ELECTRICITY LAWYER

IMPACT ASSESSMENT REPORT

IMPACT OF FUEL SUBSIDY REMOVAL ON THE NIGERIAN POWER SECTOR: MAKING A CASE FOR RENEWABLE ENERGY DEVELOPMENT

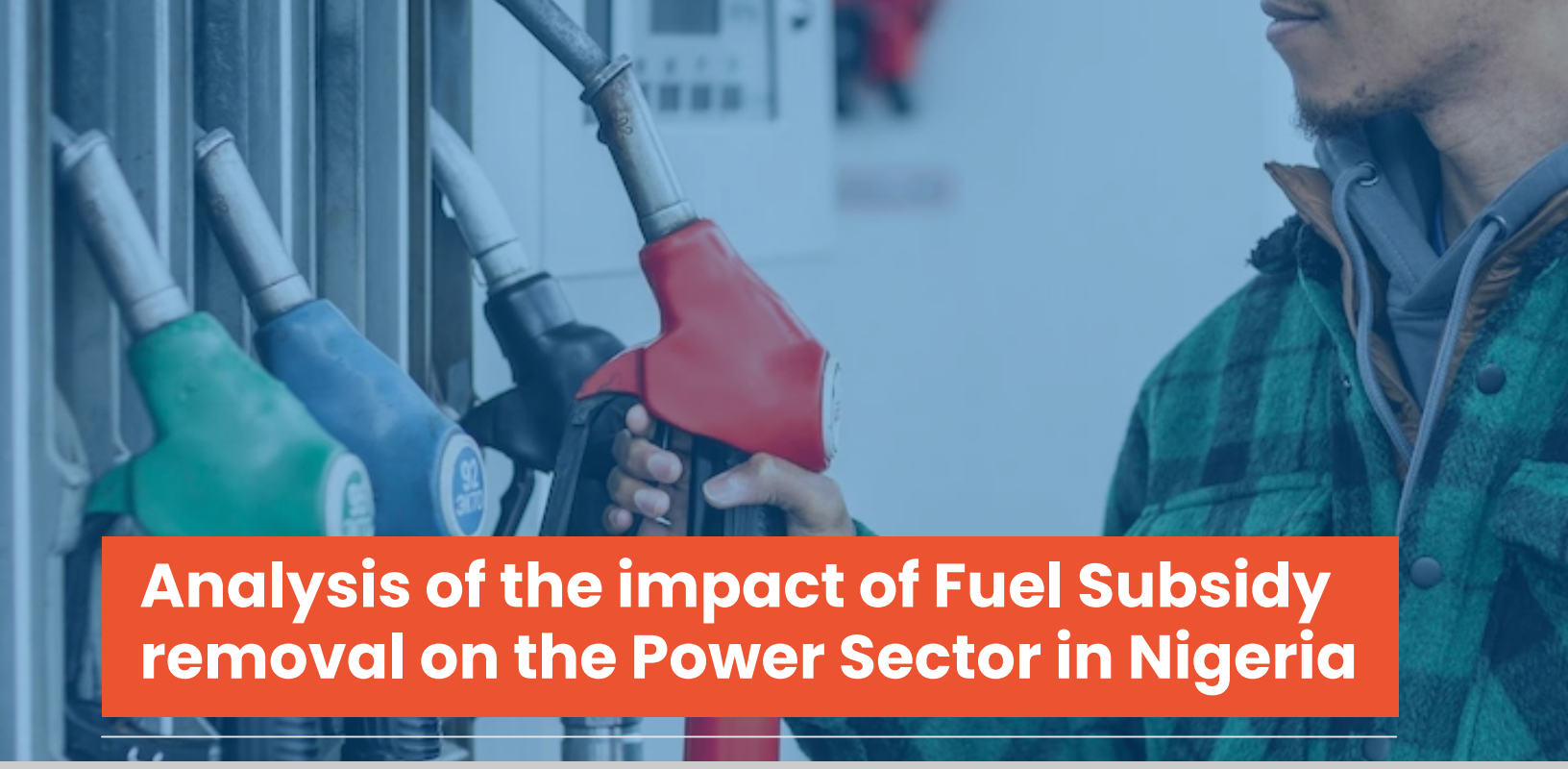
Introduction

The Inaugural event for the 16th President of the Federal Republic of Nigeria, his Excellency Bola Ahmed Tinubu, held on the 29th May 2023 where the President was heard to have uttered the words “fuel subsidy is gone”. This is based on the statement of the Nigerian National Petroleum Company Limited's (NNPCL) Chief Executive Officer, Mele Kyari, that the current 2023 budget only made provision for fuel subsidy till June 2023. Prior to the inaugural event, the outgoing administration headed by his Excellency Muhammadu Buhari had stated that no allocation had been made for fuel subsidy in the National Budget of 2023.

The term “subsidy” refers to a practice where states pay the difference between international commodity market prices and agreed domestic prices of a good, in this case, petrol. It has been noted that fossil fuel subsidy removal “frees public funds for investing in social and economic development, which would be of great value in many developing countries”.

According to the newly elected President, “funds for subsidies will be diverted to other areas such as public infrastructure, education, health care and jobs”. Accordingly, the Nigeria National Petroleum Corporation (NNPC) Limited circulated a notification regarding the increment of its pump price for Premium Motor Spirit (PMS).

This impact analysis report is aimed at assessing the effect of the fuel subsidy removal on the Nigerian power sector, given the significant role of the sector in the overall energy access agenda of Nigeria and the global landscape.



Analysis of the impact of Fuel Subsidy removal on the Power Sector in Nigeria

Nigeria's energy mix consists mainly of natural gas, hydropower, minimal diesel utilisation for back-up generators and renewable solar energy; utilised mainly in the off-grid space.

