

NIGERIA

Natural Gas



The role of carbon credits in the financing and development of Nigeria's gas market

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White Paper

This White Paper is a Hawilti report series on Nigeria's natural gas industry prepared by Hawilti for the 21st NOG Conference & Exhibition. It was prepared by Hawilti's analysts with contributions from various public and private sector executives in Nigeria.

For questions about this paper or to provide updates, data, or information, please email info@hawilti.com.

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Key Takeaways

- Since the signing of the Kyoto Protocol in 1997, Nigeria has managed to implement several Clean Development Mechanisms (CMD) generating carbon credits that were be sold and traded globally. About half of these large-scale projects have directly targeted the processing of associated gas to reduce routine flaring.
- However, the extent of these projects has been limited and Nigeria continues to flare a significant amount of gas. According to the World Bank, Nigeria was still responsible for 5% of gas flared globally in 2020.
- As Nigeria embarks on its Decade of Gas, Government sources estimate that \$385 to \$500m are lost in emission credit value by not monetizing flared gas and certifying the corresponding reduction in carbon emissions.
- Given the historic rise of carbon prices since 2021, market fundamentals now provide strong incentives to invest in emission-reduction projects to issue certified emission reduction (CER) credits.



Since the launch of carbon markets some twenty years ago, the world has seen the emergence of several mechanisms to offset and trade emission permits and help countries cut their carbon footprint. For the developing world and Africa in particular, these carbon markets have opened a new avenue to attract capital into emission-reduction projects across a wide range of sectors.

In Nigeria, the past two decades notably saw the registration and development of several Clean Development Mechanisms (CDMs) that supported the reduction of gas flaring and the issuance of certified emission (CER) credits. However, the potential to monetise and process Nigeria's flared gas remains largely untapped. In 2022, the country still estimates that some \$500m is lost in emission credit value by not monetizing flared gas and certifying the corresponding reduction in carbon emissions.

This paper seeks to explain the main trends that have shaped emission markets since the signing of the Kyoto Protocol in 1997 and understand the impact they have had on the development of the Nigerian gas sector. As Nigeria embarks on a Decade of Gas, it also sheds light on current dynamics shaping up carbon markets globally and the opportunities they offer to support the country's gas commercialization agenda.

The birth and rise of global carbon markets

The development of carbon markets, or emissions markets, started in Europe in the early 2000s, just before the global financial crisis of 2008. By putting a price on carbon, these markets provided incentives for governments and corporations to invest in emission-reduction projects. However, the first years of carbon markets proved them susceptible to corruption and other integrity risks, and it is only from 2018 onwards that they really started building momentum.

The Kyoto Protocol

The development of carbon markets started with the signing of the Kyoto Protocol in 1997. Through the United Nations Framework Convention on Climate Change (UNFCCC), it committed industrialised nations to limit their greenhouse gases (GHG) emissions by setting individual reduction targets.

By putting a price on carbon, the treaty led to the development of carbon markets where sovereigns and corporations can get involved in the trade of emission permits that help them meet their reduction targets. Several flexible market mechanisms were set up in that regard, including the Clean Development Mechanisms (CDMs) that allow a developed country to implement an emission-reduction project in a developing market to earn certified emission reduction (CER) credits. Each of those carbon credits are equivalent to one tonne of CO₂, can be sold, and count towards meeting Kyoto targets.

Following a complex ratification process, the Kyoto Protocol entered into force only on February 16th, 2005, becoming the first legally binding climate treaty. It comprised two commitment periods, 2008 – 2012 and 2012 – 2020.

The Paris Agreement

In 2015, the Paris Agreement provided a more durable and binding framework, including commitments from both developed and developing countries to reduce their emissions. The Paris Agreement entered into force at the end of 2016 and works on a five-year cycle of increasingly ambitious climate action, in the form of Nationally Determined Contributions (NDCs).

Equally important, it also provides financing to developing countries to mitigate climate change. Under Article 6, if one country pays for carbon emissions to be reduced in a second country, the first country can also count those reductions towards its own national targets. In that regard, the Paris Agreement readopted the same principles that already guided the implementation of CDMs under the Kyoto Protocol.

