

A COMPARATIVE ANALYSIS ON COMPRESSED NATURAL GAS ADOPTION IN NIGERIA: KEY CONSIDERATIONS BEFORE CONVERSION

A Comparative Analysis On Compressed Natural Gas Adoption In Nigeria: Key Considerations Before Conversion.

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Introduction

Following the removal of fuel subsidy, the transition from Premium Motor Spirit (PMS) also known as petrol to Compressed Natural Gas (CNG) represents a critical strategy for enhancing energy solutions for transportation in Nigeria. This article examines the adoption of CNG in Nigeria, highlighting its potential benefits compared to conventional fuels. We will discuss the establishment of key initiatives such as the Presidential Compressed Natural Gas Initiative and the Credit Access for Light and Mobility Fund, which aim to promote CNG usage through financial incentives and infrastructure development.

In addition, we analyse the challenges hindering the widespread adoption of CNG, including high conversion costs, limited refilling infrastructure, and regulatory hurdles. By evaluating both local and global practices in CNG implementation, we seek to highlight the importance of comprehensive policy frameworks and collaborative efforts among stakeholders to facilitate a successful transition to cleaner energy sources in Nigeria.

WHAT IS CNG AND WHY IS NIGERIA TURNING TO IT?

1. CNG is a natural gas derived from compressing methane down to less than 1% of its volume by storing natural gas at baseline temperature and high pressure.¹ CNG under pressure remains clear, odourless, and non-corrosive and is a fossil fuel substitute for petrol and diesel.
2. The use of CNG is not a new concept in Nigeria's energy and transport ecosystem, in 2010 Nigerian Independent Marketing Company (NIPCO) launched the country's first CNG for vehicular and sundry applications in Benin City.² However, with the removal of the petrol subsidy in 2023 by President Bola Ahmed Tinubu GCFR (the President) and the fluctuation in global oil prices, the use of CNG has gained significant attention as an alternative fuel source for transportation.
3. CNG is widely considered a more environmentally friendly and cleaner alternative to conventional fuels because it produces lower emissions of carbon dioxide, nitrogen oxides, and particulate matter than conventional fuels, plus, it is much safer than other fuels in the event of a gas leakage as natural gas is lighter than air and disperses

¹ Axxela, 'Uses and Benefits of Compressed Natural Gas' <https://www.axxelagroup.com/uses-and-benefits-of-compressed-natural-gas/> accessed on 3 March 2025

² Dubawa, 'All you need to know about Nigeria's alternate energy' <https://dubawa.org/compressed-natural-gas-all-you-need-to-know-about-nigerias-alternate-energy/?amp=1>. accessed on 3 March 2025

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quickly when released.³

The need to pursue the development of alternative automobile fuel other than petrol and diesel in Nigeria is based on the following associated problems:

- (1) the rising cost of petrol, diesel, and other refined fuels;
- (2) environmental pollution caused by petrol and diesel exhaust fumes; and
- (3) perennial scarcity of petrol and diesel.⁴

POLICY FRAMEWORKS AND STRATEGIES FOR ADOPTING CNG IN NIGERIA

The Nigerian government has initiated frameworks that are crucial for shaping consumer behaviour, incentivizing the adoption of cleaner technologies, and creating a level playing field for alternative fuels like CNG⁵ and they include the following:

a. The Presidential Compressed Natural Gas Initiative (Pi-CNG):

The Pi-CNG is a component of the palliative intervention of President Bola Ahmed Tinubu's administration, which is directed at providing succour to the masses occasioned by the transitive hardships of the fuel subsidy removal.⁶

The aim and objectives of the initiative are to

support the deployment of CNG vehicles by existing private mass transit operators, and financing operators through an innovative asset finance program that supports individuals and corporate organizations seeking to convert vehicles. The Federal Government of Nigeria through the Pi-CNG is implementing a Commercial Vehicle Conversion Incentive Program (CV-CIP) that provides for FREE conversion (labour inclusive) of union registered vehicles in major cities where conversion program has been activated in Nigeria as well as ride-share vehicles, whose operators can benefit from a 50% discount. The intended result is to lower transportation costs for the populace by powering our mass transit and industries with cheaper, cleaner, safer and more reliable domestically produced natural gas and improve the standard of living. The President of Nigeria has put together a secretariat to drive the implementation of CNG across Nigeria. There are about 138 conversion centres now in Nigeria.⁷

b. The Credit Access for Light and Mobility Fund:

