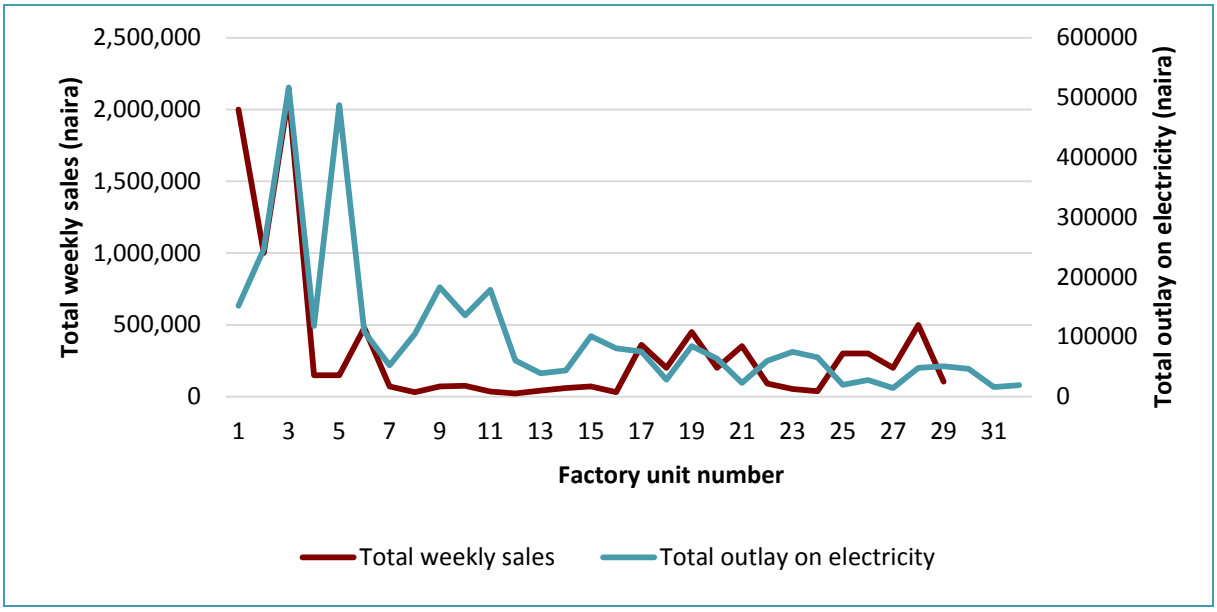
bill from the power company, 2) monthly expenditure on diesel for their generator and 3) the amount spent every month on maintaining their generator.

As was expected, we did not get any responses when we asked participants about accessing electricity by tapping distribution lines. As mentioned earlier, this is a practice where even the EEDC is complicit. However, our only aim in this line of questioning was to compute the cost of sourcing power without which our extrapolation would not work. The aim was certainly not to 'name and shame' because we well understand the constraints many of these SME owners face in keeping their production lines working – electricity shortages being one of the key challenges. In fact, this is an excellent example of how the ACE framework operates. Enforcement-related policies that involve naming and shaming in communities like these are unlikely to work as they will be viewed as adversarial to their interests. Indeed, nor will a 'whistleblower' policy work as most SME owners are likely to have accessed electricity informally to keep operating their machines. This is especially true when a solution – consistent supply of power – is not being provided. However, a solution is much more likely to work if power can be supplied through formal means at competitive tariffs (compared to what firms pay now), given that the incentives to tap or to source diesel on the black market will be weaker. Corruption here is the result of a market failure. Until that is addressed, enforcement is highly unlikely to work.

Table A1 in the annex presents selected characteristics of the sampled SMEs, including: nature of business, number of employees in each factory, number of years each factory has been in operation, estimated weekly sales (revenue), capacity of generator, and number of hours in a week the factories operate. The nature of business is entrepreneurship and includes activities such as shoemaking, metal fabrication, canopy fabrication, tailoring, printing, etc. The size of the factories in terms of number of employees ranges from those without fixed employees (people employed as the need arises) to factories with 20 employees. These factories have been in operation for between 3 years and 30 years. The weekly sales reported by the factories ranges from N22,700 to N2,100,000. However, some factories did not disclose their weekly sales due to reasons of confidentiality. The capacity of generators used by the factories depends on the size and nature of the business. The operating hours in a week range from 45 hours to 144 hours.