In terms of the impact of subsidy removal on on-grid generation, considering that Nigeria's power sector does not rely on PMS for electricity generation, the removal is not expected to have a direct impact on grid-based electricity supply. However, considering that not all regions across the nation are connected to the grid, in addition to the abysmal state of on-grid electricity supply, Nigerians rely on PMS for self-generation as a means of augmenting the insufficient power supply from the grid; consumers utilise PMS powered generators for self-generation of power. As such, the subsidy removal is expected to affect the quality of access to electricity for communities, individuals and businesses who would have otherwise relied on back-up generators for electricity supply to power additional man-hours and productive hours.

This presents an opportunity to improve and increase grid-based electricity supply to unserved and underserved communities. Nevertheless, cost considerations are itemised below when factored alongside renewable energy and diesel generation.

Based on the subsidisation of PMS, **the cost of generating power using self-generating sets was submitted to be $0.444 (₦204) (the cost of petrol was $0.40per litre (₦184))** while the **cost of power from the grid is estimated at $0.14 (₦65/kwh)**

and the **Levelized Cost of Energy (LCOE) generated through renewable energy (RE) (solar generation) ranges from 0.387 - 0.475 $/kWh (₦178.407- ₦218.975) and 0.947 US$/kWh (₦436.567) and 0.559 US$/kWh (₦257.699) for diesel generation**.
Under the recent subsidy removal initiative, NNPCL's new PMS price ranges from $1.059 to $1.208/litre (₦488/litre to ₦557/litre). While the **cost for on-grid power remains at approximately $0.14 (₦65/kwh) for residential and the LCOE generated through renewable energy (solar generation) remains within the range of 0.387 - 0.475 $/kWh (₦178.407- ₦218.975).**

Figure 1: Comparison of the cost of generating electricity per generation technology before and after the removal of Fuel Subsidy in Nigeria

Self-Generation with Petrol Powered Generators		On-Grid Generation		Diesel Powered Generation		Renewable Energy Generation	
Pre-Subsidy	Post-Subsidy	Pre-Subsidy	Post-Subsidy	Pre-Subsidy	Post-Subsidy	Pre-Subsidy	Post-Subsidy
$0.444/₦204 Kwh	$26.464/ ₦12,200 per 12hrs	$0.14/₦65 Kwh	$0.14/₦65 Kwh	0.947-0.559/ ₦436.567 - ₦257.699 Kwh	0.947-0.559/ ₦436.57 - ₦257.70 Kwh	0.387-0.475/ ₦178.407- ₦218.975 Kwh	0.387-0.475/ ₦178.407- ₦218.975 Kwh

Source: Electricity Lawyer

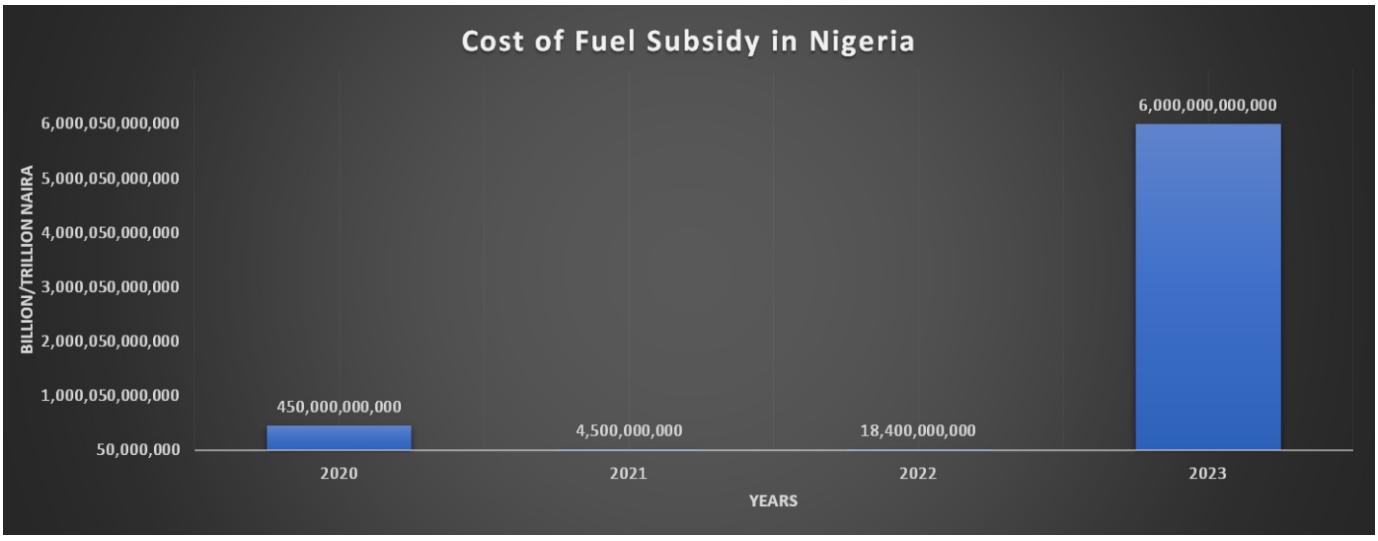
While research does not currently exist which provides an updated cost of power generation from the grid, a full tank of new generation has been estimated to run for 16-20hours and the operating time drops to 8-12hours, as the generation set gets older with a fuel requirement of 25litres. A generator set providing 12hours of power supply utilising 25litres of PMS will cost around $26.464/ ₦12,200 (excluding the cost of generation purchase, operation and maintenance).
This cost is considerably higher than the LCOE for Renewable Energy (RE) generation. This is expected to have a positive impact on the demand for RE in Nigeria. The subsidy removal provides an incentive for individual households, businesses, and industries to invest in RE generation as a supplementary source of

power generation to on-grid electricity generation, as against the traditional PMS powered generators for self-generation.

