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Transforming Africa's Trade

African Export-Import Bank
Banque Africaine d'Import-Export

Development Impact Evaluation of Geometric Power Aba Project in Nigeria

Afreximbank Catalysing Trade and Investment Opportunities with Groundbreaking Integrated Energy Project in Nigeria

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Acronyms and Abbreviations

AfCFTA	African Continental Free Trade Area Agreement
APLE	APL Electric
BPD	Barrel per day
CEMS	Continuous Emission Monitoring System
GDP	Gross Domestic Product
GPAL	Geometric Power Aba Limited
GP	Geometric Power
IEA	International Energy Agency
IPP	Integrated Power Project
MW	Megawatts
MMscf	Million standard cubic feet
NERC	Nigerian Electricity Regulatory Commission
NNPC	Nigerian National Petroleum Corporation
PHCN	Power Holding Company of Nigeria
SPDC	Shell Petroleum Development Corporation
TDIA	Trade Development Impact Assessment
ToC	Theory of Change
UNCTAD	United Nations Conference on Trade and Development

Executive Summary

Nigeria is one of the biggest economies in Africa and has the potential to play a more active role in the global economy. Actualising this potential will depend largely on the degree to which it can achieve industrial development and create the conditions for long term sustained growth and development. However, insufficient access to affordable and stable power supply in the country remains a significant barrier, undermining the competitiveness of local industries, reducing manufacturing capacity utilisation, hindering firm growth (particularly small and medium enterprises, SMEs), and impeding overall economic growth and development[1].

Electricity is a major input for manufacturing industries. The Nigeria's national grid, generating less than 5,000 MW, has often been unable to meet the demand of 40,000 MW, resulting in frequent and prolonged power outages. The lack of reliable power has rendered raw materials unusable and forced many industries and businesses to rely on expensive and polluting diesel generators, adding to operational costs and environmental issues. Consequently, these factors have caused substantial financial losses, depleting the factories' capital. Efforts to reform the power sector have aimed to bolster generation capacity, modernise transmission infrastructure, and improve distribution efficiency. Nevertheless, these endeavors have frequently faced setbacks due to insufficient investment.

The Geometric Power's (GP) Aba Integrated Power Project (Aba IPP) offers promising prospects for Aba, the industrial hub of Abia State, and one of the most commercial centres in Nigeria and West Africa. As the first integrated power generation and distribution company in Nigeria, it has the potential to provide reliable and affordable 24-hour electricity. The power project comprises a gas-fired embedded power plant with General Electric Gas Turbines of 141MW initial capacity, to be upgraded to its licensed 188MW capacity and beyond. The installation of three gas turbines with a total of 141 MW capacity was completed and commissioned in February 2024.

This Development Impact Evaluation Report measures the success of the Geometric Power Aba Project, its expected development impact on Aba, Abia State, and Nigeria and the challenges and opportunities the project presents for future private sector engagement. It draws lessons and provides recommendations for ongoing and future power generation and distribution infrastructure interventions. The evaluation applies quantitative and qualitative approaches, and development impact and policy-relevant scenarios and projections in the description of a possible impact of the project, which received the support of Afreximbank. To establish evidence of the project's expected impact, the evaluation also considers the counterfactual element, which is defined as what would have happened to the same industries and businesses at a similar time had the project not been implemented.

Main Findings

On the upside, By end of 2024, one turbine of 47 MW of power plant operating at full capacity daily generates about 1.1 million kWh of electricity, with 10 million standard cubic feet of daily gas supply, providing uninterrupted power to 48,732 households, businesses and industries in Aba. By 2030, Abia State will become the first to attain self-sufficiency in electricity with almost 500 MW of power produced per day. By 2032, Nigeria national grid receives excess power from GP, with more than 1000 MW of power generated.

i. **Impact on manufacturing output and economic growth:**
The project is expected to reduce the power outage costs for manufacturing firms in Aba and Abia State by US$1.3 billion annually and increase the State's manufacturing output by US$707 million, equivalent to 8.1 percent to its GDP by providing stable and affordable electricity to industrial and commercial entities. Moreover, it is anticipated to attract 2,000 new industries in the metro and provide essential electricity supply to unlock the full potential of the Enyimba Economic City, thereby contributing significantly to local economic development.

[1] Seventy-one percent of Nigerian industries generate their power, further acknowledging the poor state of electricity supply in Nigeria (Osakwe, 2017). Evidence from the World Bank 2021 energy progress report also shows that Nigeria has the largest electricity gap in the world.

ii. **Impact on employment:** At full operational capacity, the project could generate up to 3,000 direct jobs, with additional 300,000 indirect employment opportunities expected across various sectors due to increased economic activities supported by reliable power supply, reducing the country's unemployment rate by 2.6 percent.

iii. **Impact on fiscal revenues and budget:** The increased economic activity and productivity resulting from improved power supply are projected to generate additional government revenue for Abia State amounting to US$84.8 million each year, improving the country's budget deficit by 1.13 percent while transforming the State's budget, which currently faces a deficit of US$25.37 million, into a surplus of US$59.5 million.

iv. **Impact on SMEs and business opportunities:** The project will benefit 28,778 Nigerian SMEs that are involved in production and create opportunities for the establishment of more trading shops and retail outlets. It will also create opportunities for the development of road infrastructure, improvement in local services including enhanced water supply, schools and healthcare facilities, a boost in agricultural productivity due to a more reliable power supply, as well as increased support for rural electrification programs and enhanced tourism and leisure opportunities.

v. **Impact on infrastructure development:** Afreximbank has supported the development of critical infrastructure through its financing of the Geometric Power Aba Project. This includes the construction of a 141 MW gas-fired power plant equipped with advanced GE LM6000PD gas turbines and associated distribution infrastructure. This infrastructure modernisation not only addresses the immediate power needs in Aba but also sets a precedent for integrated power generation and distribution projects in Nigeria.

Overall Assessment

Relevance: Project objectives and outputs were generally consistent with the Abia State and Nigeria government's development strategy and Geometric Power business strategic plans as well as Afreximbank's Industrialisation and Export Development strategic pillar. Thus, the assistance to GP by the Bank is considered highly relevant to the country's overall development needs and GP institutional development as well as the Bank's development objectives.

Effectiveness: With few exceptions, the completed power project succeeded in achieving the expected outputs and immediate objectives including the improvement in power generation capacity, modernisation of transmission infrastructure, and enhancement in distribution efficiency and reliability, with significant expected economic and social impact as discussed in the above main findings. While the project encourages greater use of local energy resources, the realisation of the anticipated socioeconomic development hinges on GPAL operating at full capacity, which is contingent upon the availability of gas. The power project has improved the power supply situation in Aba; however, the factories still do not receive adequate power to operate at full capacity due to inadequate gas supply to the power plant. Each gas turbine requires 10 million standard cubic feet (MMscf) of gas supply per day to be fully operational. Hence, for the 141 MW of already built capacity to deliver electricity each day (or the completed three gas turbines to be fully utilised), 30 MMscf/d of gas supply would be required. Between February and May 2024, the actual average gas supply per day was 3.26 million standard cubic feet, implying that none of the three turbines built has been fully utilised due to inadequate gas supply. That said, overall, the project was found to be effective in increasing access to electricity for the beneficiaries.

Efficiency: By design, all projects were to produce a planned output and be implemented in a reasonable time at reasonable cost. Nonetheless, the Aba IPP experienced multiple challenges that delayed its completion and led to cost overruns. Afreximbank stepped in to help restructure the debt and bring the project to fruition. Moreover, APL Electric Company Limited (APLE), the distribution SPV) has initiated a mass metering programme to ensure all electricity users have prepaid meters, aiming to enhance timely bill payments and customer trust. Despite this initiative, the significant cost involved has resulted in the majority of users still lacking meters.

Executive Summary

Sustainability: Afreximbank's support ensures the sustainability of Aba IPP by addressing financial challenges and facilitating project completion. The Bank's involvement in restructuring debt and raising capital underscores its commitment to long-term investments in critical trade-enabling infrastructure projects that promote sustainable economic growth and development in Africa. The recent government measures to increase electricity tariffs will allow Geometric Power to enhance its investments, expand current operations, and realise the anticipated development impacts of the project, ensuring their sustainability.

Lessons

1. Afreximbank's financing of Aba IPP not only addresses Nigeria's energy challenges but also unlocks significant opportunities for economic growth, job creation, and sectoral development. The project serves as a pivotal initiative in the region, illustrating the Bank's role in promoting trade-enabling infrastructure development and fostering economic transformation through strategic investments.

2. The project is strategically located in South-Eastern Nigeria's industrial hub. Aba is renowned as a commercial center bustling with thousands of SMEs and manufacturers of Made-in-Nigeria industrial products. The presence of the Geometric Power Plant in Enyimba City (also financed by Afreximbank) and its associated benefits underscores the potential development impact of the project. It also reinforces the strong alignment between Afreximbank's interventions and its trade and development objectives.

3. The project underscores the importance of public-private partnerships in tackling Nigeria's energy crisis. It has garnered support from the Federal Government of Nigeria through a carve-out and concession agreement, as well as from private investors such as Afreximbank and local banks. It also emphasises the crucial role of the private sector in driving innovation and technology to tackle challenges within the power sector.

4. The existence of capacity incongruencies across the power supply value chain could be due to infrastructure deficits or poor services or both. Ensuring the success of an integrated power generation and distribution infrastructure project requires careful consideration of several factors. These include securing necessary agreements with gas suppliers, end-use consumers, and distribution companies, ensuring the availability of meters for customers, addressing tariff issues to maintain a fair balance between cost reflectivity and consumer affordability.

5. The Aba IPP can serve as a blueprint for advancing development in the African electricity supply sector, offering a replicable model for future strategic and operational directions for the Bank's assistance to the energy sector.

6. The results of this evaluation report offer valuable insights for both medium and long-term business planning for the client. Additionally, it aids in the effective design of power projects within the Bank and serves as a foundation for ongoing monitoring and evaluation.

Recommendations

1. **Address Gas Supply Challenges:** The primary bottleneck affecting Aba IPP is inadequate gas supply, which limits the operational capacity of the turbines. To mitigate this, GPAL should continue engaging with alternative gas suppliers to ensure reliable and sufficient gas provision for optimal plant operation. It may also consider establishing long-term contracts with gas suppliers to secure consistent and cost-effective gas supply. Afreximbank could consider availing its guarantees, supply chain and related financial instruments that will help GPAL to secure adequate and reliable gas from the suppliers. This is pivotal to ensure the sustainability of the power project benefits.

2. **Improve Revenues Collection:** APLE should prioritise the mass metering programme to enhance revenue collection and customer satisfaction. Consider innovative financing models or partnerships to accelerate meter deployment. Afreximbank could provide financial guarantees to bridge funding gaps.

3. **Effective and Efficient Strategy for Power Distribution:** In the short term, APLE needs to implement an effective and efficient strategy for power distribution. Establishing a clear schedule for power allocation to each factory would enable better production planning and utilisation of resource.