Figure 7 below shows total weekly sales revenue and total outlay on electricity reported by the sampled SMEs. The maximum revenue reported was N2,100,000 and the lowest total weekly sales was N30,000. Total outlay on electricity varies from N14,500 to N516,600. As is expected, firms with higher sales have higher electricity consumption with a few outliers.

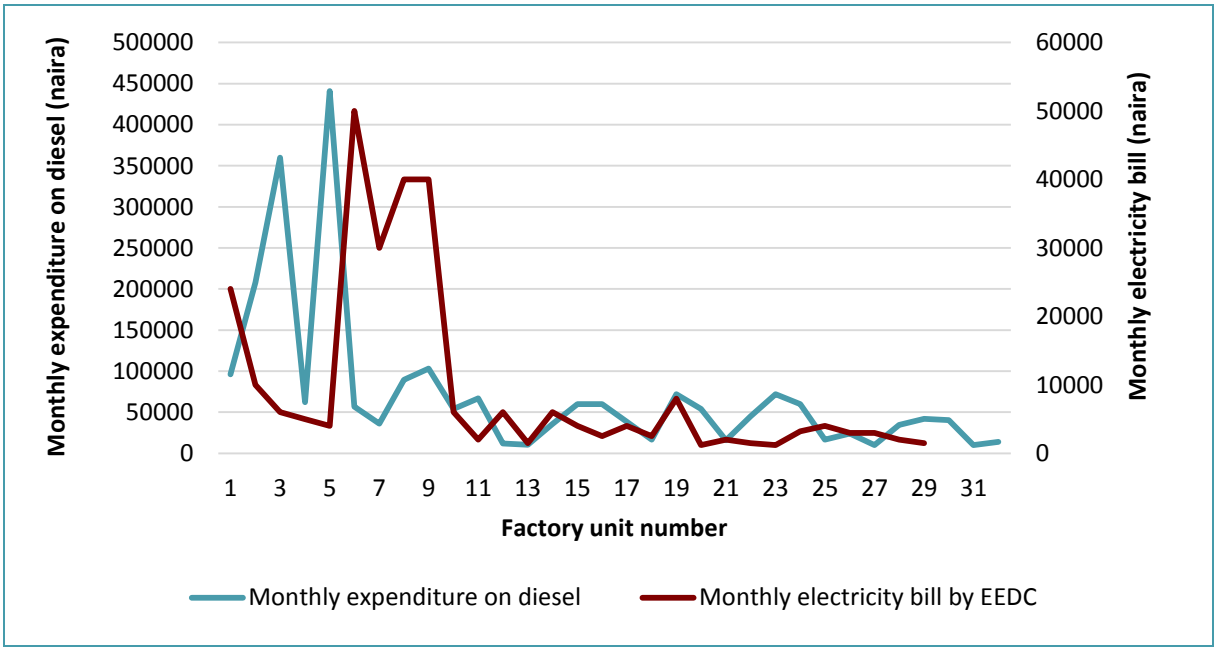
Figure 7: Total weekly sales and total outlay on electricity



Source: The authors.

Figure 8 below shows the monthly expenditure on diesel and the monthly electricity bill provided by EEDC. The highest expenditure on diesel reported was N441,000, while the highest monthly expenditure on electricity provided by EEDC was N50,000. For most firms, power purchases and diesel purchases appear to be correlated because of differences in the activities of firms (some are more power hungry). This is striking as most firms are buying just a little more diesel than they are from EEDC. Even small differences in the share of diesel in the mix raises costs as we see in the last figure in this series (Figure 9), implying diesel-based generation is expensive and inefficient, even allowing for poor supply from the grid.

