“Thinking Big” and Reforming Ghana’s Energy Sector

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"Thinking Big" and Reforming Ghana's Energy Sector

"We are in a crisis. Power is a problem in this country and it's an accumulated problem."
Samuel Fletcher, Volta River Authority (Ghanaweb, February 1, 2015)

Abstract

Growing demographic needs, increased urbanization and rural electrification, increasing technology penetration, and the pressure to transform into a middle-income country have led to a rapid rise in energy demand in the past two decades in Ghana. But supply lags behind, and has become a major constraint to growth and improvements in living standards. While Ghana has committed itself to universal access to electricity by 2020, the real challenge is in reaching the capacity to meet this goal; and most importantly, ensuring that supply is adequate and reliable.

This paper addresses the question: Why is Ghana still burdened with periodic energy crises? Some of the problems that have besieged the supply side include: poor policies and poor management, inappropriate pricing and tariff setting, poor revenue collection, poor institutional coordination, and weak governance and regulatory framework. What are the progressive steps that must be taken if Ghana is to set up an energy sector platform that would enable deep-seated transformation? And is the creation of a power ministry the panacea? This paper throws light on these questions and, going forward, highlights a number of issues for consideration, including: (a) the nature of ownership structures that seem to have put higher priority on political objectives than on financial sustainability and efficient operations; (b) the weak governance and regulatory mechanisms of the power sector; (c) under-pricing, incomplete collections, and lower power tariffs; (d) inadequate financing, inadequate investments, and insufficient upgrading of power-sector infrastructure; and (e) the lack of a blueprint in addition to the dearth of long-term and sustainable planning in the energy sector.

1. Introduction

1. Worldwide, a well-functioning power sector is essential for growth and improvements in the quality of life of people. Electricity powers modern society. It lights buildings and streets and runs computers. The widespread use of electric-powered machinery plays major roles in both industrial and household production. Without electricity, economic transformation through enhanced productivity in manufacturing and services, technological innovations, and promoting value-addition in resource-based economies would not be possible.

2. Energy generation in Ghana has gone through several phases: from diesel generators and stand-alone electricity supply systems (owned by industrial mines and factories), to the hydro phase, and now to a thermal complement phase powered by gas and/or light crude oil.[1] With economic growth, increased penetration of technology in everyday life and rising demographic needs, the country—every now and then—has faced the problem of not having enough electricity to meet its growing development needs. The recent energy crisis has taken most Ghanaians by surprise. It should not, because we have been here before, noticeably in 1983, 1994, 1997-98, and 2006-07, with increasing severity. The 2006-07 energy crisis is estimated to have cost GDP growth by about 1.5%.[2] The recent energy crisis threatens not only GDP growth, but also public safety and the prospect of transforming the economy.

3. Much of the contents of this paper is informed by two reports: World Bank's *Energizing Economic Growth in Ghana: Making the Power and Petroleum Sector Rise to the Challenge*, published in June 2013, and *Ghana Constraints Analysis: Partnership for Growth*, published in 2011 by a joint United States and Government of Ghana Technical Team. Except for the creation of the Ministry of Power and the takeover of Ghana National Gas Company (GNGC) by Ghana National Petroleum Corporation (GNPC) in late 2014, the policy and institutional environment that informed both reports is largely unchanged. Rather, what has changed is the noticeable reality and severity of the energy crisis, marked by the frequency of rolling power blackouts and the damage inflicted on the economy. The troubling rationing system, the slowdown in industrial activity, consequent job and income losses, and the disruptions in household life are telling reminders of what now seems to be a perennial drag on Ghana's development agenda. And for a country on the take-off stage into middle-income status, electricity has now become a critical resource and "major constraint on development initiatives, unless the right configuration of supply, availability and accessibility is achieved."[3] It is for these reasons that we believe the recommendations of both reports are worth revisiting, highlighting, and discussing in order to inform policies and decision-making going forward.

4. In the following sections, we outline briefly the state of energy demand and the supply gap, the matrix of supply side challenges, and finally identify some key issues that should be the focus of policy decision-making. But first some background.

[1] This phase included construction of the Takoradi and Tema Thermal Plants and the development of the West African Gas
[2] World Bank, 2007.
[3] USG-GOG Report, Aug 2011, p. 8

2. Background

5. In broad outline, the economic history of Ghana's power sector is filled with crisis management, administrative hand wriggling, and inertia. Reforming and restructuring the power sector has, since the late 1980s, remained exactly what the industry literally has become—a power struggle.

6. Following the drought in 1982-83, it was advised that Ghana restructure the power sector in order to prevent future catastrophe. The road to reform has been slow since. In fact, government dragged its heels and reforms stalled when hydro slowly recovered in the mid to late 80s. It would take another drought in 1993 before government would act. Meanwhile, according to a study published by the Ministry of Energy and Mines in 1996, the domestic demand for electricity rose steadily by about 11 percent per year between 1985 and 1993, and 15 percent between 1993 and 1995. Against this background, and with World Bank prompting, the government established the Power Sector Reform Committee (PRSC) in September 1994. Significantly, it took nearly three years for the PRSC to submit its summary report to government (in April 1997).