In October 2024, the Ministry of Finance Incorporated, CREDICORP, and the Pi-CNG

³ Nnaemeka Ohia, Anyadiegwu C.I.C, Chukwuemeka Muonagor, 'Economic Analysis of Utilising Compressed Natural Gas (CNG) as Vehicular Fuel in Nigeria (2018) https://www.researchgate.net/publication/320088815_Economic_Analysis_of_Utilising_Compressed_Natural_Gas_CNG_as_Vehicular_Fuel_in_Nigeria. accessed on 3 March 2025

⁴ ibid

⁵ Abdul Basit Kolapo Imam, *Evaluating Regulatory Frameworks for Sustainable Transport: CNG Adoption in Nigeria* (2024) <https://www.researchgate.net/publication/38429>

[2835 Evaluating Regulatory Frameworks for Sustainable Transport CNG Adoption in Nigeria?enrichId=rgreq-3b30e000051022c8aa58a4a011dd8e8c-XXX&enrichSource=Y292ZXJQYWdlOzM4NDI5MjgzNTtB_UzoX](https://www.researchgate.net/publication/320088815_Economic_Analysis_of_Utilising_Compressed_Natural_Gas_CNG_as_Vehicular_Fuel_in_Nigeria?enrichId=rgreq-3b30e000051022c8aa58a4a011dd8e8c-XXX&enrichSource=Y292ZXJQYWdlOzM4NDI5MjgzNTtB_UzoX). accessed on 3 March 2025

⁶ Petroleum Conversion Initiative, 'The Initiative' <https://pci.gov.ng/about-us> accessed 3 March 2025.

⁷ Pi-CNG Conversion Incentive Program <https://pci.gov.ng/cip-program> accessed on 3 March 2025.

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Initiative officially launched the Credit Access for Light and Mobility Fund (CALM Fund) in Abuja. This significant initiative aims to provide affordable credit for converting provide a quick and smooth exit where more favourable gigs present themselves. Considering the passive income that record labels generate from artistes' live performances, promotions and advertisements, a term/ contract period clause vehicles to CNG and adopting solar energy solutions.⁸ The CALM Fund is designed to be a lifeline for households and businesses seeking to manage escalating transportation and energy expenses. With flexible financing options available, Nigerians can now access immediate loans through selected financial intuitions to convert their vehicles to CNG, significantly reducing dependence on costly fuels. The CALM Fund addresses key challenges by encouraging the switch to CNG.⁹ Meanwhile, Pi-CNG will facilitate vehicle conversions via authorized centers, offering discounted packages for consumers utilizing CALM loans.

c. Partnership and Collaborations

The Federal Government of Nigeria (FGN) has collaborated with various partners in the transportation and energy sectors, including Portland Gas, Innoson Motors, Dana Motors, the Nigerian National Petroleum Company Limited (NNPCL), the Depots and the

Petroleum Products Marketers Association of Nigeria (DAPPMAN) and several others to support its goal of donating locally made CNG buses and providing free or subsidized CNG conversions for transporters. Other significant partnerships are with major stakeholders in the transportation sector such as the National Union of Road Transport Workers (NURTW), and the National Association of Road Transport Owners (NARTO) to promote the conversion from petrol to CNG for commercial vehicles. Additionally, key partners with the Federal Government of Nigeria include the Nigerian National Petroleum Company Limited (NNPCL) and Bovas Group who are working to ensure CNG refuelling stations are made available to all. The FGN is also partnering with the Nigerian Midstream and Downstream Petroleum Regulatory Authority (NMDPRA) to create concessionary pricing for CNG gas at the rate of N230 to N300.¹⁰

d. Tax Incentives on CNG

Under the VAT Modification Order 2024, equipment and infrastructure for CNG expansion such as parts and semi-knocked down units (for assembly) of CNG vehicles, conversion kit, CNG conversion and installation services are now exempt from VAT.¹¹

IS CNG CONVERSION WORTH THE COST?

