Current Energy Landscape In Nigeria & Socioeconomic Impact

FOREWORD

The specter of climate change looms large, presenting a challenge that transcends borders and generations. Every corner of our planet, including the very lands and waters that cradle Nigeria, is at risk, rising sea levels, shifting weather patterns, increasingly erratic climate phenomena, and global geo-political uncertainties have made their presence felt, signaling the need to swift decision action.

Nigeria stands committed in joining the international community in combating this existential threat. Our motivation is twofold: it is both our ethical responsibility to safeguard our planet and the unique prospect of refining our nation's trajectory toward sustainable growth and prosperity. We can chart a course that intertwines economic development with environmental stewardship by harnessing the vast potential of renewable energy sources.

Context

Nigeria, with its diverse economy and abundant natural resources, faces significant energy challenges and opportunities. According to the country's NDCs, the agriculture, industry, oil and gas, power, transport, waste, and water sectors each play a crucial role in the country's energy landscape. A comprehensive energy scenario analysis is essential to address these challenges and harness opportunities. This analysis will evaluate possible future pathways of Nigeria's energy systems under various assumptions and conditions, aiding in the formulation of robust, sustainable energy policies and strategies.

Objectives

1. **Assessment of Current Energy Landscape:** Evaluate the current state of energy consumption, production, and distribution across the specified sectors in Nigeria.
2. **Development of Energy Scenarios:** Develop and analyze multiple energy scenarios for Nigeria up to 2050, considering technological, economic, environmental, and social factors.
3. **Sector-Specific Analysis:**
   Oil and Gas Sector: Examine scenarios for managing reserves, reducing flaring, and transitioning to renewable energy.
   Power Sector: Evaluate the potential for expansion of renewable energy sources, grid improvements, and electrification rates.
   Transport Sector: Analyze the impact of electrification, biofuels, and efficiency improvements on energy demand.
4. **Policy and Strategy Recommendations:** Provide recommendations for energy policies and strategies that support sustainable development, energy security, and environmental sustainability in each sector.

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Executive Summary

Without further action, Nigeria's emissions could rise from 129 Mt CO2e in 2022 to about 2000 Mt in 2050. Under Business-As-Usual (BAU), the bulk of emissions growth will come from transport, driven by population growth, GDP per capita growth, and vehicle ownership.

Alternative Net Zero pathways consider five country-level objectives or guiding principles: environmental sustainability, energy system costs, economic impact, social implications, and security of supply.

AN ORDERLY TRANSITION TO NET ZERO

Nigeria could achieve Net Zero CO2 emissions by 2060, through the deployment of low-carbon solutions across all sectors. A 2060 target could achieve an orderly transition, balancing public policy objectives.

Four main decarbonization technologies will anchor an Orderly Transition. Together, renewables, low-carbon hydrogen, battery electric vehicles, and clean cookstoves cover over 90% of the 2060 abatement.

SOCIOECONOMIC IMPACTS AND FINANCING NEEDS

The Energy Transition Plan (ETP) is set to lift over 100 million people out of poverty. In a Net Zero scenario, Nigeria would need around USD 1.9 Trillion in capital investment by 2060 (USD 410 bn more than under BAU), with most of the investment going to the power and transport sectors. Delivering this investment could drive new economic activity in the energy sector and beyond, potentially supporting an additional 840 thousand net new jobs by 2060.

Capital markets could provide the largest funding pool, but tapping these sources will require de-risking interventions.

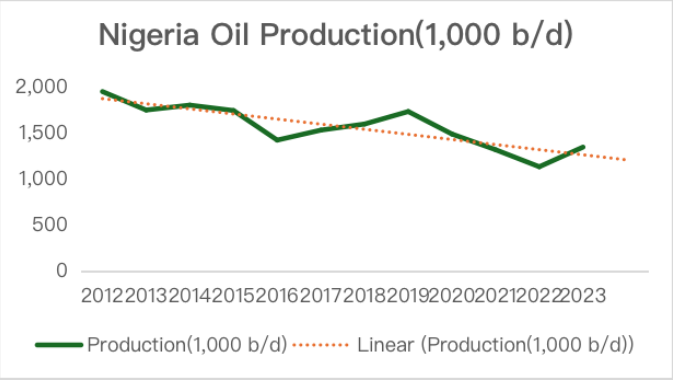
THE PATH FORWARD

There is a set of clear next steps to drive the implementation of a pathway, underpinned by strong governance, a clear timeline and cadence of interaction, and supportive policies.