4. **Community and Stakeholder Engagement:** APLE should strengthen community relations and stakeholder engagement efforts to garner local support, address concerns, and foster positive relationships essential for sustainable operation.

1

Introduction

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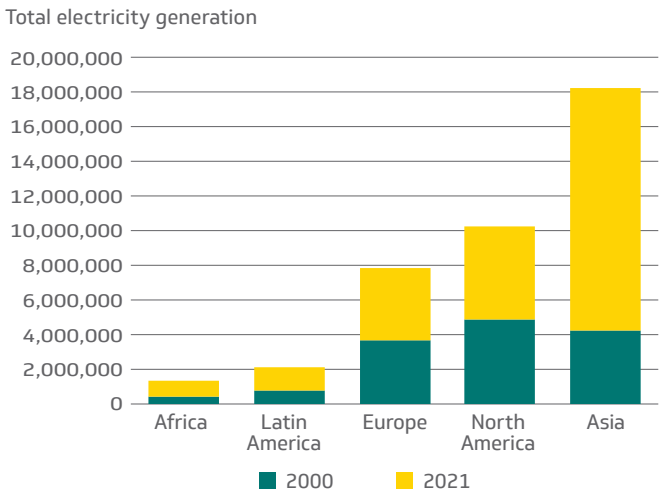
1. INTRODUCTION

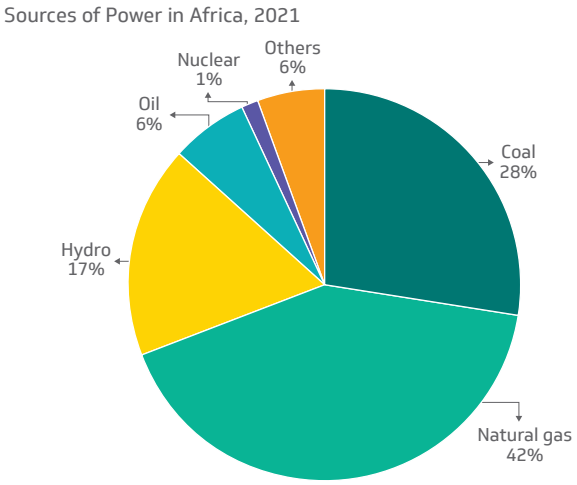
This Chapter provides an analysis of the current state of the power in Africa, draw attention to the existing gaps in electricity production, consumption, and access in Nigeria and the sizeable potential for domestic electricity transmission and distribution infrastructure, the Bank's interventions in the sector and the rationale for the Development Impact Evaluation of Aba IPP in Nigeria.

1.1 The State of the Power Sector: Africa and Nigerian Contexts

Africa continues to make notable progress toward transforming and expanding its power sector. New power plants are being constructed and electricity consumption sees steady improvement annually. Nevertheless, amid these advancements, critical challenges persist. Despite doubling its capacity between 2000 and 2021, Africa's total power generation still stood at 890,353 gigawatt-hours (GWh), just over half of Latin America and 6 percent of Asia (Figure 1). South Africa and Egypt account for 51 percent of the total electricity production in Africa. Nigeria had a total electricity capacity of 36,037 GWh in 2021, only moderately higher than 26,121 GWh in 2010. Natural gas, coal and hydro remain the primary sources of energy in Africa.

Figure 1: Total and Sources of Electricy Generation by Region (in GWh)



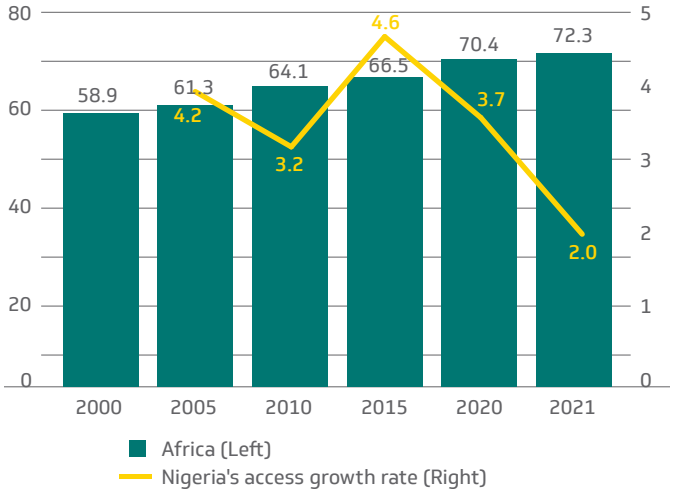


Source: International Energy Agency (IEA) Database

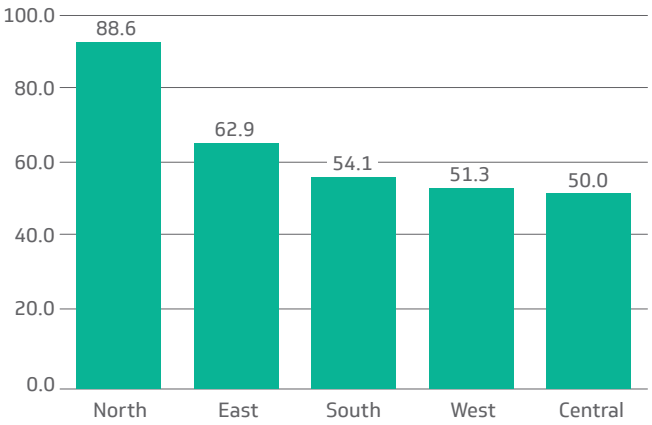
As a general rule, power generation capacity should grow at about the same rate as the economy in order to keep pace with demand. However, this has not been the case. The continent's gross domestic product (GDP) has grown at an average annual rate of 3.5 percent between 2005 and 2021, whereas electricity generation capacity has grown at an average annual rate of less than 3 percent.

The low level of power generation is accompanied by correspondingly low rates of electrification. Evidence from Figure 2 shows that less than two-thirds of Africa's population has access to electricity, compared to over 90 percent in Latin America. When excluded North Africa, the average dropped to 37 percent. Electricity access in Nigeria has largely declined since 2000. The gap between West Africa and the rest of the continent has widened over time, almost half of the population in the sub-region has no access to electricity in 2021.

Figure 2: Access to Electricity in Africa (% of Population)



Access in 2021

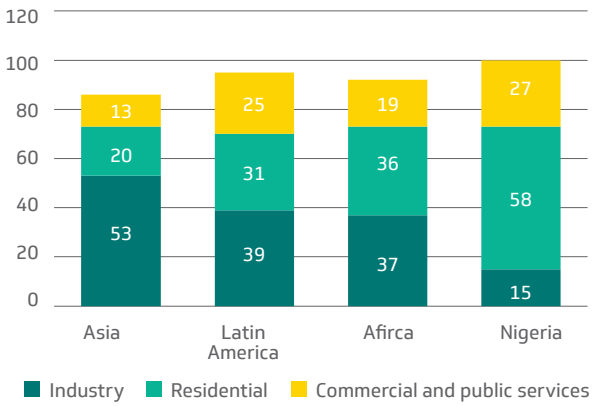


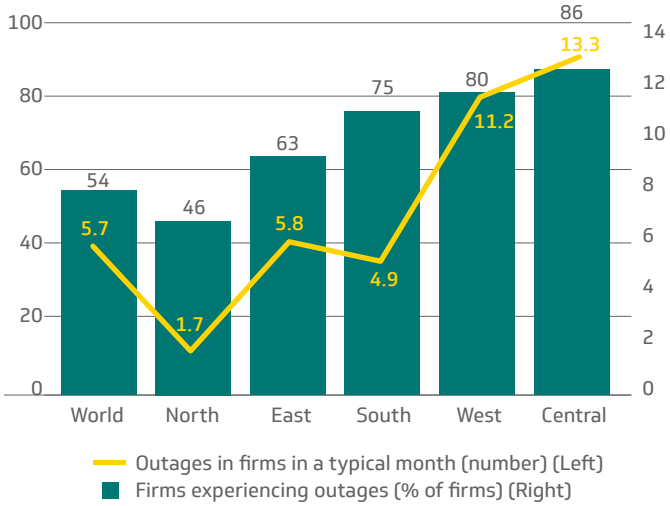
Source: World Bank

Given Africa's low levels of electricity generation and access, the average per capita consumption of electricity in the continent falls below 1 MWh annually, with Nigeria ranked 25th in the region in 2021 according to IEA statistics. By contrast, Latin America boasts an annual average per capita consumption of 2.6 MWh, while in Asia, it stood at 3.3 MWh.

In addition to insufficient power generation and access, Africa's electricity supply is largely unreliable. About 70 percent of manufacturing enterprises across the continent face an average of 7.4 power outages per month, notably higher than the global average of 54 percent experiencing 5.7 outages (Figure 4). The World Bank Enterprise Surveys 2019 highlighted unreliable electricity supply as a major constraint for almost 40 percent of firms in Africa. This challenge is particularly acute in Central (86 percent), West (80 percent), and Southern (75 percent) African subregions. Nigeria leads the list of countries with the highest frequency of power outages in firms, with 32 occurrences per month, followed by Benin (28), Central African Republic (28), Niger (22), Congo (21), and Gambia (21), all located in West and Central Africa. In 2020, the World Bank estimated the economic cost of power shortages in Nigeria at around US$28 billion – equivalent to 2 percent of its GDP[2].

Figure 3: Electricity Consumption by Sectors and Power Outages in African Firms





Source: IEA and World Bank

Energy plays a vital role in the industrialisation process. No country has been able to initiate and sustain an industrialisation programme without access to stable and affordable power supply[3]. Newer industries are highly dependent on a guaranteed level of power quality, and poor-quality power supply either acts as a constraint on the emergence of these industries, or else forces firms to adopt expensive alternative methods of power supply. The deficiencies of Africa's power sector are a serious drag on long-term growth and

[2] https://rea.gov.ng/world-bank-nep-intervention-rescuing-nigerias-communities-darkness/

[3] Osakwe (2017), Wrigley (2013), Stern (2004).

export competitiveness that generates jobs through high productivity growth, labour intensity, economies of scale, and the industrial sector's backward and forward linkages with other sectors of the economy. The implication for Nigeria is its impact on the ability for firms to operate at full capacity, low competitiveness of manufacturing firms and lack of firm growth, particularly for small and medium enterprises (SMEs). It also results in underinvestment in the sector, thereby limiting the ability of domestic firms to expand capacity. Today's global energy crisis has underscored the urgency, as well as the benefits, of an accelerated scale-up of stable and affordable energy availability, particularly in Africa.