Shifting Market Fundamentals

Increasing regulation of the fight against climate change gave birth to the EU emissions trading system in 2005. The European carbon market relies on a cap-and-trade scheme that compels factories, power plants, and airlines to pay for each tonne of CO₂ they emit. Each industry is allowed a certain amount of GHG emissions in the form of tradable permits that are registered in a Carbon Bank. Excess polluters are required to buy additional allowances and cleaner operators can sell their surplus allowances.

But the recession of 2008 coupled with excessive allocations plunged it into an ineffectual crisis for many years. The market was oversupplied and underpriced and did not provide incentives to build a greener European economy.

Carbon markets rely on basic market fundamentals of supply and demand. While prices tripled in 2018 to eventually reach €25/tonne in 2019, this remained too low to make a significant difference. According to Joseph Stiglitz and Nicholas Stern for instance, the price of carbon worldwide needs to be between \$50-100 per tonne by 2030 to meet the Paris Agreement goal of limiting global warming to 2 degrees above pre-industrial levels.

The COVID-19 pandemic provided another negative ground because lower industrial activity and lower power demand saw emissions drop drastically in 2020, suppressing the need for compliance entities to buy emission permits.

Positive change came only recently with several new market developments. The United States rejoining the Paris Agreement in 2021 was a first one, followed the same year by new European legislation to cut emissions faster by 2030. Soaring gas prices have also led power producers to switch back to coal, leading to higher emissions and a higher demand for carbon credits.

As a result, emission permits in Europe were back to €30/tonne in early 2022 and have witnessed a historic rise since then, to close at almost €100/tonne a few months ago.

Globally, several countries have embraced carbon trading as an incentive to cut their carbon emissions. While Europe has remained the largest carbon market in the world for many years, several additional marketplaces are now growing and thriving. The Western Climate Initiative was launched in North America as early as 2007, followed by the Regional Greenhouse Gas Initiative covering Northeastern Americans states in 2009. More recently, Korea launched its own emissions trading scheme, known as KETS, in 2015, followed by China in 2021. China's national carbon trading scheme is significant given the country's carbon footprint and is targeting carbon emissions from its power sector.

While the growth of several carbon markets is a good indicator of the increasing adoption of carbon trading schemes globally, their regionalization also demonstrates the failure of implementing a single and uniform cap-and-trade scheme.

EU Carbon Permits, €



Source: Trading Economics

The Nigerian Gas Opportunity

Nigeria is Africa’s largest oil producer and holds some of the world’s largest proven reserves of natural gas. The country has hosted for decades several international oil companies (IOCs) that saw early on the benefit of tapping into carbon trading schemes to cut their carbon footprint in the Niger Delta. Most of these initiatives were implemented as Clean Development Mechanisms (CDMs) focused on monetizing associated gas to end routine flaring.

However, the country still emits some 22 million tonnes of CO2e equivalent due to flaring every year. The government estimated those emissions to be worth some \$385m in shadow carbon credit value in 2019. By 2022, that value had increased to \$500m.

A fairly diversified economy where government revenues heavily rely on oil, which is itself the single largest export revenue earner.

Nigeria’s gross domestic product (GDP) remains fairly diversified with the oil sector accounting for less than 10% of economic output. Agriculture, particularly crop production, remains the pillar of economic activity and has traditionally contributed a fourth of Nigeria’s GDP, followed by trade (15%). However, filling up state coffers is heavily reliant on oil & gas revenues.

Depending on oil prices and oil production levels, the Nigerian government collects 50 to 60% of its yearly revenue from the country’s oil sector. Similarly, oil & gas exports account for a whopping 90% of total export revenues, including 80% from oil and 10% from liquefied natural gas (LNG).