7. The first 220 megawatts (MW) of the Takoradi Thermal Power Station (TTPS) was commissioned in December 1997, more than a decade after the 1983 drought. An additional 330 MW was commissioned in 2000. From 1999 through to 2002, hydro generation represented about 75 percent of the overall supply for Ghana. With persistent drought, government was expected to engage independent producers to provide emergency power in 1999 and also in 2000. Even then, according to a World Bank study completed in 2004, the full 330 MW of the Takoradi thermal commissioned in 2000 consistently generated below capacity because of design defects and logistical problems.

8. The World Bank has historically played an important role in this sector and has been instrumental in the reform process. Between 1961 and 1995 alone, the Bank conducted 8 lending operations aimed at reforming the power sector. Critics have argued that while the need for reform is not in doubt, it is the template of the reform that has itself become part of the struggle. Also part of the struggle is the longstanding contractual obligation to the Volta Aluminum Company (known as VALCO), a commitment that arguably subordinates the long-term public interest. The mid-1990s saw a spate of soft reforms as a condition for further World Bank assistance. These reforms included the establishment in 1997 of (a) the Public Utilities Regulatory Commission (PURC) (Act 538) to oversee tariff setting and pricing, and (b) the Energy Commission (EC) (Act 541) to oversee the regulatory environment. Major reforms ensued in 2006, leading to the unbundling of generation, transmission and retail distribution, the establishment of Ghana Grid Company Limited (GRIDCo) and the introduction of Independent Power Producers (IPPs). The Renewable Energy Act of 2011 aimed at encouraging private sector investment with guaranteed prices for electricity generated from renewable energy sources. One thing is clear, unless hit by a crisis, reform has not been the prerogative of the power industry.

3. Ghana's Energy in the Context of Global and Africa Energy Performance

9. Table 1 puts Ghana's energy performance, access and security in global and continental perspective. In the overall category of Energy Architecture Performance Index (EAPI),[4] Ghana lags considerably behind the global top 10 performers. Whilst Ghana's average score of 0.45 is above the SSA average of 0.28, it lags considerably behind the global average of 0.84. Ghana's energy access and security ranked 105 out of 124 countries assessed in 2013. Noteworthy, while Ghana has made considerable strides since 2000 in terms of growing and modernizing the economy, electricity production per capita has declined. Ghana's installed generation capacity of 132MW per million population in the mid-2000s fell short of of 797MW per million among middle-income African countries.[5]

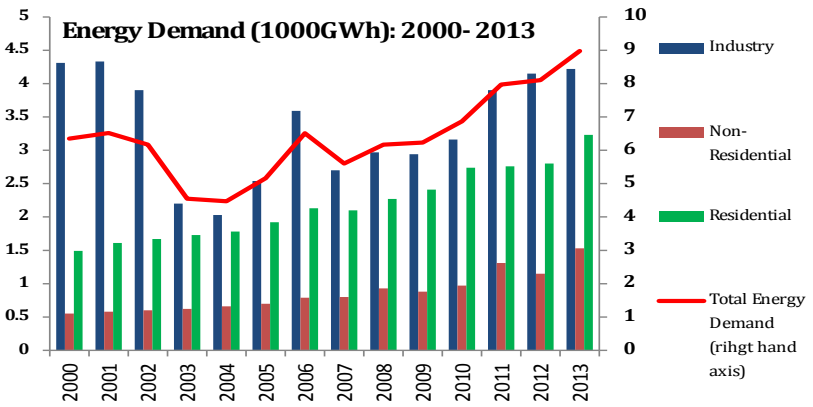
Table 1: Ghana versus Global Top 10 in Energy Performance and Energy Access and Security: 2013

Country	Energy Architecture Performance Index (EAPI) 2014		Energy Access and Security Basket	
	Score	Rank	Score	Rank
Norway	0.75	1	0.96	1
New Zealand	0.73	2	0.85	5
France	0.72	3	0.81	18
Sweden	0.72	4	0.85	6
Switzerland	0.72	5	0.82	14
Denmark	0.71	6	0.88	3
Colombia	0.7	7	0.84	7
Spain	0.67	8	0.78	30
Costa Rica	0.67	9	0.77	35
Latvia	0.66	10	0.77	36
Ghana	**0.45**	**83**	**0.42**	**105**

Source: The Global Energy Architecture Performance Index Report 2014, World Economic Forum. Ranking out of 125 countries.

4. The Demand Composition, Trends and Forecast

Figure 1: Historical Electrical Energy Demand, 1992-2012



10. Growth in total energy demand has more than doubled between 2003 and 2013. While industrial demand spiked in 2000-2002 and again in 2005 and 2006, it declined sharply in 2007 in the aftermath of the 2006/07 drought-driven energy crisis. Annual change in industrial demand has

[4] The EAPI is a composite index that measures the performance of global energy systems across 3 areas: economic growth and development, environmental sustainability, and energy access and security. The EAPI ranges from 0 (the least efficient) to 1 (most efficient). The 2014 measure is out of 124 countries (World Economic Forum, 2014).