1.2 Accelerating Investments in Africa's Power Sector

Efforts to reform the power sector in Africa have included attempts to improve generation capacity, modernise transmission infrastructure, and enhance distribution efficiency. However, these efforts have often been hampered by inadequate investment. While public utilities traditionally finance the power sector, many are grappling with severe liquidity constraints and indebtedness. Consequently, many countries in the continent are seeking private investment in the sector. The privatization initiative will lift the binding constraints to effective and efficient generation, transmission and distribution of power, attract essential capital for infrastructure upgrades, capacity expansion, and the adoption of advanced technologies.

West Africa: The sale of the five National Integrated Power Projects (NIPP) represents a notable advancement in the Nigerian government's comprehensive strategy to revitalise the power sector through privatization. To address domestic electricity needs and enhance its underdeveloped hydropower capacity, Nigeria has commissioned the 700 MW Zungeru Hydro Plant to boost the hydropower capacity in the country. This plant is the second-largest hydroelectric facility in Nigeria, following the Kainji Dam. Additionally, a significant milestone in fortifying Nigeria's power sector has been achieved with the commissioning of the 141 MW Aba Integrated Power Project (Aba IPP) in Abia State. Furthermore, Geregu Power is collaborating with Siemens Energy to expand capacity at its Geregu gas-fired power plant, located in central Nigeria, to 1.2 GW[4].

Ghana's current power plant capacity stands at 4,132 MW, with Hydro contributing 38 percent, Thermal 61 percent, and Solar less than 1 percent.[5] To bolster this capacity, the Ghanaian government has inaugurated Phase 1 of the Kumasi 1 Thermal Power Plant, a 150-megawatt facility poised to significantly augment the nation's power grid. This endeavor is complemented by the establishment of a 110-kilometer natural gas pipeline, designated as the primary fuel source for the new plant.

Senegal's 'Gas to Power' strategy, which seeks to establish a framework to optimise the entire natural gas value chain, from primary energy supply to power distribution to final consumers, can ensure that investments help to further energy access on the continent. The country is in the planning stages for a new 250 MW gas-fired power plant in Gandon.

The Mauritania-Mali 225 kV electricity interconnection project, with an estimated total investment of US$888 million, aims to link 100,000 households to the grid across both nations[6]. This project, organised into three lots (one in Mali and two in Mauritania), will facilitate the installation of an additional 2,000 km of medium and low voltage electricity distribution networks along its designated route. Additionally, the project encompasses the construction of two 50 MW solar power plants in Kiffa and Néma, Mauritania, with the generated electricity transmitted through the new high-voltage line.

North Africa: In support of its goal of 8.3 Mt/year of green hydrogen and byproducts by 2050, the Tunisian government has signed a memorandum of understanding (MoU) with the Saudi company ACWA Power for the development of a 600 kt/year green hydrogen project in Tunisia[7]. Under the agreement, ACWA Power will establish, operate and maintain up to 12 GW of renewable power generation units, storage systems and transmission lines, in addition to electrolysis devices, and infrastructure projects to allow direct connection to the main pipeline. The project will be developed in three phases. The first phase (200 kt/year) will include the installation of 4 GW of renewable capacity and 2 GW of electrolysis capacity, in addition to battery storage facilities.

Egypt has recently signed a framework agreement with a French company Voltalia to develop a 1 GW hydrogen project near the Ain Sokhna port in the Suez Canal Economic Zone, in north-eastern Egypt[8]. The project is expected to require a total investment of US$3.4bn. The country has also inaugurated a 252-MW Gulf of Suez wind farm, anticipated to yield 1,200 MWh of clean electricity annually. In addition, it has launched the process for allocating about 6 million m2 of land to seven international companies and consortiums for the development of 27 GW of solar and wind projects[9].

Southern Africa: For decades, Angola's national electricity grid had major supply gaps. There was no interconnection between the northern, central, and southern parts of the country, leading to regional power shortages and unreliable service.[10] In support of the country's goal of 60 percent electrification by 2025, the government has begun work on a 343km, 400-kilovolt transmission line that will join the northern, central, and southern "grid islands" for the first time. In addition, the Angolese and Namibian governments have signed a memorandum of understanding (MoU) for the construction of a new 600 MW hydropower project in Baines on the Cunene River in the Ruacana region of Namibia.

[4] https://www.enerdata.net/estore/energy-market/nigeria/
[5] https://www.enerdata.net/publications/daily-energy-news/ghana-commissions-150-mw-gas-fired-power-capacity.html
[6] https://www.enerdata.net/publications/daily-energy-news/afdb-grants-us303m-225-kv-mauritania-mali-power-interconnector.html
[7] https://www.enerdata.net/publications/daily-energy-news/acwa-will-develop-green-hydrogen-project-tunisia-12-gw-renewables.html
[8] https://www.enerdata.net/publications/daily-energy-news/voltalia-and-taqa-sign-deal-build-1-gw-hydrogen-project-egypt.html?utm_source=Enerdata&utm_campaign=ab02d20e52-Email_Daily_Energy_News_2024-07&utm_medium=email&utm_term=0_838b1c9d18-ab02d20e52-124730421
[9] https://www.enerdata.net/publications/daily-energy-news/egypt-energy-renewable-projects-27gw.html#:~:text=Egypt's%20New%20and%20Renewable%20Energy,and%20wind%20projects%20in%20Egypt.
[10] https://powerafrica.medium.com/bridging-the-power-gap-in-angola-db7ece305c97
[11] https://www.enerdata.net/publications/daily-energy-news/edf-consortium-signs-deal-develop-15-gw-hydro-project-mozambique.html
[12] https://www.enerdata.net/publications/daily-energy-news/edf-consortium-signs-deal-develop-15-gw-hydro-project-mozambique.html
[13] https://www.enerdata.net/publications/daily-energy-news/420-mw-nachtigal-hydropower-plant-starts-supplying-power-cameroons-grid.html

The government of Mozambique aimed to reach an electrification rate of 100 percent by 2030 (up from 44 percent in 2022) and to double hydropower capacity by 2025[11]. As of end-2021, Mozambique's hydropower capacity stood at 2.2 GW (equivalent to 77 percent of the total capacity). In pursuit of these objectives, the government has agreed with its strategic partners to build a 1.5 GW Mphanda Nkuwa (MNK) hydropower project, which is located on the Zambezi River, 60 km downstream from Cahora Bassa[12].

Central Africa: As of end-2021, hydro represented 46 percent of Cameroon's installed capacity and 61 percent of its power generation. The 420 MW Nachtigal hydropower plant has started supplying electricity to the Cameroonian grid, as the first 60 MW unit of the power plant has been commissioned[13]. The commissioning of the remaining six other units is progressive. The Nachtigal plant will provide power to the country's Southern Interconnected Grid, increase electricity production capacities in Cameroon by 30 percent and allow the export of electricity through the Cameroon-Chad Electricity Grid Interconnection Project, enabling Cameroon to supply 100 MW of electricity to Chad.

East Africa: Tanzania's 2,115 MW Rufiji hydropower project, one of the country's major infrastructure projects, will increase the nation's electricity provision capacity by almost 150 percent, more than double its capacity from 1.6 gigawatts to more than 3.7 gigawatts, allowing the country to provide universal access to electricity, producing 5,920-gigawatt hours of power annually. At present, only 40 percent of the population has access, and outages of electricity are recurrent, even for those with access.

Ethiopia has the largest hydropower capacity in Africa as of 2023, reaching some 4.9 gigawatts. The government's transmission project in the eastern part of the country will see the construction of 157 km of 400 kV double-circuit transmission lines and associated substations at Harar, Jijiga and Fafem[14]. Additionally, the Aysha Wind Power Project construction deal signed between the Ministry of Finance and AMEA Power will see the construction of the Horn of Africa's largest onshore wind farm with a capacity to generate 300 megawatts of electricity.

The Democratic Republic of Congo has inaugurated a 240 MW Busanga hydropower plant located in Lualaba province[15]. Out of the 240 MW capacity, 170 MW (71 percent) is supplying Sicomines, a copper mining company, and 70 MW (29 percent) is allocated to the country's national power utility SNEL.

In sum, at 625.6 trillion cubic feet, Africa's own gas reserves could go a long way to meeting the continent's growing energy demand, while new discoveries are constantly being made[16]. Nigeria has the largest natural gas reserves in Africa at 206.53 trillion cubic feet, making it the 9th largest gas reserve holder in the world; followed by Algeria (11th in the world), Senegal, Mozambique, Egypt, Tanzania, Libya, Congo, Equatorial Guinea, Cameroon, and Sudan[17]. To facilitate the widespread energy access, Africa cannot afford to turn its back on fossil fuels entirely. Natural gas, the least polluting fossil fuel, will be key for Africa in the short to medium term, acting as a transitional base fuel alongside renewables, providing an input for industry, a source of clean cooking fuel, as well as electricity where renewables are unavailable or intermittent[18]. Just a small amount of gas can generate a lot of electricity, while gas-fired power plants are typically quicker and less expensive to build than alternatives such as hydropower, geothermal, nuclear, or coal.

Africa is the continent with the lowest rates of electricity access globally, so it faces the unique challenge of needing to develop its energy infrastructure amid a global climate crisis it did little to cause. Addressing this power deficit requires the mobilisation of a wide range of resources. Reliable grids, that do not fluctuate are essential for industrialisation and export development and delivering public services such as healthcare.

1.3 Afreximbank Intervention in the Power Sector in Nigeria

Adequate distribution of energy is a cornerstone for national development, playing a critical role in facilitating industrialisation and trade. Recognising the challenges in the sector such as inadequate liquidity, high level of debt, and a lack of profitability, Afreximbank continues to support energy projects on the continent and has committed more than US$4.6 billion to Africa's power sector between 2019 and 2023. With approximately US$900 million of funding in Nigeria.

In 2021, the Bank acting as notable investor, signed a US$50 million term loan facility with Geometric Power Aba Limited to support the completion of the generation and distribution infrastructure, commissioning of the gas supply pipeline and commencement of operations of the project. It is expected that four gas turbines with a total capacity of 188 MW licensed generation capacity be developed. The Project will produce and distribute power across nine local government areas (LGAs) within the Aba ring-fenced zone and promises the provision of 24-hour power supply to Aba residents. The power project is anticipated to be the main source of power to the Enyimba Economic City – a 10,000-hectare Economic Free Trade Zone owned by the federal government and other private sector investors, for which the Bank has approved US$201 million for the provision of infrastructure within the Economic Free Trade Zone.

The installation of three gas turbines with a total capacity of 141 MW out of the 188 MW licensed generation capacity has been completed and commissioned in February 2024. The development impact evaluation of the project, therefore, is necessary.

[14] https://www.enerdata.net/estore/energy-market/ethiopia/
[15] https://www.enerdata.net/publications/daily-energy-news/congo-dr-officially-inaugurates-240-mw-dam.html
[16] Addressing Africa's energy deficit (Mo Ibrahim Foundation, 2022).
[17] https://energycapitalpower.com/top-ten-african-countries-sitting-on-the-most-natural-gas/
[18] Research has shown that if the whole of sub-Saharan Africa (minus South Africa) were to triple its electricity consumption using entirely gas it would only add 0.6 percent to global carbon emissions (Mo Ibrahim Foundation, 2022).