Figure 8: Monthly expenditure on diesel versus EEDC electricity bill

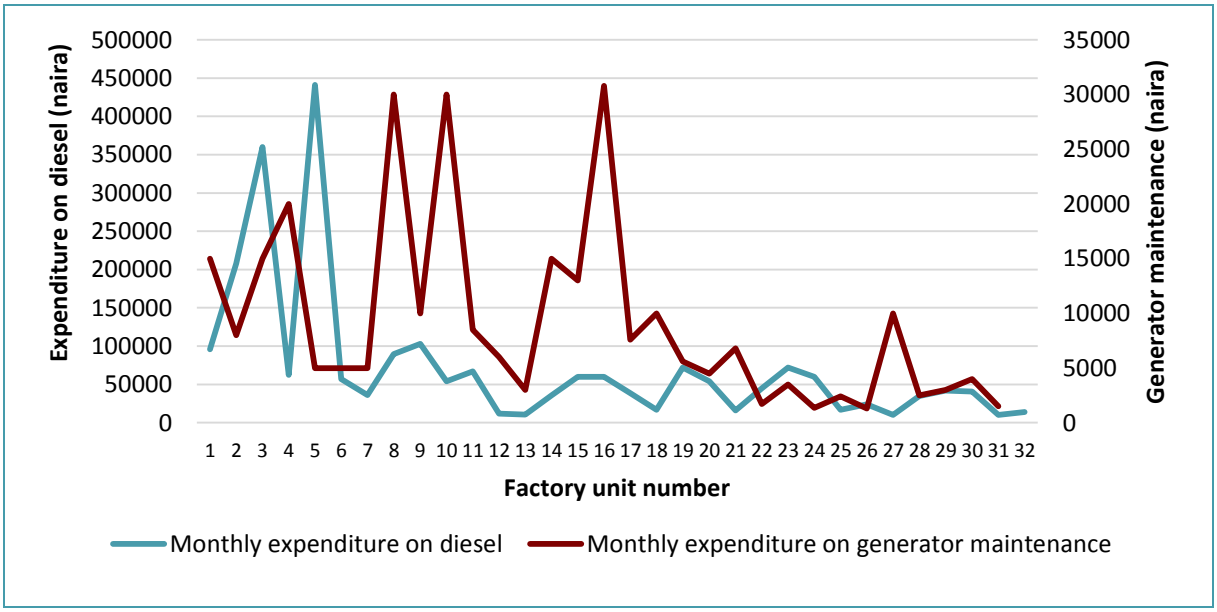


Source: The authors.

Figure 9 below shows monthly expenditure on diesel and generator maintenance. The highest expenditure on diesel was N441,000 while generator maintenance was N30,800. Generator maintenance is often not computed as a cost but, as we see from this graph, it is significant. The IFC report on backup generation referred to earlier conservatively estimates O&M costs to be 10% to 20% of fuel costs, and that is significant (IFC, 2019).

Spending on alternative costs is high not just because of diesel but also because of poor-quality generators. So small firms could have high unit costs of power not because they are buying more diesel, but because they have poor-quality generators which need high spend on maintenance.

Figure 9: Expenditure on diesel and generator maintenance



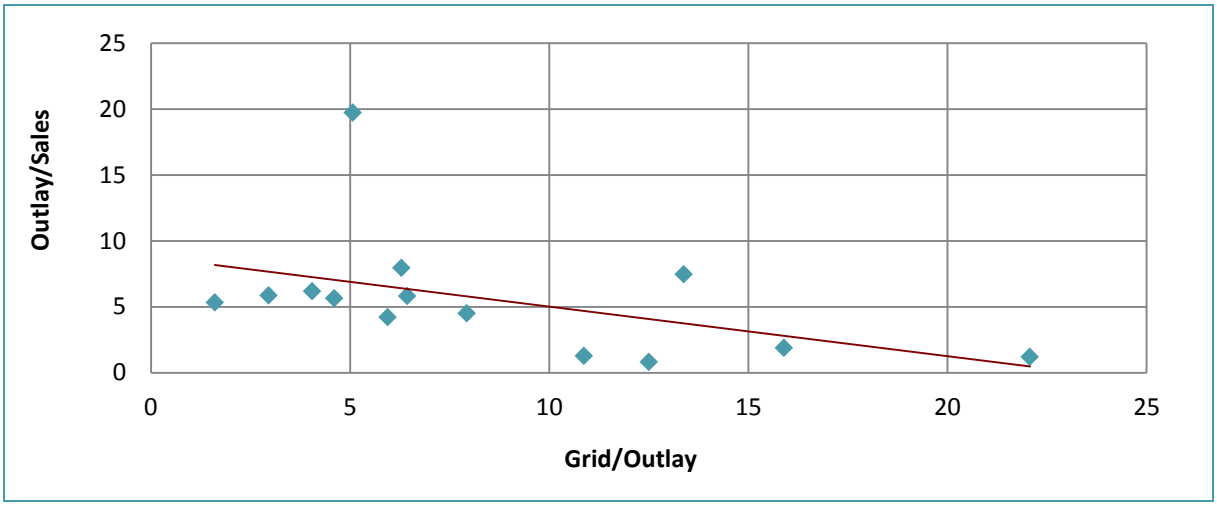
Source: The authors.