⁸ Punch Newspapers, 'FG Unveils Credit Scheme for CNG Conversions, Solar Adoption' (16th October 2024) <https://punchng.com/fg-unveils-credit-scheme-for-cng-conversions-solar-adoption/> accessed 3 March 2025.

⁹ Application for the CALM FUND loan accessed at the CREDICORP website at [CREDICORP | Apply for Credit](https://credicorp.com/apply-for-credit)

¹⁰ Zawya, 'Nigeria Federal Government Partners with Transport Unions on CNG' <https://www.zawya.com/en/business/transport-and-logistics/nigeria-federal-government-partners-with-transport-unions-on-cng-ap6umco8> accessed 3 March 2025.

¹¹ Order 2 of the Value Added Tax (Modification) Order 2024 which introduces notable amendments to the VAT Act.

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The economic viability of CNG in Nigeria is evident in the significant price disparity with petrol. Petrol sells for approximately ₦1,000 per litre, whereas CNG is available at a substantially lower cost of ₦200 per standard cubic meter, representing an 80% reduction. Conversion from petrol to CNG will usually cost ₦1.5 million but this can differ based on the car's engine size.¹²

When comparing the fuel costs of CNG and petrol cars over a distance of 100 kilometres, CNG vehicles generally offer a more economical option due to their higher fuel efficiency and lower petrol prices. When considering petrol efficiency, a vehicle that consumes 5litres for 50 kilometres a day will have a fuel cost of N5,000 per day and N150,000 a month. In comparison, CNG priced at N200 per standard cubic meter, requires 2.5scm for the same distance of 50 kilometres and costs N500 for a daily 50-kilometer journey and resulting in a monthly expense of N15,000. This illustrates the potential 90% savings and efficiency of using CNG for automotive travel.¹³ Instructively, while CNG cars provide significant savings in petrol costs, it's essential to weigh these savings against factors such as initial purchase price, performance preferences, and CNG availability.

GLOBAL LANDSCAPE ON CNG ADOPTION

The current global landscape of CNG adoption reflects a diverse and dynamic energy sector shaped

by factors such as natural gas availability, environmental policies, and economic considerations. For instance, Asia-Pacific, led by countries such as India, Pakistan, and China, boasts a substantial number of CNG vehicles and refueling stations, driven by national policies aimed at reducing air pollution and dependence on oil imports. Several other countries, including the United States, Canada, the United Kingdom, Italy, Thailand, Iran, Australia, and New Zealand, also utilize CNG as an automotive fuel.

Iran has converted approximately 200,000 vehicles to dual-fuel systems, which includes both public transport and private vehicles. The overall number of CNG vehicles in Iran is substantial, with over 4 million CNG cars operating in the country.¹⁴

In Pakistan, CNG is regarded as "the fuel of the future." Approximately 22% of all vehicles in Pakistan, which translates to about 3.5 million vehicles, are reported to run on CNG. This includes both private and public transport vehicles.¹⁵ Pakistan aims to save approximately \$30 million annually. Similarly, in South America, countries like Brazil and Argentina have made significant strides in CNG adoption, integrating it extensively into their public transportation systems¹⁶. Brazil has a significant number of vehicles running on CNG, including taxis, buses, and private cars. [As of recent data, there are](#)

[CNG-potentials-through-dual-fuel-cars-merits-and-challenges](#) accessed on 3 March 2025.

¹⁵ The Express Tribune 'Let's Not Use Natural Gas as Car Fuel' (2012) <https://tribune.com.pk/story/474125/let%E2%80%99s-not-use-natural-gas-as-car-fuel> accessed on 3 March 2025.

¹⁶ Comprehensive Energy Data Intelligence 'The Global Landscape of Compressed Natural Gas: Adoption and Innovations' <https://rextag.com/blogs/articles/the-global-landscape-of-compressed-natural-gas-adoption-and-innovations> accessed on 3 March 2025.

¹² Bolu Abiodun '5 things you need to know before changing your car to CNG' (October 15 2024) <https://techpoint.africa/2024/10/15/convert-your-petrol-car-to-cng-in-nigeria/> accessed on 3 March 2025.

¹³ Joseph Chukwukaorah 'Nigeria's Petrol Wahala: Is CNG Our Way out?' <https://sydani.org/nigerias-petrol-wahala-is-cng-our-way-out/><https://ackodrive.com/car-guide/cng-car-vs-petrol-car/> accessed on 3 March 2025.