Nigeria's Projected Oil GDP, ₦ bn (2020 - 2024)

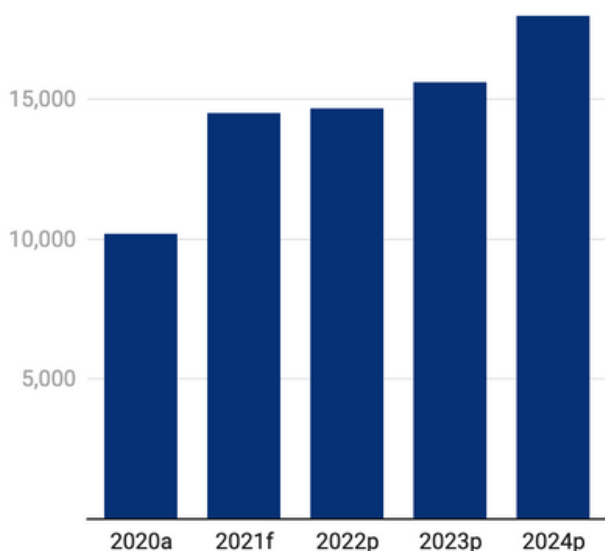


Chart: Hawilti • Source: Budget Office

Nigeria is recovering from two recessions in the span of five years and continues to face external vulnerabilities that deeply affect its short-term prospects.

The performance of the Nigerian economy continues to be deeply linked with that of its oil sector and of global commodity prices. Unfortunately, the crash of oil prices in 2016 and 2017, and again in 2020, sent it to recession twice in the span of five years. Nigeria experienced five consecutive negative quarters in 2016 and early 2017, and two consecutive negative quarters in 2020 on the back of the Covid-19 pandemic.

Even as the economy recovered in 2021, the country’s crude petroleum and natural gas GDP kept falling as under-investment, crude theft, and crippling infrastructure limit production. In Q1 2022, Nigeria’s oil & gas GDP was still down -26%. Recovering from both recessions has been tedious to say the least. On top of the external shocks caused by fluctuating oil prices and the Covid-19 pandemic, Nigeria’s persistent insecurity has not boded well for its economic recovery. Beyond just insecurity caused by Boko Haram across its Northern states, Nigeria must also deal with repeated insurgency in the Niger Delta that targets oil companies, especially their workers and infrastructure, but also a growing herder-farmers’ conflict across its central states.

In this context, maximizing gas utilization and monetizing gas reserves remains critical to supporting economic growth and diversification.

Nigeria’s government, along with its public and private sector, are all aligned on the urgent needs to monetize natural gas to support industrialization and expand energy access across the country.

According to the International Energy Agency (IEA), over 80m Nigerians still do not have access to electricity out of a population of over 200m. Meanwhile, the ones who do continue to rely on intermittent grid power or expensive and polluting diesel generators.

Put simply, Nigeria is far off from providing access to affordable, reliable, sustainable, and modern energy to its citizens and industries. Daily available grid-power generation capacity stood at below 6 GW last year, an abysmal figure for a country whose GDP is the biggest in Africa.

As a result, some 20 to 25 GW of power remains consumed off-grid and is generated from imported diesel and premium motor spirit (PMS) at four to five times the cost of on-grid gas-fired electricity.

Energy consumption levels also remain very low. In 2019, Nigeria consumed about 100 kWh/capita of electricity according to the IEA. This remains massively below the Modern Energy Minimum of 1,000 kWh per person per year recommended by the Energy for Growth Hub, inclusive of both household and non-household electricity consumption.

On top its ability to generate power and provide energy to Nigerian households, natural gas also plays a critical role in the country’s industrialization and economic diversification strategy.

The commodity can easily provide feedstock to anchor industries such as fertilizer, petrochemicals, cement, ammonia, or methanol. These have in turn the power to create thousands of jobs while diversifying the country’s export basket.