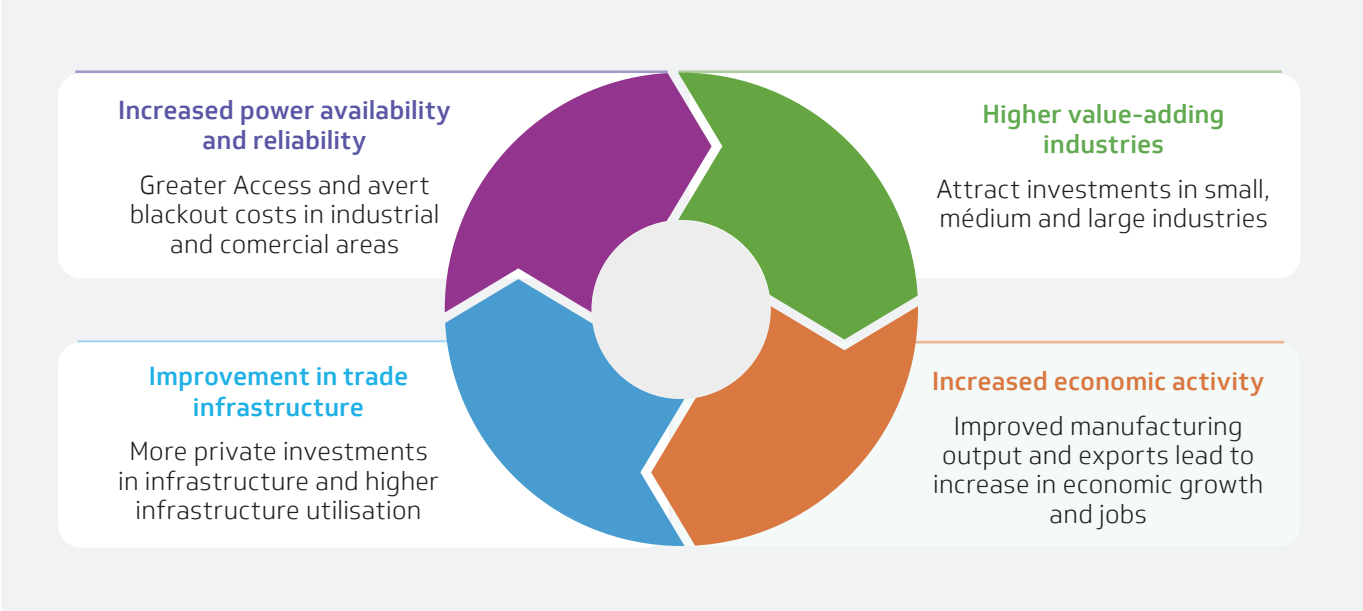
1.4 The Rationale for Development Impact Evaluation

Project Evaluation is one of the Bank's evaluation products under its Trade Development Impact Assessment (TDIA) framework and it is conducted after the completion of a Project. The aim of the project evaluation is to:

1. Measure the success of the project by assessing the attainment of intended and achieved project targets,
2. Assess Afreximbank's expected contributions to trade and development in Africa through the intervention, and
3. Identify challenges and opportunities the project presents for future private sector engagement.

The Aba IPP forms a critical trade-enabling infrastructure investment, with various development impact benefits as presented in Figure 4 below. The main economic benefits consist of improved electricity access and reliability, which allows for greater investor confidence leading to increased investments in small, medium and large value-adding industries, enhance the efficiency and competitiveness of industries, improve manufacturing output, exports, import substitution and, eventually create employment and empowerment for the youths. Subsequent increases in corporate revenue and profit allows for more private investments in infrastructure and infrastructure utilisation.

Figure 4: The Development Impact Benefits of the Aba IPP



The specific objectives of this evaluation are to (i) estimate the expected impacts of Afreximbank supported Aba IPP within Aba metropolis, Abia State and Nigeria as a whole in terms of key intermediate and long-term development outcomes; (ii) examine project design and implementation issues that may affect the development outcomes of the project; (iii) identify the most pressing challenges and opportunities that can benefit from private sector engagement and the Bank's innovative and strategic financial intervention and initiatives; and (iv) generate lessons and provide recommendations for ongoing and future infrastructure interventions. The overarching evaluation question is: "What are the differences expected to be made by the Bank-supported Geometric power project in Aba metropolitan and Nigeria?" This is important in terms of Afreximbank's corporate accountability and enables wider lessons to be identified and shared across the organisation.

Drawing on the foregoing objectives, the evaluation aims at answering the following questions:

- To what extent has the project met its intended objectives during the implementation period?
- What is the expected impact on Abia State's manufacturing output, exports and industrial development?
- How many jobs (direct and indirect) will be created, and what percentage is women and youth?
- To what extent will the project promote small businesses and support industries in Aba and Abia Sate?
- What is the expected impact of the project on government revenues?
- What are the lessons learned?

2

THE GEOMETRIC POWER ABA PROJECT

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2. THE GEOMETRIC POWER ABA PROJECT

Chapter 2 assesses the success of the Aba IPP by examining project design and implementation issues that may affect the development outcomes of the project.

Aba IPP which comprises two companies, Geometric Power Aba Limited (GPAL) and APL Electric Company Limited (APLE), which are for generation and distribution, respectively, is the first integrated power generating and distribution company in Nigeria. The Aba IPP was initiated in 2004 to address the grave effects of power shortage in Aba, Abia State. The Project, since its inception, faced a number of challenges including regulatory, political, financial, and legal issues, with the bulk of these issues left unresolved until 2022, leading to the Project being commissioned in February 2024.

2.1 Strategic impetus for Launching the Geometric Power Aba Project

The development of Aba IPP is based on a commercial study and technical audit of the Aba Island conducted by GP in collaboration with the Government owned utility, Power Holding Company of Nigeria (PHCN) in March 2006 which covered information on daily peak load for the Aba Island, suppressed demand, list of shut down industries and forecast power consumption requirements of the various of customers categories in Aba. Over time, PHCN service became increasingly problematic, with frequent power curtailments and very poor power quality. Virtually all industrial and commercial enterprises have been forced to rely on various forms of self-generation and emergency power solutions, while some of the largest industries have decided to establish permanent power stations to satisfy all power requirements. The report identified a wide and increasing gap between demand and supply of electricity in Aba.

The result of the study was further substantiated by a subsequent comprehensive census of all categories of consumers in Aba and a technical survey of the existing Aba distribution network conducted in January 2008 by NRECA of USA, the Distribution Management Contractor for the Aba IPP. Another study in 2009 showed that residents and commercial entities in Aba are willing to pay cost reflective rates for power rather than continue to incur extremely high cost of operating back-up generators for their businesses. The study further indicated that approximately two-third of all households in Aba generate almost 170MVA (approximately 136MW) of electricity through generators while about 115MVA (approximately 92MW) is generated by both commercial and industrial consumers. These figures demonstrate the unsatisfied demand for electric power in Aba.

The Aba IPP is unique as it is the first electricity project in Nigeria that is fully vertically integrated with embedded generation and distribution capabilities. This approach ensures the integrated power project can supply power directly to its immediate community, prioritising local needs and distributing surplus power to Nigeria's national grid. The Geometric Power Aba Limited (GPAL) has obtained a generation license and distribution license from the Nigerian Electricity Regulatory Commission (NERC) to generate and sell electric power, whereas APLE also obtained a licens to distribute electricity to the consumers in the Aba ring-fenced area comprising nine (9) out of the seventeen (17) Local Government Areas in Abia State.

Strategically positioned in the industrial South-Eastern Nigeria, the Aba metropolis is one of the most commercial areas in Nigeria and West Africa. It is renowned for its cottage and small scale industries specialising in textile, pharmaceuticals, soap, plastics, cement, footwear, and cosmetics.

2.2 Project Design and Implementation

The Aba IPP is aimed at constructing a gas fired power plant of 188 MW capacity and 4 units of GE LM6000PD gas turbine each has a generating capacity of 47 MW, located at Umuojima-Ogbu in Osisioma LGA, Abia State. The power plant is also equipped with three rehabilitated distribution substations (Umuode, PHCN, Aba Control), and five new additional substations (Aba Power Plant, Osisioma, Port Harcourt Road, Factory Road and Ogbo Hill). In addition, the project also includes the 100.5 km new industry-centred distribution lines to ensure the delivery of reliable affordable power supply to several industries and large commercial entities. A dedicated 27km gas pipeline has been part of the project which will ensure reliable transportation of gas fuel to the power plant from Shell's gas gathering center.

The Aba IPP constitute:

- Natural gas supply system,
- The power plant with four gas turbines,
- The Power Plant Sub-Station MV (33 kV),
- Thirteen overhead transmission lines (33 kV),
- Eight distribution sub-stations (33 kV/11 kV),
- Fifty two distribution lines (11 kV) (430 km),
- Low voltage lines (400 V) (1,500 km), 1,475 distribution transformers (11 kV/400 V), and energy meters

The Tour of the Geometric Power Aba IPP Plant

General Electric (GE) gas turbine model LM6000PD is a two-shaft/two-spool engine consisting of a five single stage low pressure compressor, a fourteen-stage high pressure compressor, a two-stage high pressure turbine, and a five-stage low pressure turbine. The engine is equipped with a stainless steel mesh screen in the inlet air stream for "last chance" protection against foreign object damage. The salient features of GE LM6000 PD, open cycle gas turbines are:

- SPRINT (Spray Inter-cooling) Power Boost System;
- Chilled Inlet Air to 8.9oC;
- Generator output: 11.5 KV, 50HZ, 0.8 pf 46.77 MW; 9,001 KJ/KWh (LHV);
- Dry Low Emission Combustor (DLE), NOx emission of 25 ppm without water injection; and
- Aero derivative gas turbine technology.

To meet an emissions limit for nitrogen oxides (NO2) of 46 parts per million by volume (ppmv) at the stack based on a dry oxygen (O2) content of 15 percent, the combustion temperature and air to fuel ratio is to be monitored to ensure operations occur at optimal proportions so as to minimise the production of NOx. Like all heavy-duty gas turbines, the LM6000PD has earned a solid reputation for high reliability and environmental compatibility. With a Dry Low NOx combustion system, it is capable of achieving less than 25ppm NOx on natural gas. It has an advantage of excellent thermal efficiency and can provide millions of hours of service. It has a worldwide use and acceptability. Continuous Emission Monitoring System (CEMS) monitors the NOx, CO and O2. If any of these parameters go beyond the tolerable limits an alarm is raised and this can be brought in control by properly controlling / tuning / mapping the combustion system. The exhaust stack and silencer assembly are capable of reducing the exhaust noise of the LM6000 PD gas turbine. The power project also follows the World Health Organization (WHO) Air Quality Guidelines.