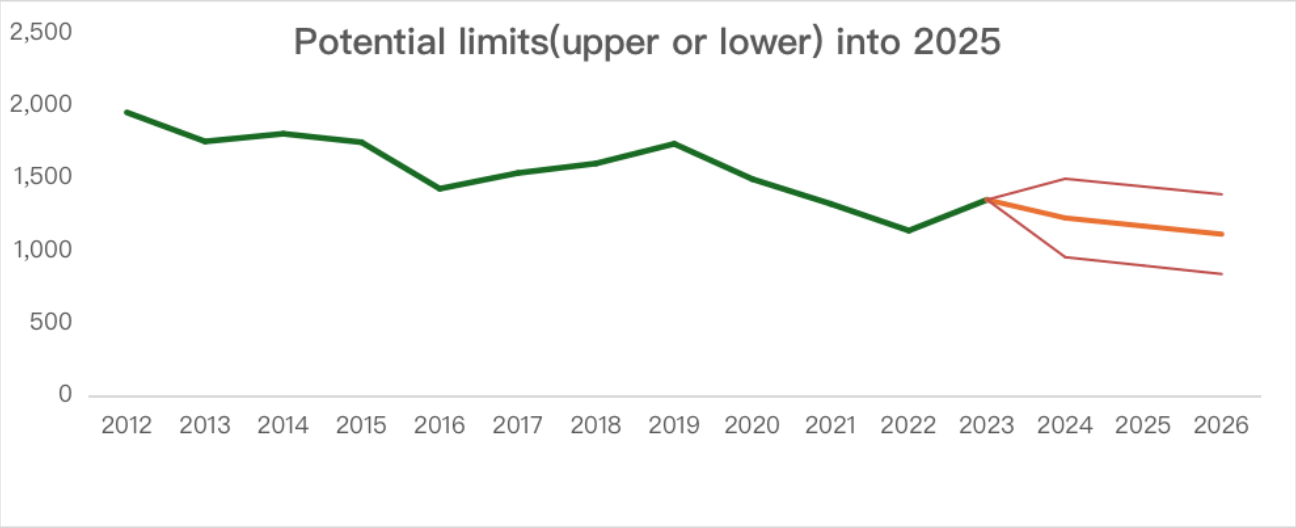
Current Energy Landscape

Nigeria currently ranks as the largest economy and richest oil resource center of the African continent, as well as the largest gas consumer and producer of West Africa. The country's growing population and array of socioeconomic issues mean it needs sustainable energy sources to meet the increasing needs of all sectors of the economy. Currently, Nigeria's energy sector is heavily dominated by fossil fuels and traditional biomass, making it the 13th-largest producer and the 8th-largest exporter of crude oil in the world.

The Oil and Gas sector: Nigeria's oil production has been on a steady recovery trajectory since 2020 following consistent and repeated efforts by NNPC Ltd to fight crude oil theft. The country's oil and condensate production currently stand at some 1.5-1.6m barrels per day (bpd) and the ambition is to ramp this up past the 2m bpd threshold in the years to come.