[5] USG-GoG technical Report 2011, p. 58

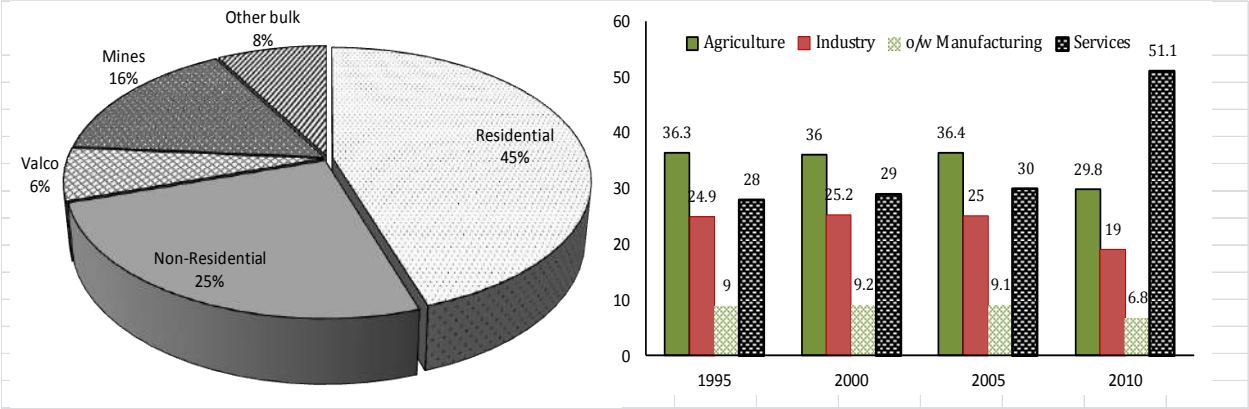
since risen modestly between 2008 and 2011, but fell off sharply to 1.7% in 2013 (Table 2). From a low base in 2000, annual non-residential demand growth has risen from an average of 9% in 2000-2010, nearly doubled to 16.5% in 2010-2013, and doubled again to 33% in 2013. Residential demand growth has increased overall by 6.2% per year during the last decade, but that rate more than doubled in 2013 alone per Table 2.

11. The following patterns emerge from Table 2 and Figure 2. The rapid growth in the services sector as a source of economic growth from 29% of GDP in 2000 to 51% in 2010 in part explains the growth in electricity demand since 2005. That growth has been fueled by expansion in information and telecommunication, business services and innovation in the delivery of financial services, all dependent on energy availability. The decline in industry demand is also explained in part by the diminishing share of industry and specifically manufacturing in GDP; industry declined from 25% in 2000 to 19% in 2010 and manufacturing from 9% in 2005 to 6.8% in 2010. Increasingly, Ghana's retail electricity supply has a predominantly residential and non-residential customer base (about 70%). This has implications for pricing, revenue generation and the cash flow to make the industry financially viable.

Table 2: Average Annual Percentage Growth in Demand

	2000-2010	2010-2013	2013
Industry	2.2	9.7	1.7
Non-Residential	8.9	16.5	33
Residential	6.2	7.8	15.4

Figure 2: Approximate Shares of various groups in Electricity Use: 2013 and Sectoral Contribution to GDP



12. Various consumption forecasts exist. In 2014, the Energy Commission forecasted that peak load demand would range between 1,900-2,200MW against the system peak load transmission of within 2,200-2,300MW. From the 2010 demand of 1,506MW, Ghana's requirement was expected to hit 2,764MW in 2015. Unmet demand in 2013 was projected to be within a 240-330MW thermal equivalent. With growth rates in demand of between 6-7%, the projected demand would reach between 3,598-3,898MW. The World Bank Report forecasts about an additional 2,400MW of generation capacity by 2020, which would require more

than doubling Ghana's generation capacity from 2012, subject to an average GDP growth of no more than 7% per annum.

5. Supply Capacity and Trends

13. The supply mix as of January 2015 shows hydro providing 52% of power needs and the rest from thermal, of which 20% can run on gas only and 80% on dual fuel generator (gas and light crude oil).

Table 3: Ghana's Installed Generation Sources as of January 2015

VRA Hydro	47%
VRA Thermal	36%
VRA Solar	0.1%
IPP Thermal	12%
Bui Hydro	5%

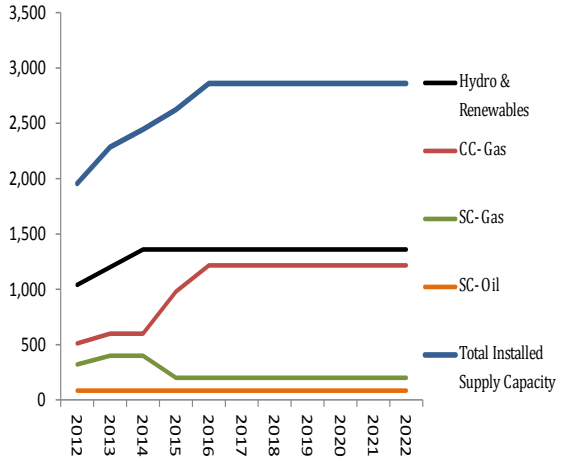
Table 4: Projected Electricity Generation: 2011 – 2013