GPAL has completed the installation of three GE LM 6000 PD gas turbines of total capacity of 141 MW out of the 188 MW licensed generation capacity. GP will distribute the generated power through the APLE Electric Company Limited. The following substations have also been completed and are being used for power evacuation: Aba Power Plant Substation, Osisioma Substation, Port Harcourt Road Substation, the new portion of Umuode Substation, and the new portion of Aba Control Substation. Rehabilitation of the old portions of Umuode and Aba Control Substations are ongoing, and completion and commissioning of the other substations are awaiting completion of the Factory Road.[19] Overhead lines including Osisoma, Umuode, Port Harcourt Road, Aba control and PHCN interchange have been completed whereas the stringing of the overhead lines of Factory Road and Owerrinta are still ongoing.

The Tour of Power Substations

A 27km gas pipeline was built from Imo River 1 AGG Owaza to the Power Plant at Osisioma, Aba, which is equipped with scrubbers, filters, gas pressure reducers and gas metering facilities to ensure that the stipulated quality of gas is available for the gas turbines. GPAL had initially agreed with Shell Petroleum Development Corporation (SPDC) consortium to supply gas to their power plant. The consortium members included SPDC, TOTAL Energies, AGIP Oil Company and Nigerian National Petroleum Corporation. However, this plan fell through due to the change in operatorship of Oil Mining Lease (OML) 17 in 2021, when the Federal Government opted not to renew SPDC's license. As a result, there has been insufficient gas supply since the launch of the GPAL in February 2024. GPAL is engaging other gas suppliers in other to resolve this challenge.

Nigeria faces a severe shortage of gas supply. This shortage is exacerbated by the fact that the regulated tariff for domestic power generation is lower compared to what gas suppliers earn from exporting gas. Consequently, there is a financial incentive for gas suppliers to prioritize export over domestic supply. Similarly, the low electricity tariffs that distribution companies contend with also hinders investment opportunities, though the government has recently increased electricity tariff in Nigeria.

Each gas turbine requires 10 million standard cubic feet (MMscf) of gas supply per day to be fully operational. Hence, for the 141 MW of power to be generated per day (or the completed three gas turbines to be fully utilised), 30 MMscf/d of gas supply would be required. First gas was introduced into the gas pipeline on 17th February 2024. However, according to data from GPAL, the actual average

[19] The life span of some equipment in the substations is outdated and cannot be monitored from the control room if not rehabilitated. Similarly, some of the transmission cables are also weak, leading to loses as input generated in terms of MW of power is not commensurate to the output being transmitted.

gas supply per day between February and May 2024 was 3.26 MMscf (Table 1), implying that none of the three turbines built has been fully utilised due to inadequate gas supply. Meanwhile, the max capacity of the Owaza-Osisioma gas pipeline is 90 MMscf/day and this can support 2 GE Frame E Gas Turbines and 1 Steam Turbine to increase site generation capacity by 375 MW.

Table 1: Gas Consumption at Geometric Power

MMCF	February	March	April	May
Week 1	1.97	47.19	21.08	21.83
Week 2	55.69	5.18	0.00	20.55
Week 3	–	47.69	30.77	17.65
Week 4	–	20.96	24.41	6.99
Total	**57.66**	**121.02**	**76.26**	**67.02**
Average per day	**4.44**	**3.90**	**2.54**	**2.16**

Source: Geometric Power

APLE also faces challenges with meter provision. Despite launching a mass metering program aimed at ensuring all electricity users have prepaid meters, thereby boosting customer confidence and facilitating prompt monthly bill payments, the majority of users still await meters due to its huge cost implications. For instance, APLE estimates it would require over 25 billion naira to supply meters to 200,000 customers. Consequently, the company is opting for a phased approach to tackle this issue. This involves metering its 30 feeders one feeder at a time, to ensure proper energy accountability.

Meanwhile, the development of a new power project called OMA Power, with NERC license to generate up to 1,080 MW is underway. OMA Power Project is a 3-phase green-field 1080MW facility located in Abia State, Nigeria. The first phase of the OMA Power project is a 500 MW (gross) simple cycle facility driven by General Electric Frame 9 turbines which is a proven technology. It will have an option for expansion and upgrade to a 1,080 MW combined cycle facility in its subsequent phases. The plant will be run on natural gas.

The Aba IPP was initially expected to cost US$100 million, a price tag that had climbed to US$203 million. Initiated in 2004, the project faced multiple challenges that delayed its completion and led to increased costs. Afreximbank stepped in to help restructure the debt and bring the project to fruition. The Bank successfully completed its Advisory and Capital Raise Mandate for the power project.

The Aba IPP is being funded with 40 percent equity and 60 percent loan capital. Afreximbank is a notable lender having advanced US$50 million to finance the project. A consortium of local banks provided a US$70.5 million loan facility. KS Energy of Turkey is the Engineering, Procurement, and Construction Contractor for the completion of project. KS Energy is also the Operation and Maintenance contractor

3

DEVELOPMENT IMPACT ASSESSMENT METHODOLOGY

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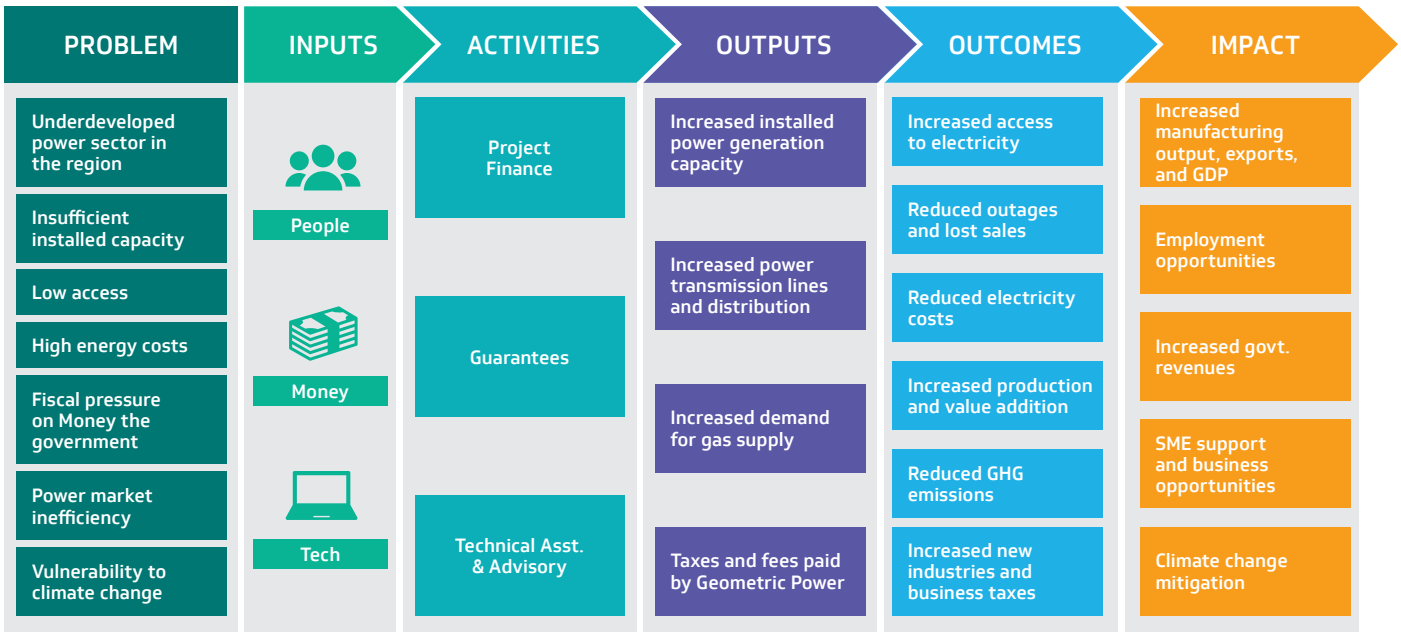
3. DEVELOPMENT IMPACT ASSESSMENT METHODOLOGY

In this chapter, we define how to measure the success of the Aba IPP, which then informs the specifications regarding data collection and quantitative and qualitative analysis.

3.1 Measuring the Success of the Aba IPP

The Aba IPP is established to act as catalyst for trade, investment, and sustainable economic growth, with the aim to facilitate the economic transformation of commercial centre and industrial hub of Abia State (Aba) in Nigeria. These are possible objectives by which to measure the success of the Aba IPP. We used a framework that draws on these objectives to assess the expected impact of the Power project, otherwise known as the Theory of Change (ToC), guided by the Bank's TDIA Framework (Figure 5).

Figure 5: Theory of Change for Aba IPP



Source: Developed by Afreximbank

3.2 Data Collection

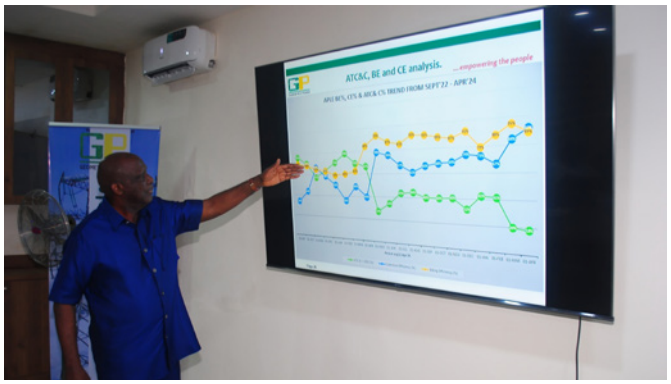
The Evaluation is based on a collection of primary data, secondary data, internal data, project document reviews, semi-structured interviews, focus group discussions, and project field visits. It also includes a survey that captures data and qualitative information from project participants, such as key stakeholders' perceptions about the project's current/future impact on them.

A survey was developed by the Bank's Development Impact team to capture relevant data and information from project participants The survey was sent to the Geometric Power team on Monday, 18 March 2024, which was completed and returned to the Bank on 4 April 2024. On 19-20 June 2024 the Development Impact team visited the Geometric Power to conduct a semi-structured interview. The interview was attended by Professor Bart Nnaji, Chairman/CEO for Geometric Power Group, Mrs Agatha Nnaji, Managing Director for Geometric Power Group, Mr. Ugo Opiegbe, Managing Director for APL Electric Company (APLE), Mr. Ben Caven, Managing Director for Geometric Power Aba Limited (GPAL), Mr. Anthony Alozie, Chief Financial Officer, Blessing Ogbe, Chief Operating Officer for APLE, Simeon Akpata, Head Technical for APLE, and Dr. Chukwunonso Okolo, Principal Manager Project Development. The project documents were received from the Principal Manager of Project Development with detailed history and phases of the project implementation.

In addition, a field visit to several industries and SMEs served by the power generated by the Aba IPP was also carried out to gather more information about the performance of the Bank's investments and validate the information provided by the client.

The primary data from Aba IPP was complemented with data on electricity production and consumption from IEA and World Bank.