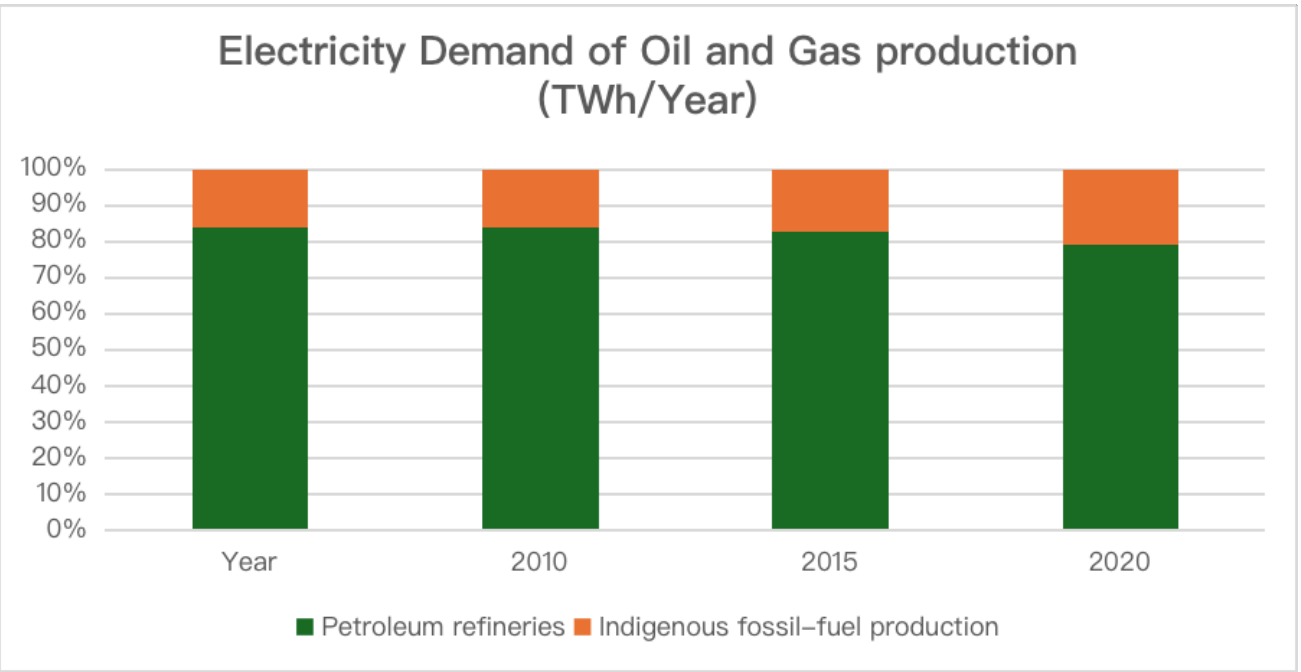


	OIL	GAS
Reserves	37.2 billion barrels	5.2 trillion cubic metres
Production	2417 thousand barrels	43.2 billion cubic metres
Average years of extraction remaining, calculated	42 years	120 years



Source: Nigerian National Petroleum Corporation (2023)

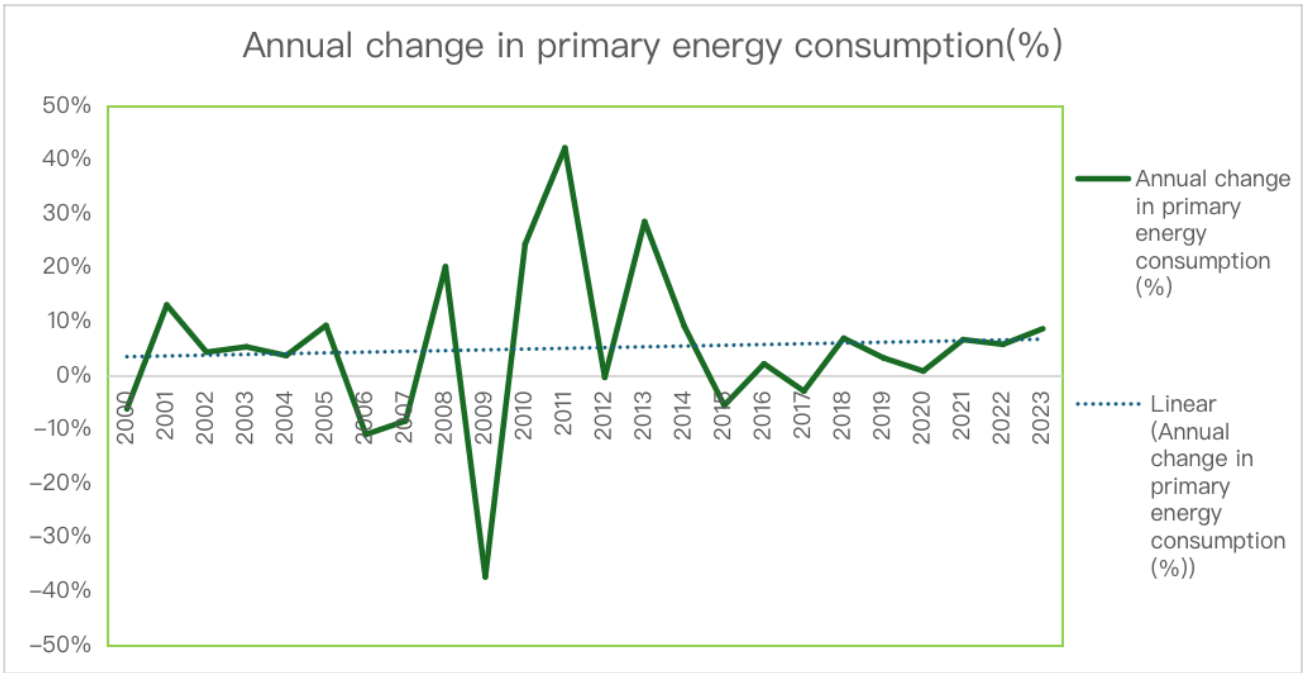
Nigeria is among the leading exporters of crude oil in the world, but it imports about 85% of its refined petroleum products due to the low-capacity utilisation of its oil refineries (around 65%). gas-only exploration projects and the gas reserves consist solely of associated petroleum gas. Despite this, Nigeria exported more than 8% of globally traded liquefied natural gas (LNG), making Nigeria the world's fourth largest LNG exporter in 2012.