In Figure 10 below we consider large firms with sales above N100,000 and with observations for all variables. On the vertical axis (Y-axis), we compute the ratio of power outlay on weekly sales. Power outlay comprises all expenditures related to non-grid power such as weekly expenditures on the following: diesel, generator purchase and maintenance. And grid expenditure denotes weekly expenditure on EEDC (electricity bill). The ratio of non-grid power outlay on sales adjusts for the size of the factories and gives us an idea of the cost-to-revenue ratio for each factory. On the X-axis we compute the ratio of grid on non-grid outlay. This ratio captures the extent to which the factories rely on power from the grid relative to alternative sources (e.g. diesel). A ratio above one means that the factories spend more on EEDC compared to other sources of power and vice versa.

The scatter plot shows an inverse (negative) relationship between the ratio of outlay over sales, and the ratio of grid over outlay. This pattern of relationship implies that, as the ratio of outlay/sales rises, the ratio of grid/outlay declines and vice versa. Except for a few outliers, the rest of the factories show that an increase in expenditure on grid supply over outlay will result in a decline in the ratio of outlay over sales. In other words, an increase in

the use of EEDC (holding other variables constant) will result in a decline in expenditure on cost of power as a share of outlay. Or as expenditure on EEDC increases, less will be committed to expenditure on outlays (e.g. diesel, generators and maintenance). It means that relying on diesel is very expensive and substituting diesel with poor-quality grid supply, even a little bit (everyone uses a bit of both), results in lower total expenditure on power as a percentage of sales.

Figure 10: Relationship between the ratio of outlay over sales, and the ratio of grid over outlay



Source: The Authors.

Our respondents were clear that they would support a disaggregated generation and supply mechanism if the costs were lower than what they currently face. This finding can be further strengthened as the policy space encouraging such moves has now opened up. In 2012, the FGN announced policies that made it possible to create independent distribution networks (NERC, 2012). A more recent policy announcement was made in 2017 for 'eligible customers' that has further helped in devising such solutions (Clyde&Co, 2018). This allows consumers who have a consumption level of at least 2 Megawatt hours (MWh/h) in a month to source electricity directly from a generator rather through a DisCo. These customers also need to be connected to the same distribution network. The policy allows end users to aggregate their consumption to meet this consumption criteria. The SME clusters in our study meet this criterion easily. Technology to address this level of scale is also now available and gas can be used as a feedstock, with availability in Anambra and the recent linking of Aba to the gas transmission network (most of the gas available is in the country's Niger delta in the southern coastal region).

The EEDC tariff that these firms pay is N31.51 kWH (Gershon and Ezurum, 2017). However, typical costs for the formal, and larger, private sector are between N75-80 kWh as they also use other sources of power (Abati, 2020). In Box 3 we look at examples from two of our respondents who shared their total monthly costs on electricity as well as total monthly consumption and it is clear that there is a wide range of tariffs that we can call 'developmental' – that is, a price that has the potential to lower corruption risks as well as costs for SMEs, enhancing both individual profitability as well as net social benefit. This is a

range between what the distribution company currently charges and what the SME owners currently spend on electricity, including on self-generation. This is also the range within which they will be willing to pay and not need to access electricity informally, thus ensuring that a disaggregated, off-grid policy will be self-enforcing (horizontal enforcement) and therefore self-sustaining.