Presentation by the Chairman to Afreximbank team on the Progress of Aba IPP



3.3 Quantitative Assessment

The ex-ante project evaluation applies a mixed method approach—quantitative and qualitative—in addressing the evaluation questions raised in Chapter 1. The quantitative analysis applies development impact and policy-relevant scenarios and projections in the description of a possible impact of the project. We used thematic analysis for qualitative data collected from the Aba IPP.

The Aba IPP is expected to build four turbines with electricity generation capacity of 188 MW. As of February 2024, three turbines of 141 MW capacity have been completed and commissioned. At optimal utilisation, five turbines (equivalent to 235 MW) are capable of meeting the Aba metropolitan's demand (comprising nine local governments in Abia State)[20]. However, a major headwind to achieving a fully optimised run is the availability of gas supply. As discussed in the preceding Chapter, each turbine requires 10 million standard cubic feet per day (or 10 MMscf/d) of gas supply to be fully utilised. According to data from GPAL, the actual average gas supply per day between February and May 2024 was 3.26 MMscf, implying that out of the three turbines built, one has not been fully utilised due to inadequate gas supply.

Drawing on the foregoing driving factors, three scenarios are run, based on a number of assumptions about GPAL utilisation capacity subject to the amount of daily gas supply. The scenario analysis covers the period from 2024 to 2032. The first scenario serves as a baseline or reference, while the subsequent two build upon it to explore the potential impact of the power project on Aba and beyond in terms of bolstering manufacturing output and GDP, generating government revenues, creating employment, and supporting SMEs.

[20] As guided by the initial feasibility study discussed in the preceding chapter.

Scenario 1: Downside

Assumptions:
Geometric Power Aba (188 MW, with space for expansion) operating at 13% utilisation by end of 2024. This ramp up to 75%, with almost three turbines fully utilised by 2030. By 2032, Geometric Power achieves full capacity, with the installation of fourth turbine in 2031.

An average daily gas supply of 5 MMcf/d in 2024 to 40 MMcf/d in 2032 is expected. At full capacity operation, each Residential, Commercial, and Industrial user is anticipated to use 16.6 kWh, 200 kWh, and 3,000 kWh per day, respectively, according to information gathered on the ground during the field visit as well as data on electricity billing from the Geometric Power.

Scenario 2: Base Case

Assumptions:
Geometric Power Aba (188 MW, with space for expansion) operating at 20% utilisation, by end of 2024. Geometric Power achieves full capacity, with the installation of fourth turbine by 2029. By 2030 capacity is expanded by additional 115 MW, and 248 MW by 2032.

An average daily gas supply of 8 MMcf/d in 2024 to 117 MMcf/d in 2032 is expected. At full capacity operation, each Residential, Commercial, and Industrial user is anticipated to use 16.6 kWh, 200 kWh, and 3,000 kWh per day, respectively, according to information gathered on the ground during the field visit as well as data on electricity billing from the Geometric Power.

Scenario 3: Upside

Assumptions:
Geometric Power Aba (188 MW, with space for expansion) operating at 25% utilisation, by end of 2024. Geometric Power achieves full capacity, with the installation of fourth turbine by 2028. By 2030 capacity is expanded by additional 300 MW, and 600 MW by 2032.

An average daily gas supply of 10 MMcf/d in 2024 to 250 MMcf/d in 2032 is expected. At full capacity operation, each Residential, Commercial, and Industrial user is anticipated to use 16.6 kWh, 200 kWh, and 3,000 kWh per day, respectively, according to information gathered on the ground during the field visit as well as data on electricity billing from the Geometric Power.

4

IMPACTS ON TRADE AND DEVELOPMENT

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4. IMPACTS ON TRADE AND DEVELOPMENT

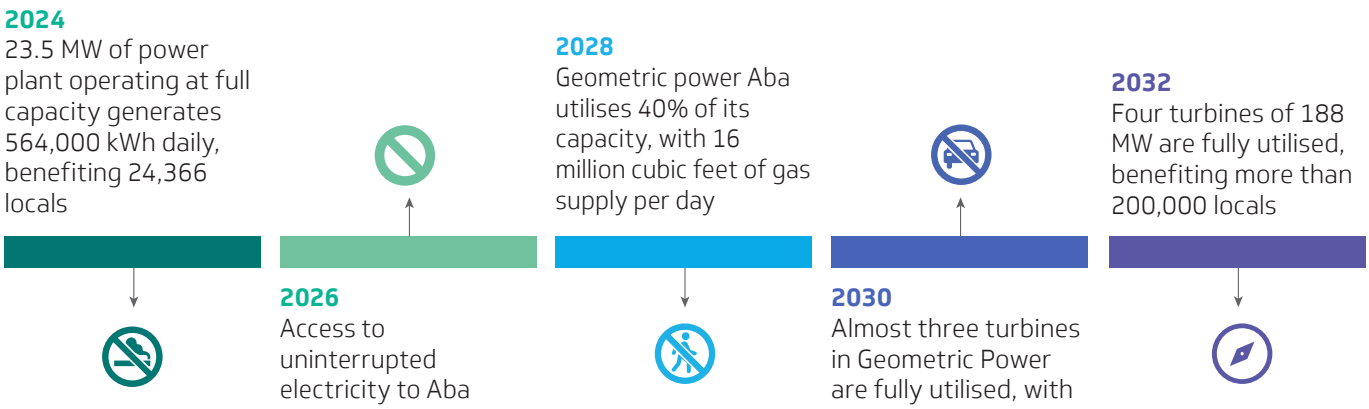
This Chapter presents the results of the three scenarios, which inform the estimates of expected development impacts of Afreximbank support to Aba IPP on Aba, Abia State and Nigeria.

4.1 Scenarios and Projections

Scenario 1: By end of 2024, about 23.5 MW of electricity will be generated, with 5 million cubic feet of daily gas supply. At full capacity operation, the 23.5 MW will generate about 564.000 kWh per day. With an average consumption of 16.6 kWh, 200 kWh, and 3,000 kWh per day for each Residential, Commercial, and Industrial user, respectively, this capacity will potentially impact 23,783 Residential, 564 Commercial, and 19 Industries.[21] Three turbines are almost fully utilised with 135 MW of capacity generated daily by 2030. By 2032, Geometric Power achieves full capacity with four turbines of 188 MW, providing electricity access to more than 200,000 locals[22].

Figure 6: Scenario 1

Geometric Power Aba utilisation at 13% utilisation



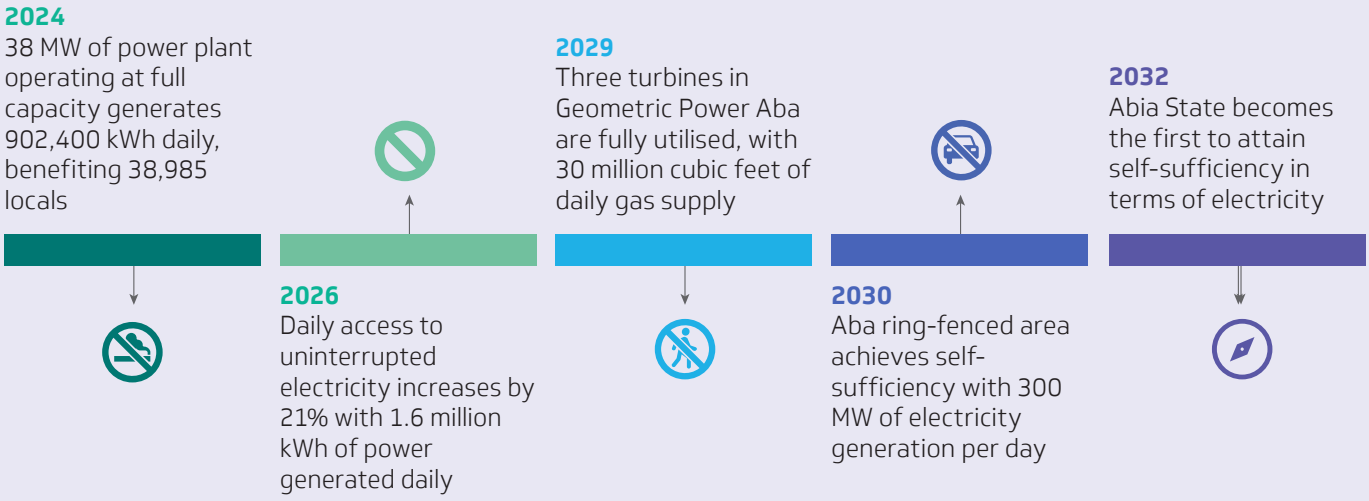
[21] This is based on 70:20:10 ratio of power generated between Residential, Commercial and Industries, respectively, as guided by the Geometric Power. It should be noted that the 564,000 kWh could serve more than 23,783, 564, and 19 Residential, Commercial, and Industrial users in Aba but that would require load shedding.

[22] By locals, we mean Residential, Commercial and Industrial users.

Scenario 2: With a daily supply of 8 million cubic feet of gas and concomitant power generation of 38 MW, operating at full capacity, 902,400 kWh could be generated per day by end of 2024, availing uninterrupted power to 38,053 Residential, 902 Commercial, and 30 Industrial users. By 2030, Aba ring-fenced area achieves self-sufficiency with the utilisation of four turbines and an additional two turbines, making a total of 300 MW. By 2032, Abia State becomes the first to attain self-sufficiency in terms of electricity with 551MW (equivalent to 13.2 million kWh) of power generated per day, providing electricity access to more than 550,000 locals.