Generating Station/ Plant	Nameplate Capacity, MW	Dependable Capacity, MW
Hydro		
Akosombo	1,020	900
Kpong	160	140
Bui	400	342
Thermal		
TAPCO	378	300
TICO	252	200
TT1PP	126	110
TT2PP	49.5	45
MRP	85	80
T3	132	120
Sunon-Asogli	220	180
CENIT	126	110
Embedded Generation		
Genser Power - IPP	5	2.1
Renewables		
Solar	2.5	1.9
Total	**2,956.0**	**2,531.0**

Poor rains, especially during the past five years, betray the historic dependency of Ghana's hydro power generation with Akosombo, Kpong and Bui's installed capacity of 1020, 160 and 400MW, respectively (Table 4). The result is that these plants operate under-capacity often as low as 75 percent.

Figure 3: Installed Capacity

Installed Supply Capacity (MW); Expected 2012, and Projected 2013-2022
Legend: CC-Combined Cycle, SC- Single Cycle

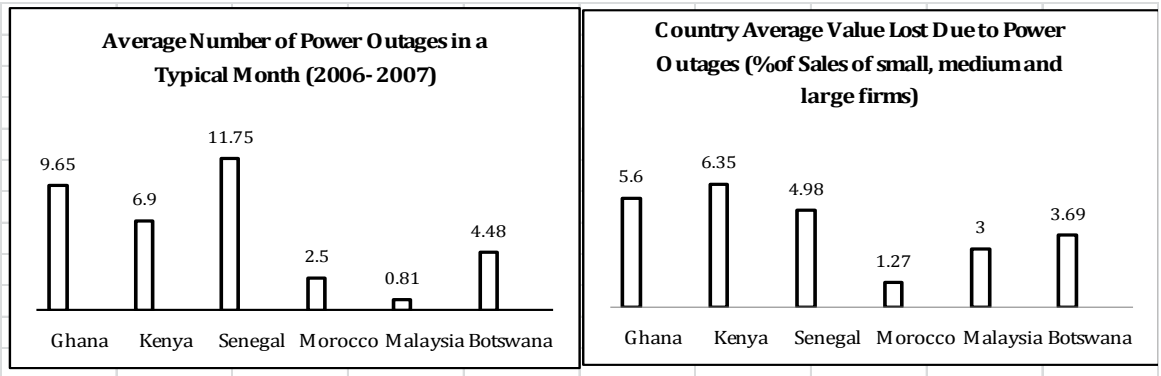


14. For a country with installed capacity of 2,956MW (currently estimated to be about 2,846MW), even routine maintenance shutdown will exacerbate the supply-demand gap. As we see in Table 4, the supply-demand gap is much greater if projected energy generation falls short of installed capacity. The lack of adequate reserve margin in capacity requirement forecast often by the Volta River Authority (VRA) does not augur well in highlighting the potential shortfalls of electricity supply. The forecast of demand and available generation capacity with a 20% reserve margin (from 2012 to 2022) reveals significant deviation between forecast figures and projected installed capacity, calling for huge investments in generation mix.

6. Economic Cost of Failure of Electricity Supply

15. Power failures cause significant direct and indirect costs to utilities, consumers, and the general economy. According to World Bank estimates, the direct cost of power outages to African nations is typically about 2% of GDP. "For reference, Ghana's GDP growth averaged about 5% between 2000 and 2010, meaning that power unreliability in those years negated a significant amount of potential economic growth. The World Bank again estimates that Ghana's nominal GDP as of 2008 was approximately $16.1 billion, meaning that power outages potentially cost the economy more than US$320 million per year."

Figure 4: Duration of Power Outages and Value Lost Due to Power Outages: Comparators



16. This amount (US$320 million) was more than enough to fund the activities of Ghana Grid Company Limited (GRIDCo), the national transmitter, from 2010 to 2016 and to ensure its efficient performance to consumers. Supply interruption imposes substantial cost on households because of damage to appliances

and the spoilage of food, and compromises public safety in the delivery of health care services, often with tragic consequences. And the greater the technology penetration into economic activities, the greater the economic losses. Direct costs to utilities, among other things, include cost of repairing damaged equipment, process restart costs; generation revenue losses, and reduced equipment's life span.

17. Figure 4 shows the duration of power outages and the estimated value loss for selected countries in lower- (Kenya and Senegal), middle- (Morocco), and upper-income (Botswana and Malaysia) brackets. Ghana's average number of power outages during the 2006-07 crisis was twice that of Botswana, four times of Morocco and 12 times more than Malaysia. Ghana's value lost of about 5.6% is only marginally exceeded by Kenya's 6.3%. The opportunity cost related to loss of sales and revenue, the cost of doing business resulting from uncertainty, as well as the cost of on-site power equipment such as generators and uninterruptible power supplies have ripple effects on households and businesses. They unnecessarily increase cost, and reduce income and profitability with adverse effects on government revenue targets.