As the newly elected President has suggested, the resources that otherwise would have been allocated for subsidy can be channelled to other sectors of the economy. **This provides an opportunity for the allocation of such resources to sectors such as the power sector (including strengthening the transmission system) and the gas to power value chain.**

Economically, Foreign Direct Investments (FDI) were formerly limited in the electricity industry because investors were concerned about their capacity to repay investment(s) at government-controlled prices. FDI in the industry will produce revenue for the government through taxation and levies. **Also, the availability of foreign exchange at the Central Bank of Nigeria would be another result of the termination of fuel subsidies. A steady supply of foreign currency to the Central Bank will result in the country having a single foreign exchange rate regime, which will stabilize the foreign exchange market and eliminate the black market**. Foreign exchange will be easier to obtain for goods and machinery imports, etc.

Figure 2: Cost of maintaining Fuel Subsidy in Nigeria over 2020-2023

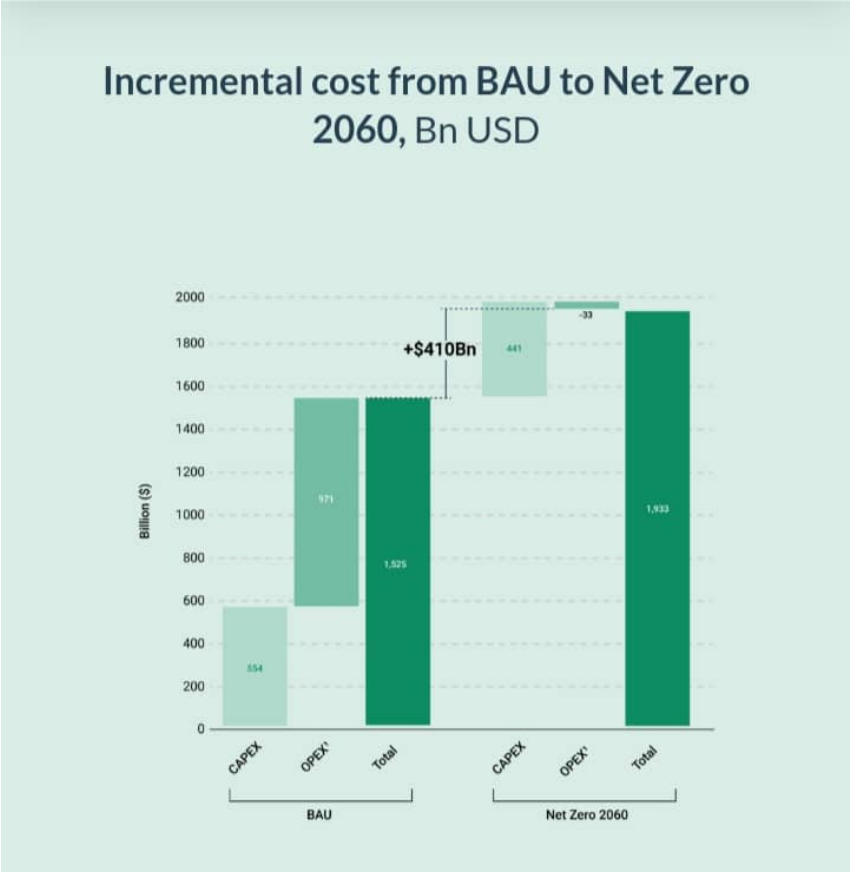


Source: Electricity Lawyer

Assessing the cost of fuel subsidy over 2020- date, it is realised that the Federal Government put the daily spend on maintaining the petrol subsidy at ₦18.4 billion for 2022. In 2021, the country spent ₦4.5 billion on fuel subsidy. The Federal government budgeted an estimated amount of ₦450 billion on fuel subsidy in 2020. For mid- 2023, the country budgeted 6 trillion Naira.

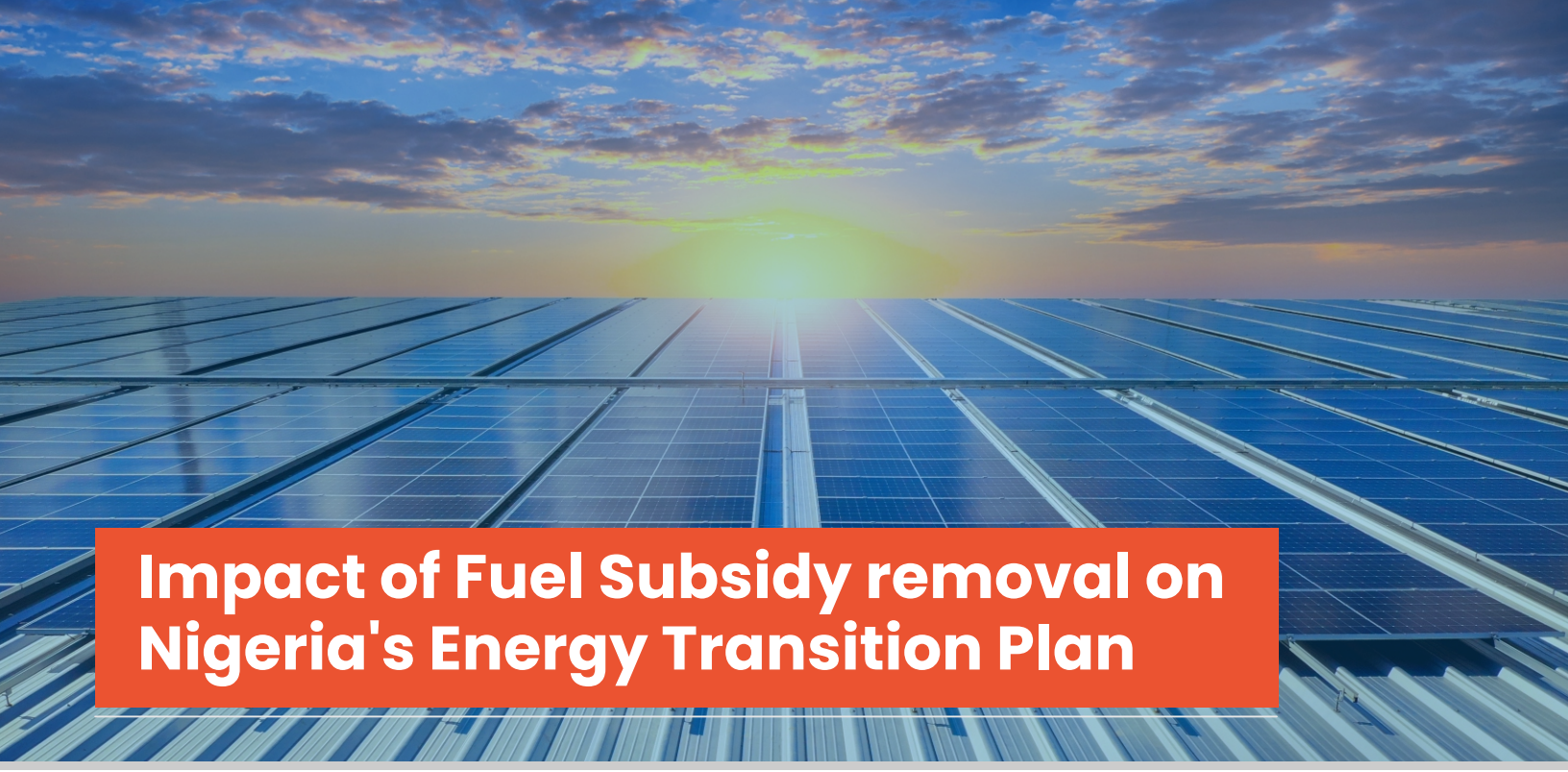
Fuel subsidies have continuously increased in cost(s) over the years, which might be ascribed to the lack of investment in renewable energy, because fuel subsidies increase the amount of expenditure(s) the government allocates to the energy sector, whereas these funds can be used as rebates and incentives for attracting renewable energy investment into the country. Moreover, one of the impediments to renewable energy development in the country has been identified as relating to shortage of funding; such monies expended on fuel subsidization should have been invested in renewable energy infrastructure, which would have resulted in far-reaching positive effects on other industries.