¹⁴ Tehran Times 'Realizing CNG Potentials through Dual-Fuel Cars: Merits and Challenges' (2024) <https://www.tehrantimes.com/news/472852/Realizing->

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approximately 1.6 million vehicles that use CNG in the country.¹⁷

In Egypt, since the initiative of CNG was launched in 1995, approximately 562,000 vehicles have been converted to run on CNG. This includes both public transportation and private vehicles.¹⁸

In Australia and the United States, CNG is primarily used in fleet applications, while many other nations favour its use in private vehicles.

The market for CNG vehicles in the United Kingdom has expanded rapidly over the past five years. This shift reflects a broader trend among various nations recognizing the environmental and economic benefits of adopting CNG as a cleaner alternative fuel source for transportation.¹⁹ Italy has about 300,000 vehicles running on CNG, supported by a network of approximately 280 filling stations.

BENEFITS OF COMPRESSED NATURAL GAS

1. Reduction in Air and Noise Pollution from vehicles

Vehicles that operate on gasoline and diesel release air pollutants that pose significant hazards to human health. These pollutants can heighten the likelihood of developing conditions such as stroke, heart

failure, heart attack, respiratory illness, and cancer. Therefore, there is an urgent need for an alternative fuel that produces fewer air pollutants compared to gasoline and diesel. CNG is known for its clean burning properties, producing significantly lower emissions compared to gasoline and diesel.²⁰ There are enormously increasing levels of hydrocarbon (HC), oxygen (O₂), and nitrogen oxide (NO_x) emissions on the roads of every major city in Nigeria, considering a switch to CNG would be most beneficial for the environment and mankind.

A study of both Delhi and Brazil has shown how the use of CNG automobiles can significantly cut down emissions. These places showed a drastic reduction in air pollutants from the time they adopted the use of CNG automobiles.²¹ Also, further study of Dhaka shows that the use of CNG as automobile fuel can greatly improve air quality and reduce premature death.²²

2. Economic Benefit of CNG

¹⁷ R C M de Paula, E A Aguiar-Júnior and J T S B Oliveira 'Study of the feasibility of measuring vehicular Compressed Natural Gas (CNG) in Brazil by Gasoline Liter Equivalent (GLE) or Ethanol Liter Equivalent (ELE)' [304580_study-of-the-feasibility-of-measuring-vehicular-natural-gas-cng-in-brazil-by-equivalent-liter-of-gasoline-elg-or-equivalent-liter-of-ethanol-ele.pdf](https://www.researchgate.net/publication/304580_study-of-the-feasibility-of-measuring-vehicular-natural-gas-cng-in-brazil-by-equivalent-liter-of-gasoline-elg-or-equivalent-liter-of-ethanol-ele.pdf) accessed on 3 March 2025.

¹⁸ Egypt Today 'Egypt Intends to Convert Vehicles to Run on Natural Gas' (2024) <https://www.egypttoday.com/Article/3/136292/Egypt-intends-to-convert-vehicles-to-run-on-natural-gas> accessed on 3 March 2025.

¹⁹ Sandhya Wakdikar, 'Compressed Natural Gas: A Problem or a Solution'

(2016) https://www.researchgate.net/publication/228558149_Compessed_natural_gas_A_problem_or_a_solution/link/56a5cc9808aeef24c58d9b0e/download accessed on 3 March 2025.

²⁰ A. F. Oluwole, O. H. Joshua, O. Oyediran, S. Guttikunda, and O. I. Asubiojo, "Prognosis of emission limits and regulations for vehicular emission pollutants in Nigeria," vol. 2, no. August, pp. 1–11, 2019.

²¹ L. Dondero and J. Goldemberg, 'Environmental implications of converting light gas vehicles: the Brazilian experience,' Energy Policy, vol. 33, pp. 1703–1708, 2005.

²² Z. Wadud and T. Khan, 'Air quality and climate impacts due to CNG conversion of motor vehicles in Dhaka, Bangladesh,' Environ. Sci. Technol., no. 47, p. 13907–13916, 2013, doi: dx.doi.org/10.1021/es402338b.