Figure 7: Scenario 2

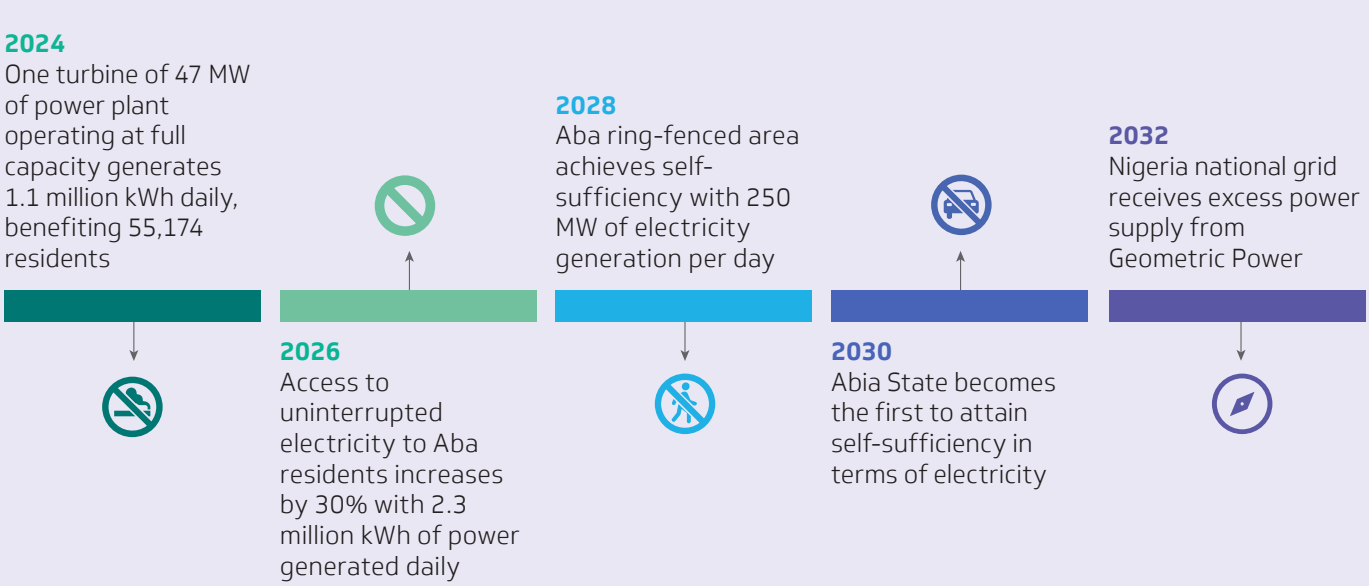
Geometric Power Aba utilisation at 20% utilisation



Scenario 3: : By end of 2024, one turbine of 47 MW of power plant operating at full capacity daily generates about 1.1 million kWh of electricity, with 10 million cubic feet of daily gas supply, providing uninterrupted power to 48,732 households, businesses and industries in Aba. By 2030, Abia State will become the first to attain self-sufficiency in electricity with almost 500 MW of power produced per day. By 2032, Nigeria national grid receives excess power from Geometric Power, with more than 1000 MW of power generated, providing electricity access to more than 1.2 million.

Figure 8: Scenario 3

Geometric Power Aba utilisation at 25% utilisation



4.2 Impact on Manufacturing Output and GDP

US$1.3 billion

Reduce power outage costs to manufacturing firms by US$1.3 billion annually

US$707 billion

Add $707 million to Abia State's manufacturing output or 8.1% to its GDP annually

2,000

About 2,000 new industries attracted

On the upside, the Aba IPP, if the required daily gas supply is achieved as anticipated, would reduce the power outage costs for manufacturing firms in Aba and Abia State by US$1.3 billion annually[23]. The resultant increase in industrial electricity consumption would add US$707 million to manufacturing output of Abia State, which is equivalent to 8.1 percent to its GDP annually[24]. Also, about 2,000 new industries would be attracted in the metro. The project would make available the much-needed electricity to unleash the full potential of the Enyimba Economic City, an over 9,000 hectares greenfield special economic zone in Aba. The Box below contains summaries of key findings from the interviews conducted by the Bank with industries visited during the field trip, assessing what would have happened without the project.

Box 1: Afreximbank's Visit to Some Industries in Aba

Visit to Greg Jane Shoe Industry

[23] Studies have shown that total outage costs for small industries in Africa *including Nigeria) is between US$0.13 and US$0.74 and for large industries between US$0.61 and US$3.32 (World Bank, 2016, Ostein and Pollitt, 2013, Foster and Steinbuks, 2009). Considering that there are mostly small industries in Aba and a few large industries, in this study, we considered US$0.37 (or US$0.13 + US$0.61 divided by 2) and multiply it by 9,623,368 kwh/d of uninterrupted power to be generated by GPAL on average per day will reduce power outage costs by $3.6 million per day or $106.8 million per month or $1.3 billion per year.

[24] Estimates suggest that one percent increase in electricity access by industries would result in about 9.4 percent increase in manufacturing output in Nigeria (Bassey, et al, 2022). Meanwhile, the current nominal GDP of Abia State amounts to US$ 8.74 billion, of which US$174.8 million is manufacturing output. In the case of the project, this will be 4.042 percent (0.094 X 0.43), implying $707 million.

Box 1: Afreximbank's Visit to Some Industries in Aba (continued)

Greg Jane International Limited, established in 2021, specialises in manufacturing shoe soles. The company currently aims to satisfy domestic demand for shoe soles in Nigeria and has plans to expand into other African markets such as Cameroon and Chad. Presently, due to power shortages, the company operates at less than 50 percent of its capacity. It currently receives less than 1 MW of power from APLE but needs 4 MW daily to operate at full capacity.

Visit to Tonimas Oil Lubricant Industry

Established in 1982, Tonimas Nigeria Limited specialises in manufacturing oil lubricants. Prior to receiving electricity from Geometric Power, the company experienced frequent outages, receiving only 4-6 hours of intermittent Power daily. It typically requires a continuous 3-hour supply to prepare machines for production, a condition not met on up to 4 days per week. Since connecting to APLE, Tonimas now enjoys an uninterrupted 8-hour power supply window daily, enabling daily production, albeit at underutilised capacity due to the lack of 24 hours electricity. With consistent power supply, the company could potentially double its current production capacity from 10 to 20 metric tons per day.

Other sources of power, such as diesel, have proven excessively costly for effectively operating industries, leading to the collapse of many in Aba. APLE has been instrumental in rescuing existing industries. We are urging APLE to ensure a consistent power supply for us. About 80 percent of Aba's industries rely on the power generated by GPAL.

Visit to Udeagbala Soap Industry

Box 1: Afreximbank's Visit to Some Industries in Aba (continued)

J. Udeagbala Holdings commenced operations in 1991 and encompasses a diverse group of industries in Aba. These include Kitchen Vegetable Oil Ltd., Beauty Base Ltd. (producer of beauty products like multipurpose soaps), Quality Pipes Ltd. (specialising in PVC production), and Dynamic Solvent Extract Ltd. (engaged in solvent extraction).

Quality Pipes Ltd., which manufactures PVCs, has faced operational downtime due to prolonged power shortages. Continuous electricity interruptions have resulted in raw materials becoming unusable, leading to significant financial losses that have eroded the factory's capital. Similarly, other factories within the group are also operating well below their capacity, averaging below 50 percent. The frequent power outages have increased maintenance costs across all facilities. The introduction of APLE has markedly improved the power supply situation; however, the factories still do not receive adequate power to operate at full capacity. To address this issue, APLE needs to implement an effective and efficient strategy for power distribution. Establishing a clear schedule for power allocation to each factory would enable better production planning and utilisation of resource.

Visit to Zandob Plastic Industry

Zandob Industries Limited is a manufacturing firm specialising in beverages and plastic goods, including bottled water, bags, plastic seals, and hot beverages. Currently, the company operates on a modest scale with 80 employees. Since the introduction of GPAL, power supply has notably improved. Previously, the company was functioning at only 20 percent capacity, but with GPAL, the production has increased to 40 percent. To fully utilize its capabilities and expand operations, additional power from GPAL is required. Addressing metering concerns is also crucial for smooth operations of GPAL.

According to the company's owner and CEO, who also serves as the Chairperson of the Association of Manufacturers in Aba metropolis, nearly 1,000 industries have shut down due to inadequate power supply. Resolving this issue would significantly contribute to the revitalisation of Aba metropolis' industrial sector.

4.3 Impact on Employment

303,000

Create about 3,000 direct and 300,000 indirect jobs when Geometric Power is fully utilised

47 percent

47% of the jobs created are youth and 22% women

2.6 percent

Employs about 0.4% of the country's labour force, reducing its unemployment rate by 2.6%

Based on information gathered from Geometric Power, it is estimated that at full operational capacity, the company could create up to 3,000 direct jobs, a significant increase from the current 669.[25] Of these jobs, approximately 22 percent are expected to be filled by women and 47 percent by youth. The planned attraction of 2,000 new industries to Aba is projected to generate a minimum of 120 jobs each, and existing 1,000 industries are anticipated to add 60,000 jobs to the current employment, the estimate is based on data collected from industries visited by the Bank. Overall, the Geometric Power project is anticipated to contribute approximately 3,000 direct and 300,000 indirect jobs, potentially reducing Nigeria's unemployment rate by 2.6 percent.

[25] 1 MW is estimated to generate 0.5 direct jobs for non-ancillary workers and 2.002 direct jobs for ancillary workers. With GPAL generating a total of 1,199 MW at full capacity, this translates to approximately 599.5 jobs for non-ancillary workers and 2,400.4 jobs for ancillary workers, resulting in a total of about 3,000 direct jobs.

4.4 Impact on Fiscal Revenue and Budget

US$141.3 million

Generate additional US$84.8 million in government revenues annually for Abia State

US$116 million

Turn Abia State's budget into surplus by US$59.5 million per annum

1.9 percent

Improve Nigeria's overall budget deficit by 1.13%

Applying the standard GDP-to-revenue ratio of 1:012, as per the National Bureau of Statistics of Nigeria, would result in an anticipated annual increase of US$84.8 million in government revenue. This would transform Abia State's budget, which currently faces a deficit of US$25.37 million, into a surplus of US$59.5 million. Additionally, it would improve Nigeria's overall budget deficit by 1.13 percent.[26]

4.5 Impact on SMEs and Business Opportunities for Private Sector

28,778

28,778 SMEs in Aba metropolis that are involved in production would be supported

1.04 million

Supply uninterrupted power to about 1.04 million households

2.3 percent

2.3% of Nigeria's total households would benefit from the project

The number of Small and Medium Enterprises (SMEs) supported by the Geometric Power project could reach 28,778 (from the current 10,000 SMEs connected to the power). Information gathered from local SMEs in Aba indicates that the project currently supplies power to the five major markets (Ariaria, Ochendo, Ezleukwu, Ekeoha, and Umechiola). At the same time, more than 1 million households could have access to uninterrupted electricity (equivalent to 2.3% of the country's total households).

Visit to Leaders of SMEs Representing the Five Major Markets in Aba

In addition, there are significant indirect benefits for the supporting industries including the development of road infrastructure, improvement in local services including enhanced water supply, schools and healthcare facilities, a boost in agricultural productivity due to a more reliable power supply, as well as increased support for rural electrification programs and enhanced tourism and leisure opportunities.

[26] Since the project is expected to add US$707 million to Abia State's GDP, this implies an increase in revenue of US$84.8 million, using a ratio 1:012 for GDP: Revenue according to the Nigerian National Bureau of Statistics. With the country's budget deficit at 11.3 trillion naira (or US$7.5 billion), the Geometric Power project will see the deficit reduced by 1.13%, while turning Abia State budget deficit into surplus.

5

SUMMARY AND CONCLUSIONS

AFREXIMBANK

5. SUMMARY AND CONCLUSIONS

There is huge potential for expansion of the manufacturing sector and achieving sustainable economic growth and development in Aba, Abia State and Nigeria that is currently being undermined by insufficient access to stable and affordable power supply. Unlocking this potential will require investments in improving power generation capacity, transmission and distribution infrastructure. Afreximbank's financing helped to revitalise the Aba IPP, which is pivotal in transforming the power sector in Nigeria. The overall assessment from the Development Impact Evaluation of the Bank's supported power project, lessons and recommendations are discussed below.