Figure 3: Cost of achieving Nigeria's Energy Transition Plan



Source: Nigeria Energy Transition Plan

As earlier noted, research reveals that a barrier to renewable energy exploration in Nigeria is a lack of funds. However, **comparing the cost of fuel subsidy over the years in Figure 2 and the $410 billion estimated to achieve the energy transition goals of Nigeria as depicted in Figure 3, it clearly portrays that the removal of fuel subsidy will give the country a push towards achieving its energy transition and developmental goals**. $410 billion converted to Nigerian Naira is around ₦189, 420,000,000; an amount which Is less than the 2020 estimation of fuel subsidy costs in Figure 2. **This implies that finances may not be the issue in Nigeria, but the diversion of same into the right sector, like renewable energy. If the amount spent on fuel subsidy is diverted to renewable energy sector, Nigeria can revamp its electricity sector industry.** The diversion of funds towards the renewable energy sector will be a key link to make available the necessary infrastructure that will aid implementation of relevant policies and laws, providing for the integration of renewable energy into the energy mix of the country to supplement grid generated electricity.



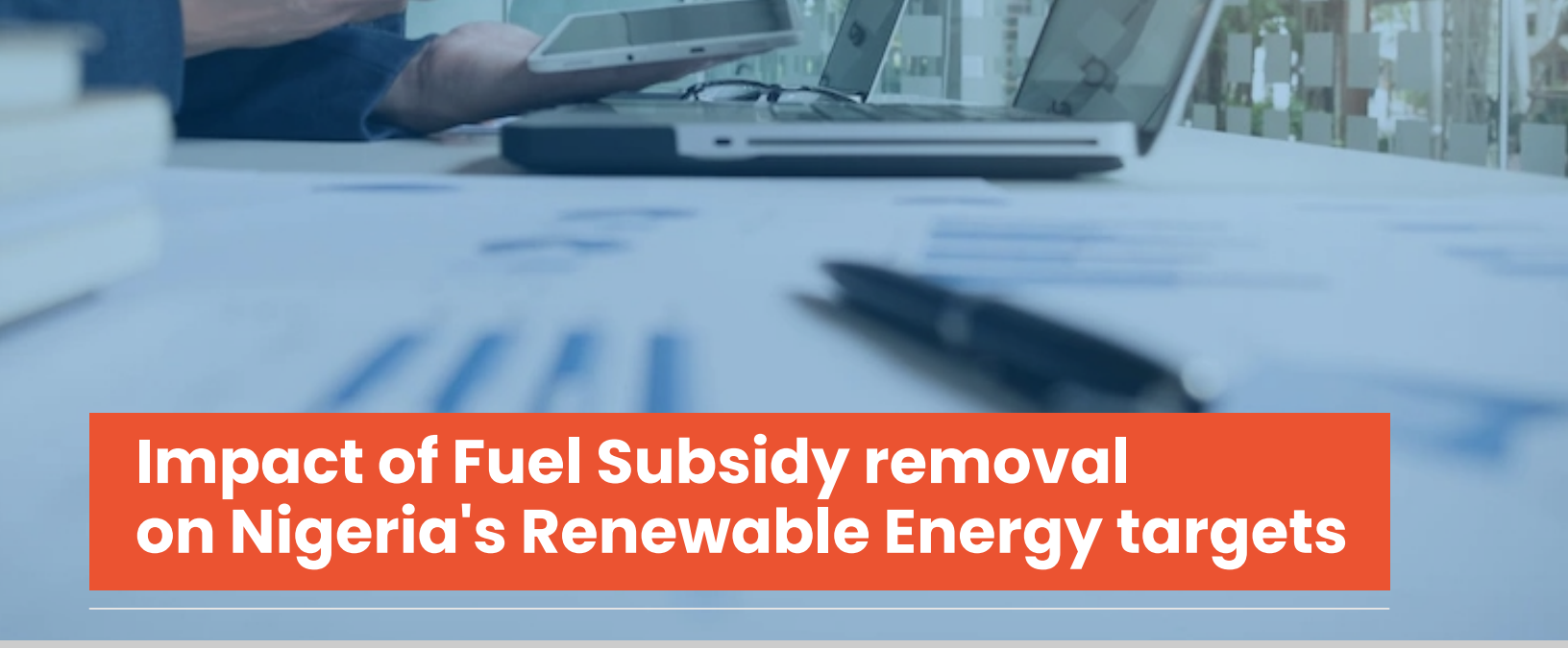
Impact of Fuel Subsidy removal on Nigeria's Energy Transition Plan