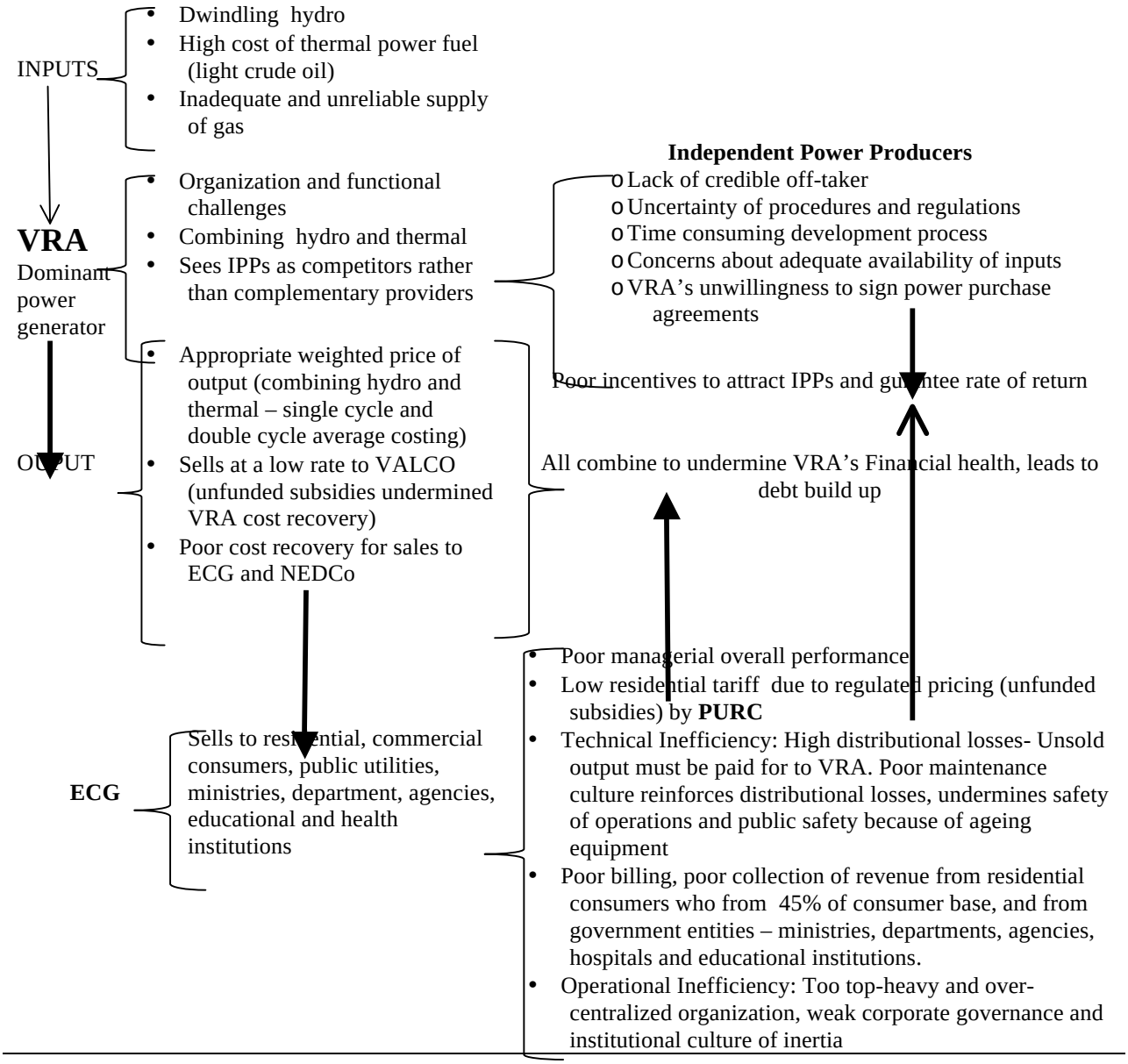
7. Ghana's Power Industry Challenges

Apart from policy inertia, the major challenges confronting the industry can be summed up simply in the growing demand and supply inadequacy and unreliability. But poor pricing and the complex web of organization and institutional bottlenecks have been no less contributory factors. We highlight them in turn.

18. On the demand side, the major challenges are in the growing demographic needs in health delivery and education institutions, increased urbanization, rapid rural electrificaton, and increased penetration of technology in everyday economic activities from home to the office. Then there are also illegal connections, and problems of metering, billing and collection. While the first group of factors are to be expected as a result of population growth and increased standards of living, the latter group of factors work against the capacity to generate revenue. In addition, the predominantly residential and non-residential customer base (70%) of the power industry, as high energy sensitive production activities (manufacturing and mining) dwindle, makes eonomic pricing, strong billing, and the collection system critical to the financial viability of the industry.