5.1 Overall Assessment

Relevance: Project objectives and outputs were generally consistent with the Abia State and Nigeria government's development strategy and Geometric Power business strategic plans as well as Afreximbank's Industrialisation and Export Development strategic pillar. Thus, the assistance to Geometric Power by the Bank is considered highly relevant to the country's overall development needs and Geometric Power institutional development as well as the Bank's development objectives.

Effectiveness: With few exceptions, the completed power project succeeded in achieving the expected outputs and immediate objectives including the improvement in power generation capacity, modernisation of transmission infrastructure, and enhancement in distribution efficiency and reliability, with significant expected development impact. The first General Electric turbine will automatically increase the quantum of electricity in the nine Aba ring-fenced area from the 25 Megawatts supplied by the Niger Delta Power Holding Company to 47 MW, which is almost double. The third turbine will increase the power output to 141 MW. There is capacity to install the fourth turbine and expand further to more than 1,000 MW and with the peak demand of Aba ring fenced area of 228 MW, the excess power can serve the remaining eight Local Government Areas of Abia State and still be exported to the national grid. Power from the national grid currently supplied to Aba will be made available to other parts of Nigeria, thereby making life better for all Nigerians. In other words, the commissioning of the Geometric Power plant will benefit all Nigerians, if not directly then indirectly. While the project encourages greater use of local energy resources, the realisation of the anticipated socioeconomic development hinges on Geometric Power operating at full capacity, which has been undermined due to inadequate supply of gas. That said, overall, the project was found to be effective in increasing access to electricity for the beneficiaries.

Efficiency: By design, all projects were to produce a planned output and be implemented in a reasonable time at reasonable cost. Nonetheless, the Aba IPP experienced multiple challenges that delayed its completion and led to cost overruns. Afreximbank stepped in to help restructure the debt and bring the project to fruition. Moreover, APLE has initiated a mass metering programme to ensure all electricity users have prepaid meters, aiming to enhance timely bill payments and customer trust. Despite this initiative, the significant cost involved has resulted in the majority of users still lacking meters.

Sustainability: Electricity demand continues to grow in an increasingly populated Nigeria and the power generation, transmission and distribution infrastructure capacity will not be able to support future demand without investment. Despite numerous challenges that caused delays in the completion of the power project, which led to cost overruns, and were exacerbated by the recent global COVID-19 pandemic and Ukraine crisis, alongside international financiers' reluctance to support African energy projects, it remains uncertain whether Geometric Power could have proceeded without the intervention of Afreximbank that enabled local banks to participate in the project. The recent government measures to increase electricity tariffs will allow Geometric Power to enhance its investments, expand current operations, and realize the anticipated development impacts of the project, ensuring their sustainability.

5.2 Lessons

1. Afreximbank's financing of the Aba IPP not only addresses Nigeria's energy challenges but also unlocks significant opportunities for economic growth, job creation, and sectoral development. The project serves as a pivotal initiative in the region, illustrating the Bank's role in promoting trade-enabling infrastructure development and fostering economic transformation through strategic investments.
2. The project is strategically located in South-Eastern Nigeria's industrial hub. Aba is renowned as a commercial center bustling with thousands of SMEs and manufacturers of Made-in-Nigeria industrial products. The presence of the Geometric Power Plant in Enyimba City (also financed by Afreximbank) and its associated benefits underscores the potential development impact of the project. It also reinforces the strong alignment between Afreximbank's interventions and its trade and development objectives.
3. The project underscores the importance of public-private partnerships in tackling Nigeria's energy crisis. It has garnered support from the Federal Government of Nigeria through a carve-out and concession agreement, as well as from private investors such as Afreximbank and local banks.
4. The existence of capacity incongruencies across the power supply value chain could be due to infrastructure deficits or poor services or both. Ensuring the success of an integrated power generation and distribution infrastructure project requires careful consideration of several factors. These include securing necessary agreements with gas suppliers, end-use consumers, and distribution companies, ensuring the availability of meters for customers, addressing tariff issues to maintain a fair balance between cost reflectivity and consumer affordability.
5. The Aba IPP can serve as a blueprint for advancing development in the African electricity supply sector, offering a replicable model for future strategic and operational directions for the Bank's assistance to the energy sector.
6. The results of this evaluation report offer valuable insights for both medium and long-term business planning for the client. Additionally, it aids in the effective design of power projects within the Bank and serves as a foundation for ongoing monitoring and evaluation.

5.3 Recommendations

Address Gas Supply Challenges: The primary bottleneck affecting the Aba IPP is inadequate gas supply, which limits the operational capacity of the turbines. To mitigate this, GPAL should continue engaging with alternative gas suppliers to ensure reliable and sufficient gas provision for optimal plant operation. It may also consider establishing long-term contracts with gas suppliers to secure consistent and cost-effective gas supply. Afreximbank could consider availing its guarantees, supply chain and related financial instruments that will help GPAL to secure adequate and reliable gas from the suppliers. This is pivotal to ensure the sustainability of the power project benefits.

Improve Revenues Collection: APLE should prioritise the mass metering programme to enhance revenue collection and customer satisfaction. Consider innovative financing models or partnerships to accelerate meter deployment. Afreximbank could provide financial guarantees to bridge funding gaps.

Effective and Efficient Strategy for Power Distribution: In the short term, APLE needs to implement an effective and efficient strategy for power distribution. Establishing a clear schedule for power allocation to each factory would enable better production planning and utilisation of resource.

Community and Stakeholder Engagement: APLE should strengthen community relations and stakeholder engagement efforts to garner local support, address concerns, and foster positive relationships essential for sustainable operation.

ANNEXURE 1

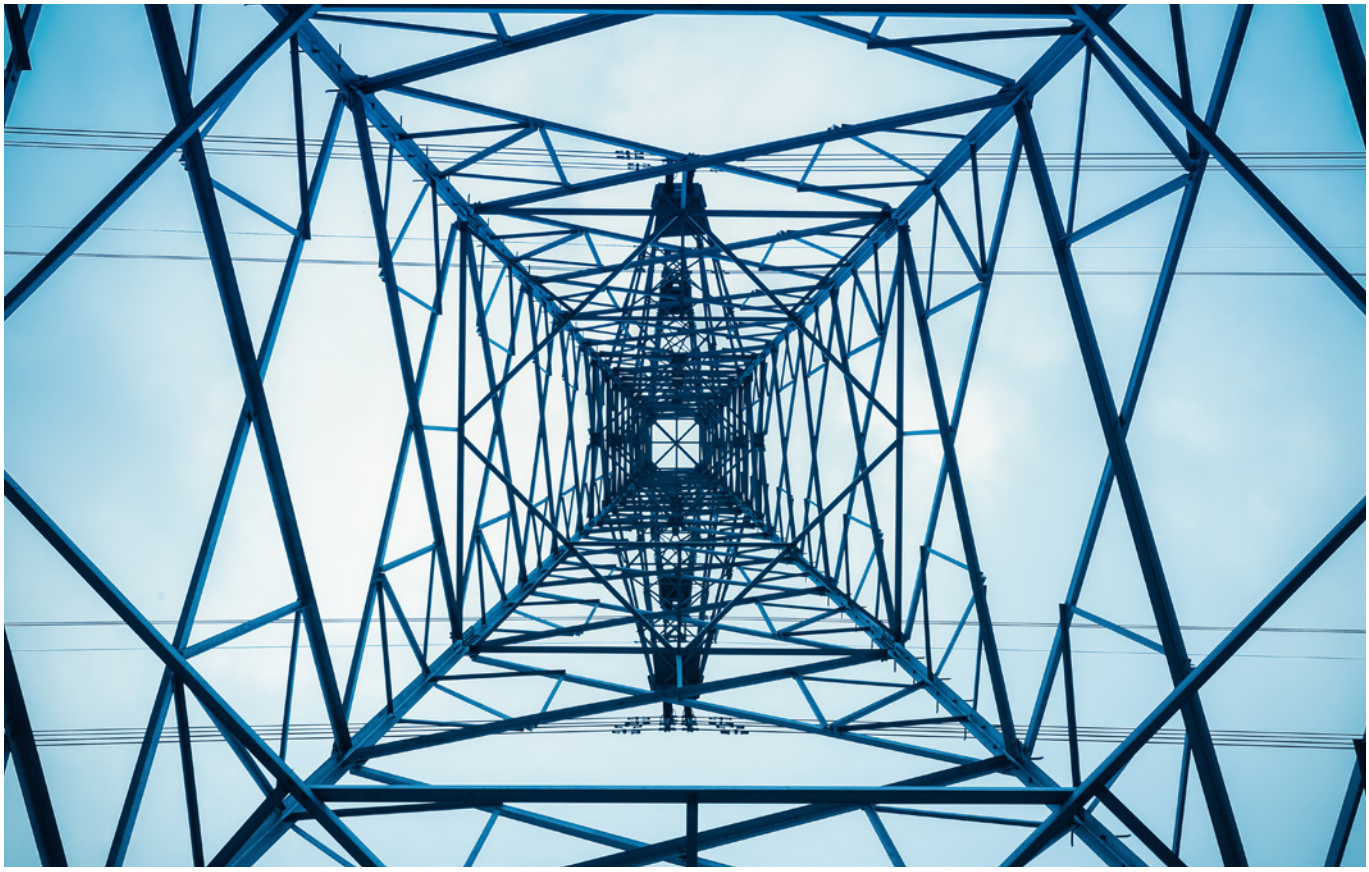
List of People Interviewed

A. Geometric Power

1. Professor Bart Nnaji, Chairman/CEO for Geometric Power Group.
2. Mrs Agatha Nnaji, Managing Director for Geometric Power Group.
3. Barr. Ugo Opiegbe, Managing Director for Aba Power Limited Electricity Company (APLE, i.e DISCO arm).
4. Engr. Ben Caven, Managing Director for Geometric Power Aba Limited (GPAL, i.e GENCO arm).
5. Mr. Anthony Alozie, Chief Financial Officer for Geometric Power Group.
6. Engr. Blessing Ogbe, Chief Operating Officer for APLE.
7. Engr. Simeon Akpata, Head Technical for APLE.
8. Engr. Livinus Nmaram, Director for Technical Training and Special Projects for APLE.
9. Engr. Abdullahi Omeh, Chief Technical Adviser to the Managing Director for APLE.
10. Engr. Chinedu Obiajunwa, Gas /GasFacility Cordinator.

B. Local Industries and SMES Benefiting from the Power Project

1. Two Shoe-making Factories
2. Manufacturer of Car Oil Lubricant
3. Manufacturer of Vegetable Oil, Beauty Products and Pipes
4. Manufacturer of Drinks and Plastic Products
5. Representatives of SMEs in Ariaria Market
6. Representatives of SMEs in Ochendo Market
7. Representatives of SMEs in Ezleukwu Market
8. Representatives of SMEs in Ekeoha Market
9. Representatives of SMEs in Umechiola Market



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