Source: The World Bank data on Nigeria electricity demand (2022)

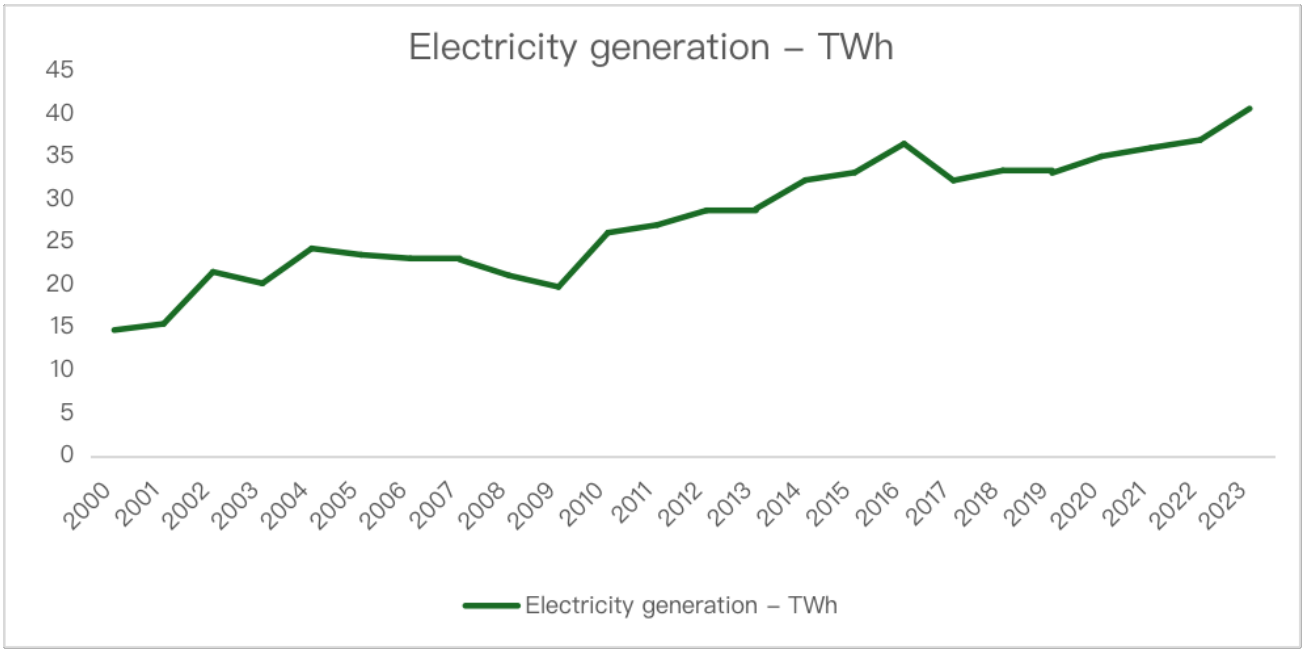
Power Sector: On Sunday, February 4, Nigeria witnessed its first national grid collapse in 2024. The situation led to the shutdown of all 20 power plants, except Ibom Power with 31 megawatts. That collapse makes it more than 200 grid collapses in the past 12 years for Africa's most populous nation, and energy experts have attributed the incessant grid collapse to technical issues and poor management.