19. Electricity pricing has been kept in check by government or in recent years by regulators. Pricing for end users does not reflect the cost of inputs nor the reality of the changing mix of the inputs away from the relatively cheaper hydro to gas and light crude oil. Inappropriate pricing coupled with unfunded and weak targeted subsidies to consumers have harmed the financial health of the Electricity Corporation of Ghana (ECG), which supplies the bulk of electricity at the retail level. A poor residential address system and weak billing of the residential customers who consume nearly 45% of the electricity supplied means that it is the easily identifiable commercial customers (25%) who bear the burden as the source of the bulk of ECG revenues.

Figure 5: MATRIX OF SUPPLY SIDE CHALLENGES



20. On the supply side, there are two types of challenges: inadequate supply and unreliable supply. Accounting for the inadequate supply are the low investment in generating capacity; inability to attract independent producers because of low incentives; poor governance and regulatory framework, and bureacratic road blocks; dwindling hydro capacity; and the inability to increase the supply mix. Moreover, input tariffs have generally lagged behind actual cost and, together with poor pricing at the user end, compound the financial non-viability of the existing system for both generating and distribution companies. Not only is production per capita falling, high transmission and distribution losses cause the effective supply to fall significantly short of the prduction capacity that is available.[6] Unreliable power supply has its origins in

[6] USG-GoG Technical team Report, 2011.

the lack of maintenance of generating, transmission, and distribution facilties, and the poor performance of ECG as the primary retailer.

21. Ghana also has some independent power producers (IPPs). However, the system for attracting new IPPs appears not to be working properly. Currently, concerns about the assured availability of gas for power plants are a major barrier for potential IPPs. Ghana may not have access to adequate supplies of gas for power generation until 2015, or possibly even 2018. Additionally, the governance and regulatory framework does not attract IPPs. For a start, potential IPPs lack a credible buyer because ECG, the usual offtaker, is in dire financial health; and there are legitimate concerns about its ability to pay power producers. There is also uncertainty about procedures and regulations. Lastly, the IPP development process is cumbersome and time consuming because Ghana does not have a single-window system for IPPs. It is necessary that the Government takes steps to remove these barriers to IPPs in power generation. The sector Ministry (now Ministry of Power) should lead the process by appointing a full-time, high-level IPP coordinator to take on this task, in conjunction with the Ministry of Finance's (MoF's) Public Private Partnership unit.

22. With VRA as the dominant actor on the supply side, Figure 5 above summarizes the nature of the challenges on both the inputs side and the output side and, together with the challenges of ECG and the Northern Electricity Distribution Company (NEDCo), reinforce each other in a vicous circle of a financially unsustainable system.

8. Key Issues for Discussion

23. According to industry experts, Ghana's energy challenges have their origins in the following:

- Dependency on one source (hydro) of generating electricity and poor supply mix
- Ownership structures and enhancing generating capacity
- Weak governance and regulatory mechanisms of the power sector
- Financial losses due to years of under-pricing of energy, incomplete collections, and lower power tariff on the supply side
- Inadequate financing of major producers and inadequate investments and upgrading of the power sector infrastructure
- Inadequate energy efficiency improvement initiatives and dearth of conservation measures
- Lack of blueprint in addition to the dearth of long-term and sustainable planning in the energy sector
- Unfunded VALCO subsidies

24. The persistence of these problems underlies the recommendations of World Bank power sector reports in 2005 and again in 2009, as summarized in Box 1. Much of the recommendations are as valid in 2015 as they were a decade ago, suggesting that even a gradual adoption would have led to a more efficient and effective power sector today.

Box 1: Findings of Previous World Bank Reports

Findings of 2005 World Bank Report

- Enhancing efficiency in all aspects of the sector is the key challenge before Ghana's policy makers.
- The sector institutions are caught in a downward spiral of below-potential performance, low resource mobilization and underinvestment, and mounting arrears of payment between sector entities and government entities.
- Timely implemtnation of power sector reforms is critical.
- Measures to promote efficient use of assets are vital.
- Efficiency issues are most pressing in the distribution sector.
- Valco subsidies sould be transparent and must be funded by government.

Key Issues in 2009 Brief by the World Bank

- Valco is negatively impacting the financial viability of the sector.
- Much of the country's high-voltage transmission system is aging badly and increasingly unreliable. The risk of outages is significant and will continue to rise.
- The electricity distribution subsector suffers from poor commercial and operational performance. High losses are due to overloaded networks, combined with problems of metering, billing, theft and inadequate revenue collection.
- Weak management and regulation of the electricity sector by the government remains a key issue.

World Bank Report, June 2013

While the problems listed above are vital, we focus on five of them for elaboration and discussion in light of current elevated policy concerns and the matrix of supply challenges captured in Figure 5.