Monthly Natural Gas Consumption in Nigeria, Bcf (2015 - 2021)

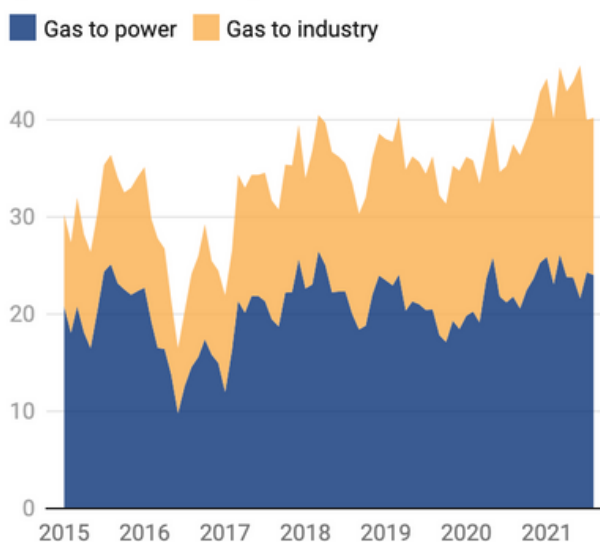


Chart: Hawilti

"Some 20 to 25 GW of power remains consumed off-grid and is generated from imported diesel and premium motor spirit (PMS) at four to five times the cost of on-grid gas-fired electricity."



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The Decade of Gas

In order to state its commitment to monetizing Nigerian gas, the Federal Government launched in 2020 what it called the “Year of Gas”.

The initiative aimed at gathering all stakeholders around the need to increase investment across the country’s gas value-chain to support economic diversification and jobs creation.

Considering its momentum, the “Year of Gas” turned into the “Decade of Gas” covering the 2020-2030 period.

The launch of the Decade of Gas comes as Nigeria implements its most ambitious regulatory reform yet – the Petroleum Industry Act (PIA) of 2021 – and seeks to embrace the so-called “energy transition” by adopting gas as a transition fuel.

It is accompanied by several public and private sector programmes, including an NGN 250bn intervention facility set up by the Central Bank of Nigeria in August 2020, and the launch of the National Gas Expansion Programme (NGEP) in December of the same year.

On the tax and policy front, machinery and equipment purchased for the utilization of gas in downstream operations remain exempt from VAT. Similarly, companies engaged in gas utilisation (downstream) can also get a tax holiday of three to five years.

The newly-enacted PIA provides additional tax incentives, including for midstream and downstream petroleum operations. These notably include a new reduced royalty and taxation system for gas, and an additional five-year tax holiday for investors in gas pipelines.

However, these incentives have so far paled in comparison to the capital-intensive nature of developing and operating gas projects in Nigeria. In addition, industry stakeholders have pointed out to several policy inconsistencies when it comes to promoting the adoption of gas in the country.

The newly introduced VAT (Modification) Order 2021, for instance, imposed VAT on the supply of natural gas to most gas-based industries (except for the power generation companies), and on the supply of imported liquefied petroleum gas (LPG).

Finally, the country’s gas pricing reform is still in progress to transition from a regulated to a market-driven pricing framework with a willing buyer-willing seller (WBWS) regime.

Industry stakeholders, led by the Nigerian Gas Association (NGA), are advocating for a long-term liberalization of the market and hope to see a willing-buyer willing-seller (WBWS) regime by 2023.

The Nigerian Carbon Credits Experience

Nigeria announced a net zero target by 2060 at the COP 26 UN Climate Change Conference in Glasgow in 2021. President Buhari subsequently signed into law a Climate Bill committing Nigeria to produce a carbon emissions reduction plan, adapt to climate change, and fix annual five-year carbon budgets. Along with the country's net zero announcement, President Buhari also insisted that natural gas would remain a critical component of the country's energy mix and a major transition fuel for Nigeria.

But for Nigeria to embrace a low-carbon development model, tackling gas flaring is a necessity. While Section 104(4) of the newly-adopted Petroleum Industry Act (PIA) provides environmental remedy and relief to host communities affected by gas flaring, a deeper commitment to a sound environmental management plan is required. In that regards, the PIA does provide some positive grounds, especially through tax incentives given to investors in gas processing.