The increase in fuel prices presents an energy transition leap opportunity for Nigeria for several reasons. Firstly, **there is the opportunity for increased utilisation of renewable energy in place of petrol-powered generation to augment poor electricity supply from the grid**, because of subsidy removal which has now made the cost of PMS power generation considerably expensive. **A turn away from PMS consumption in turn decreases Nigeria's dependence on fossil fuel(s) and the consequent end-of-pipe emissions which emanates from the utilisation of petrol for self-generation**. Further creating an incentive for RE utilisation and promoting Nigeria's energy transition plan, is the **already existing Pay As You Go (PAYGO), Power Purchase Agreement (PPA) and similar business models which provide good opportunities to enable potential consumers (individuals and businesses) alleviate the challenge of upfront costs associated with acquiring solar generating systems**; thus, making a good business case for electricity consumers to switch to renewable off-grid sources for their total energy supply as a more reliable source of power.

Secondly, **the potential rise in Renewable Energy (RE) generation will likely encourage efficient energy consumption in Nigeria**. This is because RE sources are intermittent as they depend on weather conditions which are subject to change

according to the time of the day or season. Therefore, achieving stable power supply from RE sources, requires the utilisation of battery systems to store excess power harnessed at the most productive time(s) of the RE system, for utilisation at times when the weather conditions are less favourable and the RE generation systems are less productive. The higher the quantity of batteries required to store excess power harnessed at the most efficient time(s) of the RE power generation system to achieve a stable power supply from RE generation, the higher the cost of RE power generation to the consumer. This creates an incentive to eliminate certain heavy-duty appliances or opt for energy efficient alternatives.

Thirdly, **there is also the prospect of an uptake in the utilisation of Electric Vehicles (EVs), EVs charging station, Battery swapping, green hydrogen and other energy sources that provides cheaper alternatives to PMS**. However, challenges such as the upfront cost of acquiring EVs in Nigeria in comparison with the cost of PMS for the continuous utilisation of PMS powered vehicles militate against the uptake of EVs. This is heightened by lack of sufficient number of fairly used supply of EVs to meet possible demand considering the novelty of the technology. Nonetheless, **these challenges create opportunities for innovation in terms of business models that could be adopted to encourage EVs utilisation alongside the development of a manufacturing market for EVs in Nigeria.**



Impact of Fuel Subsidy removal on Nigeria's Renewable Energy targets

In 2022, IRENA reported that due to high fuel prices, investments in renewables continue to pay huge global dividends, as highlighted by IRENA's cost(s) data. Accordingly, it was projected that high coal and fossil fuel prices in 2021 and 2022 would profoundly deteriorate the competitiveness of fossil fuels and make solar and wind even more attractive. Further submitting that with an unprecedented surge in European fossil gas prices for example, new fossil gas generation in Europe will increasingly become uneconomic over its lifetime, increasing the risk of stranded assets; on the basis that higher fuel prices will motivate customers to shift from conventional energy sources to alternatively efficient ones that can be found in renewable energy. In the same vein, high gas prices at the pump will motivate consumers to switch from a conventional car to other kinds of transportation, whether being a fuel-efficient car or an electric vehicle. While this submission and the case of Europe seems to suggest that increased pricing for fossil fuels create an opportunity for renewable energy uptake, thus, increasing the propensity of a country to advance its renewable energy targets, this position is however not sacrosanct, as policies that provide financial incentives for RE also need to be provided to incentivise investment. This is because RE has a high upfront cost and is still riddled by high technology costs.

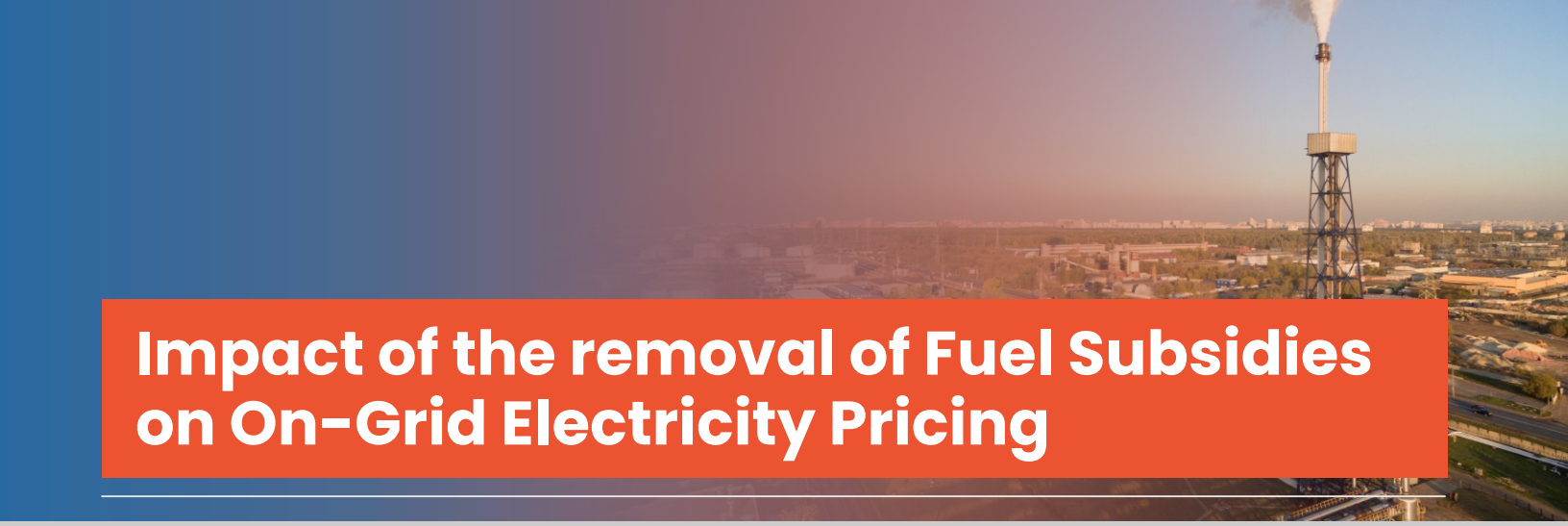
Nigeria has a renewable energy target as illustrated in Figure 4 below. In line with IRENA's projection that higher fossil fuel prices could profoundly deteriorate the competitiveness of fossil fuels and make solar and wind even more attractive, **it is anticipated that the removal of fuel subsidy and consequent increase in the cost of PMS will potentially aid the achievement of Nigeria's renewable energy targets as portrayed in Figure 4 below.**