(a) Ownership structures and enhancing generating capacity

25. Lack of a credible off-taker. The current structure of the power sector provides for the licensing of "bulk customers," who are free to procure their power needs directly from wholesale suppliers via transmission services provided by an Independent System Operator. The potential off-takers of power are ECG, NEDCo, the mining companies, and other licensed bulk customers. In Ghana's first Independent Power Provider (IPP) project, VRA had the dual role of both owner and off-taker. This dual role was rationalized on the basis that the purpose of the project was to complement hydro generation, and enable the country to optimize the yield from hydro and non-hydro sources. However, VRA has since been unwilling to sign power purchase agreements (PPAs) with IPPs, because it regards IPPs as competing rather than complementary generation entities.

26. The reality is that only ECG, and no other potential buyer, has signed a PPA to off-take power from any of the IPPs. Three out of the four PPAs underpinning IPP development in Ghana have ECG as the offtaker, and one has VRA as the concurrent co-owner and offtaker. The IPPs that have attempted to enter the Ghanaian market have reported difficulties in securing PPAs with other organizations.

27. Recommendations: *Government should take steps to create a more attractive environment for IPPs: (a) ensure credible off-taker arrangements, streamline procedures and regulations of IPPs, and minimize the time-consuming development process; (b) appoint top-notch technical*

advisor on IPPs in the new Power Ministry; and (c) designate a full-time high-level IPP facilitator to lead open competitive solicitation and contracting.

(b)Years of under-pricing of energy for final users and lower power tariff on the supply side

28. ECG's commercial performance needs improvement. On account of low residential tariffs, the bulk of ECG revenues come from non-residential consumers, who account for 56% of sales revenue, even though they account for only 12% of ECG's unit sales. This implicit cross-subsidy imposes a significant burden on commercial customers.

29. Considering the fact that PURC has failed to increase retail tariffs, ECG was reported to have incurred losses of US$44 million in 2012, and US$60 million in 2013. As noted in the 2009 World Bank report (Box 1), ECG's losses are worsened by high technical losses; poor revenue collection, from both Government entities and private consumers; and rising dollar-denominated payment obligations. Tariff policies that provide subsidies to consumers have harmed the financial health of ECG and NEDCo.

30. Subsidies and pricing. Going forward, a financially sustainable power sector requires that the price of electricity allows for full cost recovery across the entire value chain. Nonetheless, for a long time, prices paid by consumers of electricity have been below the cost of supply. The relatively low tariffs have made the sector unattractive to private investors. Since 2004, Government has spent nearly US$900 million on fuel subsidies for VRA. This is more than the cost of building the Bui Dam. Refocusing this expenditure on infrastructure would have been of much more value in the long run.

31. Gas pricing. Despite the fact that the underlying principles of Gas Pricing Policy were endorsed by Cabinet in mid-2012, based on a detailed study carried out by international consultants, Government has not yet published its Gas Pricing Policy. The study advised that gas pricing should reflect gas supply allocation priorities between different market segments, such as power generation, petrochemicals, etc. It also established benchmarks for maximum supply costs in the various market segments and minimum gas prices for associated and non-associated gas.

32. Recommendations: (a) *Given the inevitable rise in the real cost of inputs (gas or crude oil) because of the decline in hydro and the rise in thermal power, electricity consumers should be expected and must be made to pay higher costs; (b) financial provisions should be made for life-line subsidy regimes through tax expenditures in the budget; (c) VALCO should pay the same tariff for electricity as other large users or government must finance VALCO subsidies through the budget; and (d) a cost-reflective bulk electricity pricing mechanism with timely indexation should be put in place.*

(c) Inadequate collection and poor payment culture of public institutions

33. Poor Collection. In January 2015, the new Power Minister inaugurated a Task Force to collect arrears of about GHc500 million owed ECG. As noted in the 2005 Report (Box 1), the relatively poor financial health of ECG and NEDCo stems markedly from the poor payment culture of Government institutions as well as private consumers. To minimise the poor payment culture, ECG must accelerate the installation of prepaid meters at the premises of consumers. Also, severe punitive measures must be put in place as a deterrent to the theft of electricity through bypassing of meters.

34. The unworkable clearinghouse mechanism. A cross-debt clearinghouse arrangement was established to manage the inter-utility and Government debts comprising of VRA, ECG, NEDCo, and Ghana Water Company Ltd., with Government represented by Ministry of Finance (MoF). The clearinghouse was expected to meet quarterly to reconcile the cross-indebtedness of the participants and net off such debts where appropriate. This arrangement, however, has not been effective, primarily because there are no means of enforcing payment expected from the net debtors.

35. In so far as the MoF held no settlement balances for any of the institutions, and given the way that central banks make interbank clearing enforceable, the clearinghouse mechanism had to rely on voluntary compliance. Failure meant that VRA, which has over 80% of its revenues coming from these other clearinghouse members, is constantly owed, with a build-up of receivables. MoF suspended the clearinghouse mechanism in 2012, but no alternative payment system has been put in place. The debt levels and the matrix of receivables of the utilities have negative consequences for the utilities' operations and financial viability. While necessary, clearance of state arrears by the Government is not sufficient in the absence of better arrangements to prevent recurrence of the arrears.