A significant amount of Nigerian gas remains flared and the Nigeria Gas Flare Commercialization Program (NGFCP) of 2016 is yet to yield concrete results.

Nigeria flares, on average, 7 to 8% of the natural gas it produces. While flaring volumes vary from month to month, Nigerian operators burn on average 530 MMscf/d of gas into the atmosphere according to latest data available from NNPC Ltd.

Put to good use, such volumes could support about 2,000 MW of power generation but end up wasted because of a lack of processing and off-take infrastructure.

In 2018, President Muhammadu Buhari approved the Flare Gas (Prevention of Waste and Pollution) Regulations that provided the basis for the implementation of the Nigerian Gas Flare Commercialization Program (NGFCP). Under the regulations, flare payment penalties were increased to \$2 per 1,000 standard cubic feet (scf/d) of gas for companies producing 10,000 barrels of oil per day (bopd) or more, and to \$0.50 per 1,000 scf/d for companies producing less than 10,000 bopd. Such penalties have successfully managed to cut some of the country's flared gas volumes since 2018.

In addition, the 2018 regulations also provided further impetus for the roll out of the NGFCP, a programme first launched in 2016 to auction strategic flare sites to competent third-party investors. However, the program has suffered several delays. Bid submissions were closed only in April 2020, with winners yet to be announced. Up until today, the successful elimination of gas flaring by third party investors has been done outside of the NGFCP.

Monthly Flared Gas in Nigeria, Bcf (2015 - 2021)

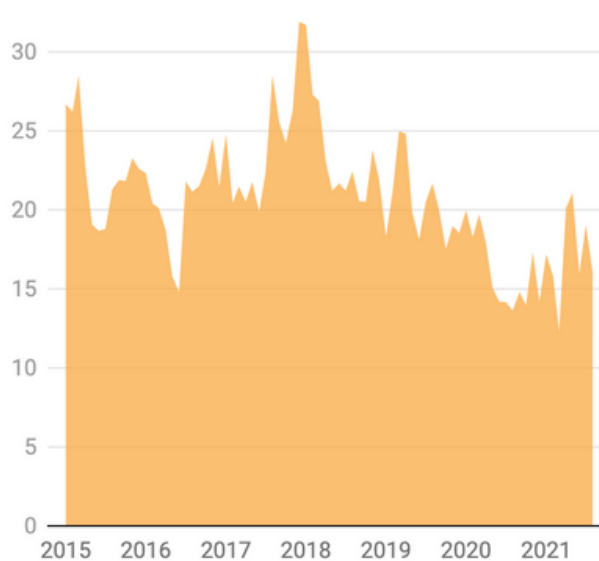


Chart: Hawilti • Source: NNPC

"Put to good use, flared gas volumes could support about 2,000 MW of power generation."

Carbon finance has offered attractive yet unexploited avenues to finance the monetisation of Nigeria's associated gas.

Following the launch of Europe's carbon market in 2005, Nigeria looked into the opportunities to attract financing into flare reduction projects that would generate carbon credits. In 2008, the Federal Government notably requested support from the World Bank to strengthen the performance of its energy sector, which included the development of a carbon finance programme to develop its gas and power sectors.

Via the implementation of CDMs, Nigeria was able to get several of these projects off the ground, with mixed results.

In the power sector, both Shell and Eni successfully managed to get projects off the ground, including the capture of flared gas at the Kwale OGPP to feed the 480 MW Okpai gas-to-power plant (Eni), and the construction of Shell's 650 MW Afam VI gas-to-power facility.

Upstream, TotalEnergies and the NNPC successfully implemented a flare reduction project at Ofon-2, where flare out was achieved in 2015. By 2021, the parties had already earned over a \$1m from the sale of their carbon credits.

According to the Second Biennial Update Report (BUR2) to the UNFCCC submitted by Nigeria in June 2021, 11 CDMs were actually registered in Nigeria, including 7 pertaining to its gas sector and the reduction of gas flaring.