Electricity in Nigeria is generated through thermal and hydropower sources. The primary source of electricity generation comes from fossil fuels, especially gas, which accounts for 86% of the capacity, however, this reliance has proven to be unsustainable due to fluctuating global prices, supply disruptions, and environmental concerns. As a result, there has been a growing recognition of the need to diversify the country's energy mix and integrate renewable energy sources. Below is a graph showing the change in primary energy consumption over the years.



Source: The World Bank data (2023)

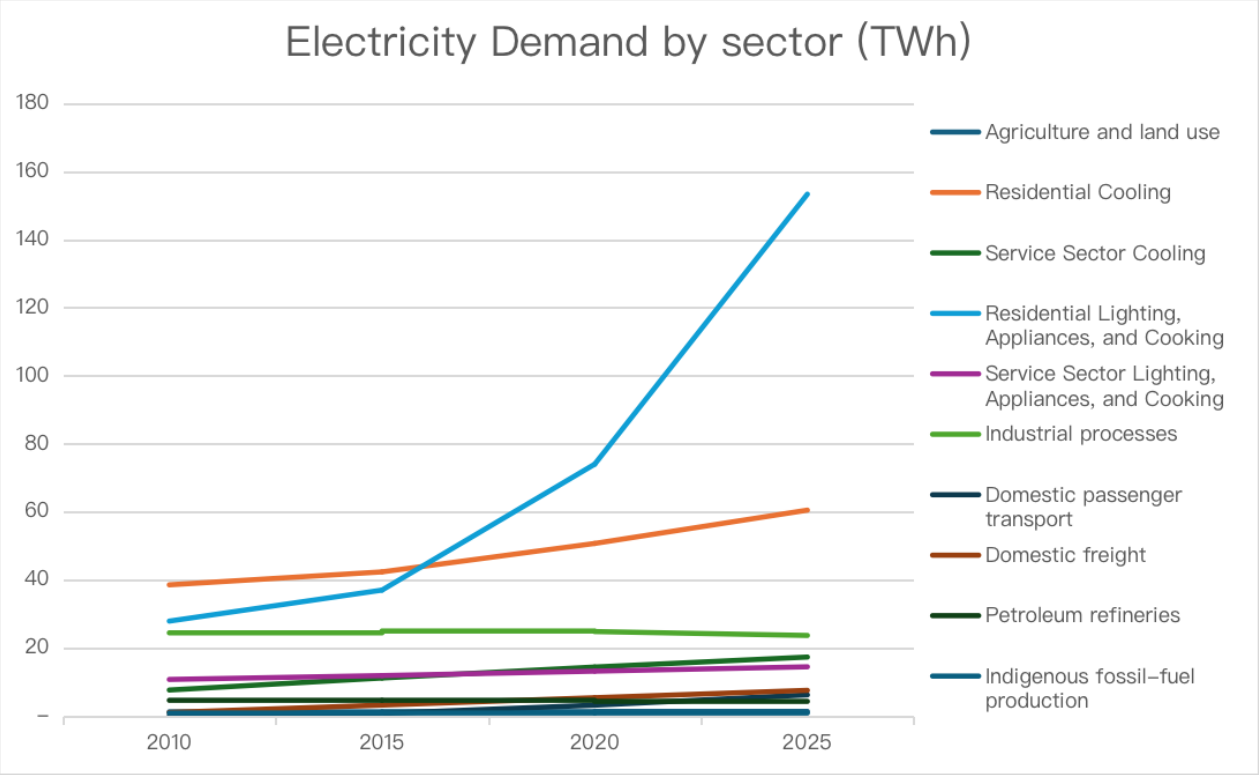
Currently, the power generation capacity of Nigeria is 16.4GW with an operational grid capacity of 6GW, with over 80% of operational energy capacity coming from off-grid diesel/petrol generators.