Box 3: Key cross-cutting findings from FGDs

An entrepreneur in the IT education sector in Aba South who isn't supplied by the grid

- Total monthly costs currently, including for diesel and an engineer for his diesel generator: N1,205,000
- Total monthly consumption based on consumption of 32KW for 22 hours every day in a month (during peak periods where he conducts examinations for the government): 19,712 kWh (The entrepreneur is a training provider for exam preparation and this figure is for when there is peak demand for his services)
- Total unit costs currently: N 61.13 kWh
- Current average unit cost on grid with EEDC (if he had been connected): N31.51 kWh
- **Any figure between N61.13 and N31.51 will be developmental for this entrepreneur**

A polythene manufacturer in the Onitsha cluster

- Total monthly costs currently, including payments to the distribution company, diesel for his generator and operations and maintenance (O&M) for the generator: N500,000
- Total monthly consumption based on consumption of 35KW for 16 hours daily and five days a week: 11,200 kWh
- Total unit costs currently: N44.64 kWh
- Current average unit cost on grid with EEDC: N31.51 kWh (Gershon and Ezurum, 2017)
- **Any figure between N44.64 and N31.51 will be developmental for this entrepreneur**

Source: The authors.

Though not for supply to clusters, it is possible to see details of the growing numbers of applications for similar, smaller projects in NERC quarterly reports. However, as experts have pointed out, this could be detrimental to the DisCos. It is important to see that their interests are balanced via compensation like the competition transaction charge being considered by NERC or through wheeling charges when electricity passes through their network from the licensed generator to eligible customers.

5.1. Mind the local political economy

In this research our evidence has established the cost advantage of a grid-based, non-diesel generator-related policy option, as well as qualitatively establishing the willingness to pay on the part of SME owners. However, a complementary line of questioning also offers a cautionary nudge in terms of the non-technocratic issues that need to be kept in mind.

The political settlements framework can be used to analyse the implications of the configuration of power at two levels. One is to describe the broader social order and the other is to analyse the configuration of power relevant for the enforcement of a particular institution or policy (Khan, 2010). As mentioned earlier, one of the reasons why a disaggregated generation and distribution policy might work in well-established SME clusters is because they have well-developed intra- and inter-organisational capabilities. However, these might be the very reasons why local power structures need to better studied. The region has a complex and contested history, Aba being the city where the vigilante group Baksassi Boys emerged, first as an anti-establishment grouping (among shoe producers) which was then co-opted by the political establishment (Meagher, 2006).

The Bakassi-related violence is now well past and some of the early members of the group are successful entrepreneurs today. But suspicion of the formal establishment exists alongside the demand for better formal infrastructure, like electricity supply. In fact, a few of our respondents flatly refused an invitation to travel to Abuja citing that the city and its institutions have seldom been of help to them. Instead, they depend almost solely on their local networks. Therefore, there are significant local informal institutional arrangements that exist and any localised policy, as supplying to clusters will be, needs to be cognizant of these.

While highlighting the need for sensitivity in making policy recommendations for this segment of SMEs, the above situation also makes clear the need for context-specific policy that can help win back some trust. Local unions and trade associations are also important players in this context. Our research suggests mistrust between customers and electricity suppliers is high in some potentially productive areas like in the ones we surveyed. This points towards deploying a more consultative process than one which is purely top-down.

It is also telling that private players such as those we spoke to in the financing sector were wary of committing to projects like this, despite the demand. Interviewees felt the risk-return profile was not favourable for them, precisely because of the local political economy issues and the high transaction costs of resolving them. Hence the difficult but necessary task of creating an 'institutional backstop' that can be a bridge between these different stakeholders. This would be required whether the context is the South East or other locations in Nigeria where clusters exist like in Suleja, Kano or Ilorin. Credible commitment mechanisms need to exist not just in the form of contracts, but perhaps, like a few of our respondents suggested, also through piloting procedures like bill payment that is transparent and builds trust. This could have a strong demonstration effect and help uptake. Once there is uptake of this sort among critical stakeholders – or to use terminology from outcome mapping, the 'boundary partners' – policy is likely to be self-sustaining and, hence, enforceable. By definition, enforcement improves, and outcomes have the potential to be developmental as consistent power helps to improve productivity.