Large-scale, gas-based carbon credits projects in Nigeria

Project	Objective	Implementing entity	CDM Registration	Status	GHG reductions, Gg*
Recovery of associated gas that would otherwise be flared at Kwale oil-gas processing plant	Capture and utilize AG previously flared at the Kwali Plant (Kwali OGPP).	Nigeria Agip Oil Company (NAOC) - Eni	9-Nov-06	Completed and successful.	1,497
Pan Ocean Gas Utilization Project	Eliminate gas flaring at the Ovade-Ogharefe and Obi-Anyima fields.	Pan Ocean Corporation (Nigeria), NNPC	1-Feb-09	Completed and successful. Crediting period lasted from October 2010 to October 2020.	2,627
Recovery and marketing of gas that would otherwise be flared at the Egbaoma (Asuokpu/Umutu) Marginal Field (OML 38)	Recover flared gas at the Egbaoma Marginal Field (OML 38) for domestic deliveries and productive use as an energy product.	Platform Petroleum Ltd, Newcross Petroleum Ltd	16-Oct-10	Completed. Crediting period started in 2021.	257
Afam Combined Cycle Gas Turbine Power Project	Build a 650MW grid-connected combined-cycle gas turbine CCGT fuelled by natural gas.	Shell Petroleum Development Corporation (SPDC JV)	29-Oct-12	Completed and successful.	550
Recovery and Utilization of Associated Gas from the Ebendo and Umusadege marginal fields (OML 56)	Build infrastructure to utilize AG from two oil fields in OML56 and cut flaring.	Midwestern Oil & Gas Company Plc; Xenergi Oilfield Services Limited	24-Dec-12	Completed. Crediting period started in February 2022.	288
OML58 IPP Gas Fired Generation Project	Construct a combined cycle, gas-powered and grid-connected IPP.	Total E&P Nigeria Ltd (TEPNG), NNPC	16-Dec-14	Registered but not implemented.	265
Ofon-2 Upstream Emission Reduction project (OML 102)	Recover and utilize AG from the Ofon 2 fields.	Total E&P Nigeria Ltd (TEPNG), NNPC	N/A. Ofon-2 was registered under the EU UK market (EU Fuel Quality Directive).	Completed and successful.	224

*Gg = 1,000 tonnes. Source: FGN 2nd Biennial Update Report (BUR2)

CASE STUDY: Pan Ocean Gas Utilization Project

Out of all CDMs implemented in Nigeria, the Pan Ocean Gas Utilization Project is one of Nigeria's and West Africa's most visible and successful one.

The project activity was registered by Carbon Limits AS, a sister company to Carbon Limits Nigeria (CLN) as a large-scale CDM project activity under the United Nations Framework Convention on Climate Change (UNFCCC) CDM framework on February 1, 2009, with the goal of capturing flared gas (associated natural gas that would have been flared) at the Ovade-Ogharefe and Obi Anyima oil fields under a joint-venture Partnership with Nigerian National Petroleum Corporation (NNPC).

Under the project activity, the treated gas was injected into an existing gas transmission line for sale to an Independent Power Plant (IPP) while the extracted NGLs was transported and sold into the national and international market. Flaring was reduced approximately 98% at the Ovade-Ogharefe and the Obi Anyima fields thereby contributing substantially not only by supplying natural gas to the domestic market, but also by serving as a crucial instrument in reducing carbon emissions by improving the local environment of the nearby community.

Typical of projects registered under the CDM, this project activity had a 10-year crediting period which lasted between (21st October 2010 – 20th October 2020). Under its Crediting Period, seven verifications were achieved amounting to a total of 2.3million tCO₂e which was issued by the UNFCCC with about 1.5million tCO₂e CERs sold. Cumulatively, the project accounted for an estimated 4.5million tCO₂e of emission reduction.

This project remains the largest registered and monetized carbon-emission reduction project in West Africa, and it continues to serve as a model and reference point for other carbon emission reduction projects in the country and the continent at large.



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Carbon Limits Nigeria

Carbon credits in a Decade of Gas

While Nigeria has gained some benefits from the implementation of CDMs so far, these have remained limited first because of low carbon prices in the early 2010s, second because of a general lack of awareness about how carbon markets really work.