Figure 4: Nigeria's 2025 Renewable Energy Targets per source

Energy Source	Target
• Small hydro	• 2,000 MW by 2025
• Solar PV	• 500 MW by 2025
• Biomass-based power plants	• 400 MW by 2025
• Wind	• 40 MW for wind energy by 2025

Source: Electricity Lawyer

Research has equally highlighted the importance of paying closer attention to financial investments in renewable energy to minimize any potential detrimental consequences of oil price fluctuations during market stress. **As such, it is critical to boost the subsidies and financial resources available to enterprises functioning in the RE sector. Therefore, while fossil fuel prices have the propensity to incentivise RE utilisation and by so doing advance a country's RE targets, the volatility of fossil fuel prices makes it an unpredictable factor to rely upon for creating a favourable environment for RE.**



Impact of the removal of Fuel Subsidies on On-Grid Electricity Pricing

Figure 5 below represents the global benchmark of electricity and fuel prices. The table assesses the alignment of Nigeria's fuel and on-grid electricity pricing alongside her African counterparts with the global benchmark considering Nigeria's fuel subsidy removal.

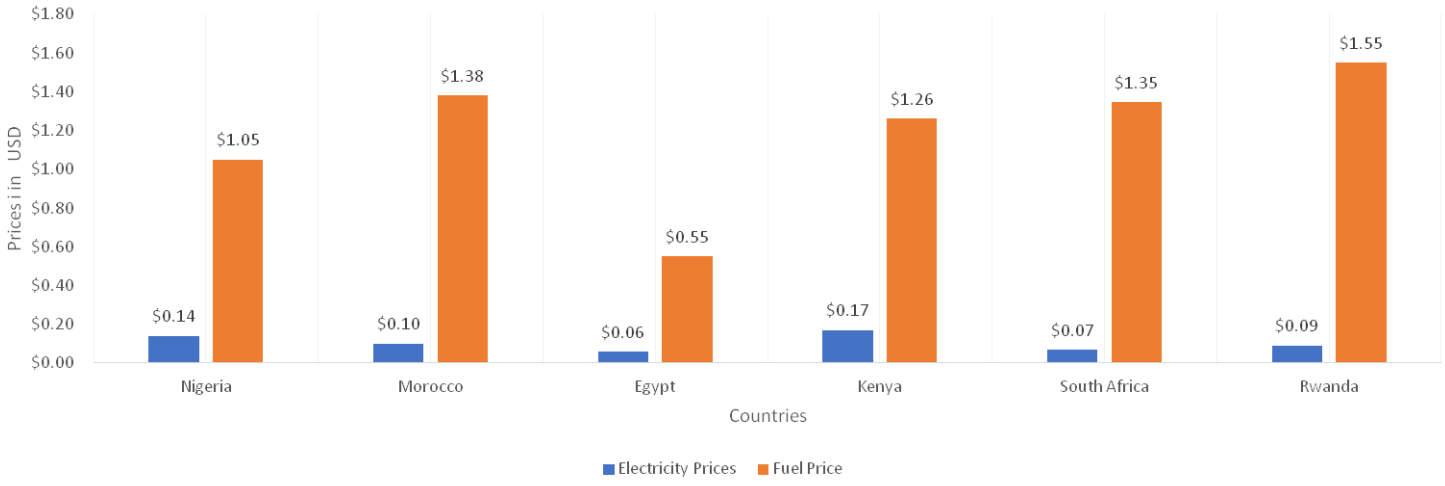
Figure 5: Comparison of Global Fuel and On-Grid Generated Electricity Benchmark rates with the Fuel and On-Grid Electricity Generation rates per referenced Countries

COUNTRIES	GLOBAL BENCHMARK[i] RATE	ELECTRICITY PRICE PER COUNTRY[ii] (BUSINESS)	GLOBAL BENCHMARK ALIGNMENT[iii]	GLOBAL FUEL BENCHMARK RATE[iv]	FUEL PRICE PER COUNTRY[v]	GLOBAL BERNCHMARK ALIGNMENT[vi]
NIGERIA	$0.136/KWh	$0.14	YES	$1.00 per litre	$1.05	YES
MOROCCO	$0.136/KWh	$0.10	NO	$1.00 per litre	$1.382	YES
EGYPT	$0.136/KWh	$0.06	NO	$1.00 per litre	$0.555	NO
KENYA	$0.136/KWh	$0.17	YES	$1.00 per litre	$1.263	YES
SOUTH AFRICA	$0.136/KWh	$0.07	NO	$1.00 per litre	$1.346	YES
RWANDA	$0.136/KWh	$0.09	NO	$1.00 per litre	$1.552	YES