36. Recommendations: *(a) Government entities (ministries, department, agencies, educational institutions, and health facilties) and public sector utilities must pay the amounts owed to ECG as soon as possible, and (b) Government should reassess the clearinghouse mechanism by setting up a task force to institute direct payments of bills to ECG, including educational and health institutions. (c) These apply equally to NEDCo to the extent that it too faces the same problems in collecting from government institutions.*

(d) Inadequate financing, investments, and upgrading of the power sector infrastructure

37. Recent estimates suggest that Ghana ought to be bringing on-stream about 200MW of new capacity every year at a cost of US$200 million in investment. Cumulatively, Ghana needs at least US$2 billion in the next decade to meet this goal. Add to this need, the past investment deficit and upgrade of power sector infrastructure, and total investment of about US$4 billion in the next 10 years is not unthinkable. Generation, transmission, and distribution all need substantial upgrading, and the necessary investments must take place in a way that addresses the fundamental building blocks of the industry to ensure sustainability. The reality of course is that without adequate gen-

eration capacity and reliable distribution networks, electricity would not be available to subsidized consumers and the rate of rural electrification would be hardly meaningful. Public funding alone is far from adequate to meet the generating need.

38. **Recommendations:** *(a) Large-scale private sector investment is essential to generation. (b) The least government must do is to clear its arrears in payment to the utility companies. (c) Realistic pricing and tariff setting for inputs are necessary to attracting private investors who need the assurance that the needed cash flows would be available to make their investments in generation viable. (d) The inefficiencies in the power sector must be mitigated and the financial "health" of ECG and the assurance of reasonable return on investments enhanced. (e) Investments in generation capacity may also be aided by renovations in the transmission system to reduce losses, which also require massive investments.*

(e) Lack of a blueprint in addition to the dearth of long-term and sustainable planning in the energy sector

39. GRIDCO is well suited for preparing the indicative medium- and long-term plans for power generation capacity requirements, as it is a well-run transmission company, and the only power utility that is currently financially viable. Functionally, EC would still maintain responsibility for indicative planning for the energy sector as a whole.

40. The EC remains responsible for the entry of the private sector into the industry, and for preparing, reviewing, and updating periodically indicative national plans to ensure that reasonable demands for energy are met. So far, the current approach has not successfully delivered results in these crucial areas of the power sector. Integrated power sector investment planning has been neglected and carried out in a piecemeal manner by different stakeholders apart from the EC, which has not assumed the leadership expected of it.

41. There is a gap in the power sector with respect to sector planning and development, primarily because of lack of sharp delineation of the roles of EC, GRIDCo, and the sector Ministry (then Ministry of Energy and Petroleum). Therefore, there is a need to define clearly the relationship between EC and the sector Ministry (now Ministry of Power), given that a key function of the EC is to advise the Ministry in the formulation of national energy policies. In the past, both parties have been dissatisfied with their interactions—the Ministry felt that EC had not delivered timely and useful advice, while EC felt its services were insufficiently called upon.

42. Recommendations: (a) *There is the need for a clear delineation of the roles and interaction among these institution. (b) The EC would be best suited to carry out indicative planning related to national energy needs as a whole, because this has to take into consideration the possible effects of the interplay of demand or substitution between various energy sources. (c) GRIDCo's responsibility for preparing indicative medium and long-term plans for power generating requirements should be formalized. (d) Bui Power Authority should be merged with VRA, while (e) the separation of thermal from hydro into separate entities should be reassessed.*

9. Going forward

43. The future of power mix – Ghana gas: Ghana's power mix is changing away from hydro to thermal. Considering that Ghana's power demand is increasing at a rate of 10% yearly, it is prudent to explore all potential power sources, including LNG, solar (for concentrated solar power), landfill gas, and nuclear. At best, Ghana Gas can supply gas that can generate 500 MW, which could raise Ghana's installed capacity from about 2,900 MW currently to about 3,400 MW, but still short of the expected installed capacity of 5,000 MW in 2016.

44. Future of WAGP and challenges of imported gas: Ensuring adequate and secure supply of natural gas is fundamental to improving the availability and affordable cost of power to both VRA and IPPs. Ghana has two different gas resources to turn to: domestic gas resources and Nigeria. However, intermittent supply interruptions on the West Africa Gas Pipeline (WAGP) have often led to acute near-term gas shortage. The recently agreed increase in the price of gas from WAGP may trigger the supply of relatively high volumes of gas from Nigeria. This expectation, however, may only materialize if other factors—such as militancy in the Niger Delta of Nigeria and efficient functioning of the value chain in the extraction, transmission and delivery of gas to Aboadze and Sunon-Asogli power plants—are normalized.

45. The New Power Ministry: Two major issues that are expected to impact markedly the organisational dynamics of the power sector are the creation of a new Ministry of Power in December 2014, and the conclusion of agreements with the Millennium Challenge Corporation (MCA) for a US$500m investment in the energy sector. The new Ministry should accelerate reforms urgently needed, especialy to ECG in its operational, technical and management efficiency. Further, the Ministry should bring about a sharper focus on the generation, supply, and efficiency of power to match economic growth.

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