Moving forward, the Paris Agreement is expected to simplify the process to get such projects off the ground. "The Rulebook of the Paris Agreement for Nationally Determined Contributions is not very different from that of Clean Development Mechanisms under the Kyoto Protocol," said James Ogunleye, Managing Director at Carbon Limits Nigeria.

"However, we can expect a simplification of the process to register projects and subsequently trade carbon credits," he added.

With carbon prices rising to historic records this year, hopes are that a new wave of emission-reduction projects could be financed across the world and in Africa. In Nigeria in particular, the launch of the Decade of Gas is providing a new momentum to boost gas consumption across the country, with a significant potential to monetise associated gas and cut flaring.

EU ETS Future Prices, €



Chart: Hawilti

Steps to implementation:

- Qualify your project as a certified CO2 emission reduction project;
- Define your project's baseline scenario (what the emissions would have been without it);
- Demonstrate the additionality of your project;
- Qualify it with the relevant regulatory authorities;
- Develop the monitoring plan for the emissions reduction;
- Commercialise your carbon credits within a regional carbon market.



© ND Western

While carbon credits from flare reduction projects will not attract the highest prices, they are still able to make gas projects in Nigeria more bankable. But successfully cutting flaring and monetising associated gas will require the structuring of solid public-private partnerships and the financing of efficient processing and evacuation infrastructure that rely on modern technologies. In doing so, several challenges will need to be overcome by implementing parties.

DATA: Collecting and processing data to establish a project's baseline and monitoring plan remains challenging. A strong team of engineers, technicians, lawyers, and data analysts must be put in place to support the credibility and viability of the project. Estimating the impact of a flare reduction project notably requires to analyse key parameters such as mass, gas-to-oil ratio etc.

QUALIFICATION: Not every project that monetises gas can qualify as an emission-reduction one. To qualify and subsequently earn carbon credits, a project must directly target associated gas that is currently flared or would be flared in the future.

BANKS: The process of implementing a flare reduction and AG monetisation project to generate carbon credits relies on resource-based financing. For the same reason, implementing parties need a commercial bank to support the project until it is operational and starts generating credits. While Nigerian banks understand CDMs, they are still not risk averse to them.

MARKET FRAGMENTATION: The implementation of the Nationally-Determined Contributions (NDCs) under the Paris Agreement just started, at the same time when carbon markets have continued to regionalise and diversify. During the project's implementation, parties must choose in which market they will be selling their carbon credits. Each market comes with different rules and a different set of documentation. While Europe remains the most attractive market in terms of prices, the launch of China's emissions market in 2021 could quickly provide alternatives.

Afam VI Gas-to-Power Plant

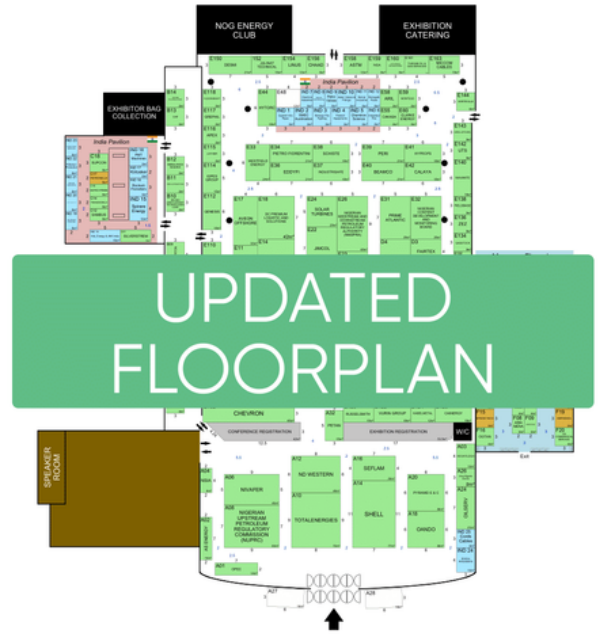




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