Source: Electricity Lawyer

Figure 5 reveals that **Nigeria's petrol/fuel price post subsidy removal exceeds the global benchmark**. However, Nigeria is not the only country in the table whose fuel price exceeds the global benchmark. **Morocco, Kenya, South Africa, and Rwanda's petrol prices equally rank above the stipulated global benchmark**. In relation to the electricity prices, **the cost of on-grid electricity supply in Nigeria post subsidy removal remains within the global benchmark range, as was the case before the fuel subsidy removal alongside Kenya**, whose electricity price ranks slightly above the electricity global benchmark price. **This reveals that Nigeria's fuel subsidy removal has thus far had no impact on the price of on-grid electricity supply in Nigeria.**

Figure 6: Graphical representation of the comparison between Global Fuel and Electricity Benchmark rates for the referenced Countries



Source: Electricity Lawyer

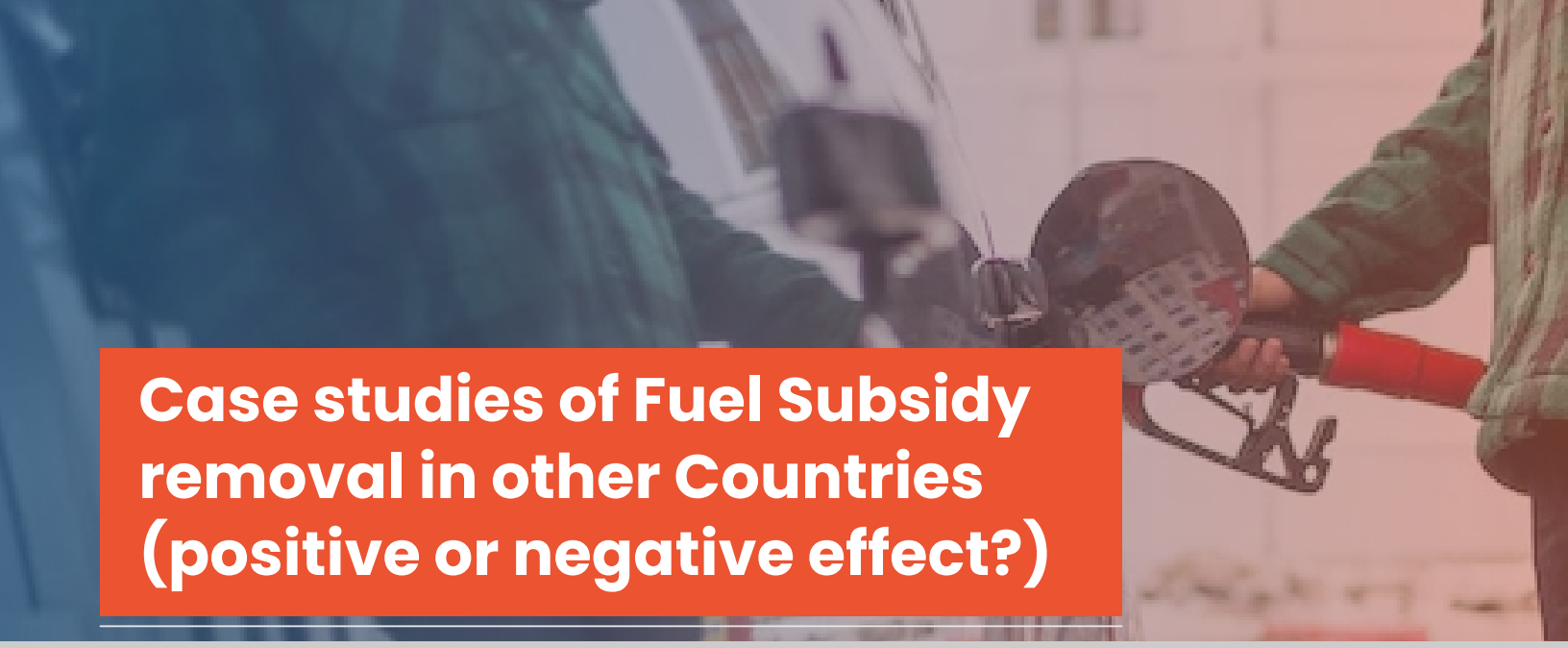
The current cost of PMS post subsidy removal, ($1.059 to $1.208/litre (₦488/litre to ₦557/litre) reveals **that it is cheaper to build clean energy generation than to generate power using PMS powered generators**. However, **in terms of on-grid generation**, the cost of natural gas for power generation remains $3.2 per million British Thermal Units, **suggesting that the cost of supplying power from the grid does not change**, although the **frequent statutory review of electricity tariffs in Nigeria by the Nigerian Electricity Regulatory Commission (NERC) projects that the tariff for on-grid generation will continue to rise, irrespective of the fuel subsidy removal**.

With the current cost of residential on-grid supply at $0.14/kwh (₦64.54) and LCOE generated through renewable energy (solar generation) ranging from 0.387 - 0.475 $/kWh (₦178.407- ₦218.975), **on-grid supply remains a cheaper alternative to RE generation. Nonetheless, there remains a business case for RE against on-grid generation when the intermittency of grid supply is considered, alongside the gradually reducing cost for RE**.

RE prices are also expected to continue declining, with prices falling even further downwards over the next three decades. **It is therefore expected that at some point in the nearest future, the cost for RE and on-grid generation will equalise, creating an equal playing field for on-grid and RE generation, otherwise termed as the Levelised Cost of Electricity (LCOE).**

It is also worth noting that the price of fossil fuels will have a stronger impact on renewable energy consumption in regions where fossil fuels take up a larger share of the electricity generation. As stated earlier, the higher cost of fossil fuels for powering generators due to subsidy removal will cause consumers to choose RE over prolonged use of fossil fuels, where the right policies are implemented to incentivise such consumer decisions.