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One of the primary benefits of CNG is its affordability as an energy source. While the initial focus on CNG was primarily driven by its environmental advantages and potential for emission control—especially in urban areas—with the cost of PMS, its cost-effectiveness has emerged as a significant factor in its adoption for road transport.

3. Safety of CNG Automobiles

Natural Gas has a higher ignition temperature than fuel or diesel, meaning it is less likely to ignite accidentally or spontaneously because it requires a higher temperature to start burning.²³ It is lighter than air and if there is a leak, it disperses quickly into the air, unlike petrol fuel or diesel that pools on the ground and can serve as a fire hazard. CNG has limited flammability making accidental combustion less likely. This makes it safer than other conventional fuels. However, it is crucial that CNG systems are properly installed to ensure safety and efficiency. The Federal Government of Nigeria (FGN) has authorized specific conversion centers for CNG installations, ensuring that the process meets safety standards. These authorized centers ensure that vehicles are converted to CNG correctly, minimizing the risks associated with

improper installations and promoting the safe use of CNG in the country.²⁴

4. Low Maintenance Cost

Natural Gas does not react to metals the way gasoline does, so car pipes and mufflers last much longer.²⁵ The extension of service duration and engine performance cut down the cost of maintaining vehicles using CNG. Some automobile experts have said cars using CNG save 70% in maintenance and running expenses compared to those running on PMS.²⁶

RECOMMENDATIONS

1. Limited Infrastructure

The limited number of conversion centres and CNG fueling stations across the 36 states in Nigeria is not enough to cater for the demand for CNG conversion in the nation. This situation underscores the urgent need for improved infrastructure to support the growing demand for CNG as a viable fuel alternative in the country.

2. Loss of Boot Space

A significant downside of converting to CNG is the reduction of boot space caused by the installation of CNG tanks in the trunk of the vehicle. This is likely to discourage owners of saloon cars, particularly those who use their vehicles for commercial interstate travel.

²³ ALTECH-ECO 'CNG:101: An Introduction to Compressed Natural Gas' <http://www.transecenergy.com/Pages/why-cng.html> accessed on 3 March 2025

²⁴ Business Day, 'FG Licenses 30 Certified CNG Conversion Centres - NADDC' (5 February 2025) https://businessday.ng/transport/article/fg-licenses-30-certified-cng-conversion-centres-naddc/?utm_source=chatgpt.com accessed on 3 March 2025.

²⁵ BGL Gas, 'The Advantages of Compressed Natural Gas' <https://www.bglgas.com/cng-advantages/> accessed on 3 March 2025.

²⁶ The Morning Star 'CNG saves 70% in vehicle maintenance, says experts' [CNG saves 70% in vehicle maintenance, say experts – The Morning Star News](https://www.morningstarnews.com/news/transport/cng-saves-70-in-vehicle-maintenance-says-experts) accessed on 3 March 2025.

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However, alternative locations for tank installation could be considered.

3. Public Perception and Awareness

Many people may not be aware of the benefits of CNG or may harbour misconceptions about its safety, reliability, or performance. The public's preference for familiar fuels like gasoline and diesel can hinder the transition to CNG. To address this, community educational campaigns and awareness programs are crucial in showcasing the environmental and economic benefits of CNG. However, changing deeply ingrained behaviours and attitudes can be challenging. Consistent educational initiatives, the establishment of more refilling stations, and incentives for conversion can significantly facilitate this transition.

Conclusion

It is safe to say that the rise in petrol prices makes the adoption of CNG in Nigeria a viable and economical alternative. The Federal Government has played an important role in encouraging CNG as an alternative fuel through initiatives such as the Pi-CNG, the CALM Fund, and the "Fiscal Incentives for the Presidential Gas for Growth Initiative," which was launched by the Ministry of Finance Incorporated, CREDICORP, and Pi-CNG. However, the adoption of CNG in Nigeria faces considerable challenges, including the expensive cost of conversion, the lack of a structured legal framework, and limited refilling infrastructure, among others. To overcome these obstacles, the Federal Government through its agencies must partner private sector stakeholders and financial institutions to facilitate the widespread

adoption of CNG.

Ultimately, Nigeria, like many other countries around the world, can significantly reduce greenhouse gas emissions and enhance the lives of its citizens by adopting CNG. This shift would also strengthen energy security in the transportation and logistics sectors.

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