6. Conclusion

The privatisation experience in the Nigerian electricity sector did not go as planned. Most analyses have identified problems of liquidity and technical inefficiencies. However, solving the liquidity crisis needs a longer-term horizon and strategy – it requires capital infusion to overhaul the efficiency of the grid from gas supply through to distribution, as well as debt restructuring to improve liquidity and enable a long-term investment view. Small sums of money will not lead to much impact. Nor will draconian measures like banning the importation of generators, as suggested by a Nigerian lawmaker, solve the crisis on the grid. If anything it will exacerbate the crisis in the sector.

Given our analysis of the configuration of power in the electricity sector, a short-to-medium-term strategy of devising disaggregated generation and distribution solutions for existing, productive SME clusters has more potential to succeed and to deliver high impact. A strategy of realigning incentives in a way that makes enforcement self-sustaining will help to reduce corruption in the sector and, by definition, will improve developmental outcomes.

7. Annex

Table A1: Characteristics of the sampled SMEs

S/No.	Nature of business	No. of employees	Years in business	Estimated weekly sales (N)	Capacity of generator(s)	Total no. of hours of EEDC electricity	Total weekly work hours
1	Shoemaking	6	19	2,000,000	12 KVA	8	78
2	Shoe machines & shoes	20	33	1,000,000	12.5 KVA	7	60
3	Computer-based test centre	20	3	2,100,000	60 KVA	None	84
4	Printing	8	8	150,000	11.15 KVA	5	66
5	Metal fabrication	4	4	150,000	10 KVA	None	45
6	Graphic design, printing & computer training	8	8	480,000	11.15 KVA	1	72
7	Metal fabrication	Hires as needed	30	Undisclosed	9.9 KVA	None	66
8	Tailoring	5	9	70,000	30 KVA	1.5	78
9	Cold room	3	12	Undisclosed	50 KVA	6	84
10	Ice block	2	11	30,000	30 KVA	4	78
11	Industrial shoe services	10	4	70,000	15 KVA	7	66
12	Cold room	5	12	75,000	50 KVA	18	84
13	Tailoring	3	11	36,000	Undisclosed	4	84
14	Barber saloon	2	25	22,700	Undisclosed	0.5	75
15	Tailoring (suits-making)	7	15	42,000	Undisclosed	1	63
16	Tailoring (shirts)	2	7	60,000	Undisclosed		72
17	Lithography & printing	10	25	70,000	10 KVA	4	66
18	Aluminum window fabrication	2	3	30,000	0.9 KVA	Undisclosed	60
19	Oil processing fabrication	1	15	360,000	20 KVA	Undisclosed	72
20	Corn grinding bucket fabrication	4	20	200,000	7 KVA	Undisclosed	54
21	Canopy fabrication	2	5	450,000	20 KVA	Undisclosed	72
22	Canopy fabrication	7	6	200,000	30 KVA	Undisclosed	66
23	Unisex tailoring	4	6	351,000	11 KVA	Undisclosed	84
24	Male tailoring	5	4	90,000	3.7 KVA	Undisclosed	69
25	Female tailoring	2	15	54,000	3.7 KVA	Undisclosed	66
26	Male tailoring	4	6	37,500	3.7 KVA	Undisclosed	57
27	Male tailoring	15	10	300,000	3.7 KVA	Undisclosed	81
28	Military/paramilitary outfitter	3	30	Undisclosed	10 KVA	Undisclosed	66
29	Female shoemaking	3	30	300,000	3. 75 KVA	Undisclosed	60
30	Male shoemaking	3	11	200,000	3.75 KVA	Undisclosed	78
31	Female shoemaking	3	27	500,000	3.75 KVA	Undisclosed	144
32	Male shoemaking	4	6	105,000	0.4 KVA	Undisclosed	60

Note: KVA = kilo-volt-amperes.

Source: The authors.

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Anti-Corruption Evidence (ACE) Research Consortium
SOAS University of London, Thornhaugh Street, Russell Square, London WC1H OXG
T +44 (0)20 7898 4447 • **E** ace@soas.ac.uk • **W** www.ace.soas.ac.uk

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