Conclusively, oil is an essential energy source in worldwide economies. As such, the volatility of oil prices has a profound effect on the financial indicators of global markets. Nevertheless, although there is a correlation between stock prices and crude oil prices in terms of uniform reactions to common factors, **oil price fluctuations do not necessarily impact renewable energy stock returns**. Using daily data on Brent crude oil prices and global renewable energy stock market indices between 29 November 2010 and 18 February 2020, research revealed that oil markets and renewable energy markets are rather disconnected. In effect, **the development of renewable energy businesses is less affected by potential shocks in the oil prices and markets, thus making a strong case for renewable energy development**.



Case studies of Fuel Subsidy removal in other Countries (positive or negative effect?)

Morocco

Prior to 2012, fossil fuel consumption was subsidised by the Moroccan Government (the government) and in 2012, the government was reported to have spent the equivalent of 5% of the nation's GDP on fossil fuel subsidies leading the government to phase out gasoline and fuel oil subsidies in 2014. Unlike in the Nigeria case, the subsidy removal was planned by the government in phases over a span of three years (2014-2016). The change has over the years led to more sustainable consumption of energy and has significantly reduced the cost to the Government. The Government of Morocco reinvested the savings from subsidy removal in renewable energy projects. The projects have been reported to create sustainable jobs, while increasing the energy independence of the country.

In 2019, Morocco had achieved 2,696MW of renewable energy capacity (being 34% of its electricity consumption). RE job creation projection was 26,000 as of 2020 and up to half a million jobs are projected into 2040. Nonetheless, policy and institutional measures were put in place to achieve this result. Firstly, there was coordination among relevant ministries. The fuel subsidy reform was implemented with coordination among relevant ministries, including the Ministry of Economy and Finance and the Ministry of Energy, Mines, Water, and the Environment. Furthermore, new institutions were established to promote investments in renewable energy, such as the Moroccan Agency for Energy Efficiency, the Moroccan Agency for Solar Energy, and the public energy service corporation Société d'Investissements Energétiques (SIE).

Government financial support, backed by Nationally Determined Contributions (NDC) commitments and domestic renewable energy plans, prompted private-sector actors to engage in the country's energy transition and create green jobs.

However, to cushion the effect of the subsidy removal, the government-maintained butane subsidies because of a lack of viable alternatives for low income and rural households. Whereas, Butane heaters generate harmful indoor air pollution, and the butane subsidy is costly, (nearly 4% of the Moroccan government's budget in 2017). Economically, while it continued to cost the government to maintain subsidy for butane, this cost is considerably lower than the cost of full fossil fuel subsidy which was initially the practice of the state. Additionally, it protected lower-income households from some of the potential impacts of the fuel subsidy reforms.

Egypt

Prior to 2014, Egypt was into the practice of subsidising petroleum/fossil fuel products. In 2013, fossil fuel subsidy was reported to have a fifth of the country's budget leading to the subsidy removal with the aim of redirecting the cost of subsidy to address unemployment and decelerated growth.

In July 2014, the Egyptian government allocated about $14 billion for fuel subsidies in the 2014-2015 budget and raising the prices of gasoline, diesel, kerosene, natural gas, and several other petroleum products. However, in the same breadth, the government adopted several new social protection measures to ease the burden on lower-income families. Several measures helped offset the disproportionate impact of the higher fuel prices on the poor, including expanded food subsidies and social security pensions, in addition to an increase in the public-sector minimum wage and higher taxes on wealthier households and businesses.

Although reforming fossil fuel subsidies is part of mitigating GHG emissions, there were no reciprocal measures, structures, or strategy to incentivise investments in renewable energy sources as was the case in Morocco.

Conclusion *and* Recommendation(s)

The PMS subsidy removal in Nigeria has a high likelihood of altering power generation in Nigeria, particularly off-grid generation. Considering that on-grid generation is solely dependent on hydro power and natural gas, there are no direct consequences on the PMS subsidy removal on on-grid generation. However, given the poor state of on-grid power supply and the consequent dependence on PMS powered generation for supplementary supply, the reliance on PMS generators is likely to shift to solar home systems or PPA arrangements in the case of larger commercial and industrial consumers, thus reducing overall fossil fuel consumption in the country. In this vein, **the PMS subsidy removal equally creates an opportunity for the achievement of the energy transition agenda under Nigeria Energy Transition Plan**. This notwithstanding, case studies from Morocco reveal that for full utilisation of the PMS subsidy removal to advance energy transition goals, RE policies and incentives also need to be taken into consideration.

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7. The exchange rate used is N461/$1 (being the prevailing exchange rate at the time the cost of each generation technology was estimated and before Nigeria's Monetary Policy enabling USD to trade at the prevailing market rate). Due to lack of updated data, a comparison cannot be drawn between the cost of generating power from self-generation set (utilising fuel based on the new petrol price post subsidy removal) and the cost of generating power from renewable sources.
8. The post subsidy price of diesel is exclusive of the Federal Government's recently implemented VAT of 7.5% for diesel
9. There is no data currently available for post subsidy cost of per kWh of power generated using PMS. The estimation used in the text is not for per kWh of self-generation. The figure provided is based on the position that a full tank of new generation runs for 16-20hours, and the operating time drops to 8-12hours as the generation set gets older, requiring a consumption of 25litres. Therefore, a generator set providing 12hours of power supply utilising 25litres of PMS will cost $26.464/ ₦12,200 (excluding cost of generation purchase, operation and maintenance). This cost is considerably higher than the LCOE for RE generation.
10. NERC and Discos have circulated notices regarding increment in Tariffs for grid supplied electricity to the effect that the cost of grid generated power will no longer be the same from July, 2023 which will also have an impact on the figures represented in the table and the attendant analysis based on the current cost.
11. Data were sourced from the sources referenced within the text.
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25. ibid
26. Levelised Cost of Energy (LCOE) is a measure of the average net present cost of electricity generation for a generator over its lifetime and is calculated by dividing the cost of developing and maintaining a mini-grid facility by the life span of the facility. It is considered the most appropriate way of ascertaining the cost of a mini-grid facility considering the high upfront cost and minimal lifespan cost in comparison with other energy sources.
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