Source: The World Bank data (2023)

Sector (Electricity demand TWh/Y)	2010	2015	2020	2025
Agriculture and land use	1.24	1.30	1.36	1.44
Residential Cooling	38.55	42.36	50.71	60.50
Service Sector Cooling	7.64	11.16	14.39	17.33
Residential Lighting, Appliances, and Cooking	27.90	37.00	74.01	153.36
Service Sector Lighting, Appliances, and Cooking	10.75	11.88	13.18	14.46
Industrial processes	24.45	24.98	24.83	23.68
Domestic passenger transport	-	0.76	3.19	6.22
Domestic freight	1.04	3.21	5.38	7.54
Petroleum refineries	4.62	4.62	4.30	3.69
Indigenous fossil-fuel production	0.89	0.89	0.89	0.96
Total	**117**	**138**	**192**	**289**

Source: The African Policy Research institute (2022)



Source: The African Policy Research institute (2022)

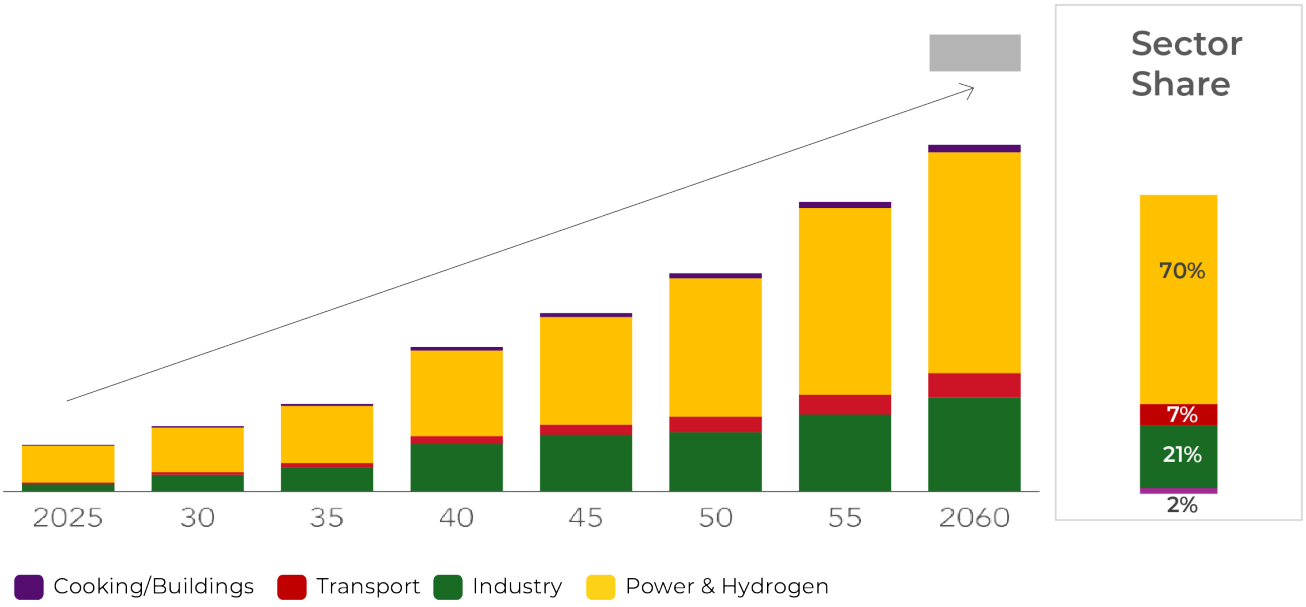
KEY OUTCOMES

- Residential energy demand makes up more than 60% of total energy demand. This is due to the rapid population growth.
- Industrial energy demand, mostly for cooling and production make up about 15% today demand.

General Finance, Policy and Strategy

Around USD 1.9 Trillion bn cumulative capital investment is needed, with power sector accounting for up to 70% of the total capex.

To achieve net-zero goals, about 220GW of solar, biomass and hydro generation capacity, 90 GW of storage and 34GW of hydrogen systems need to be built.

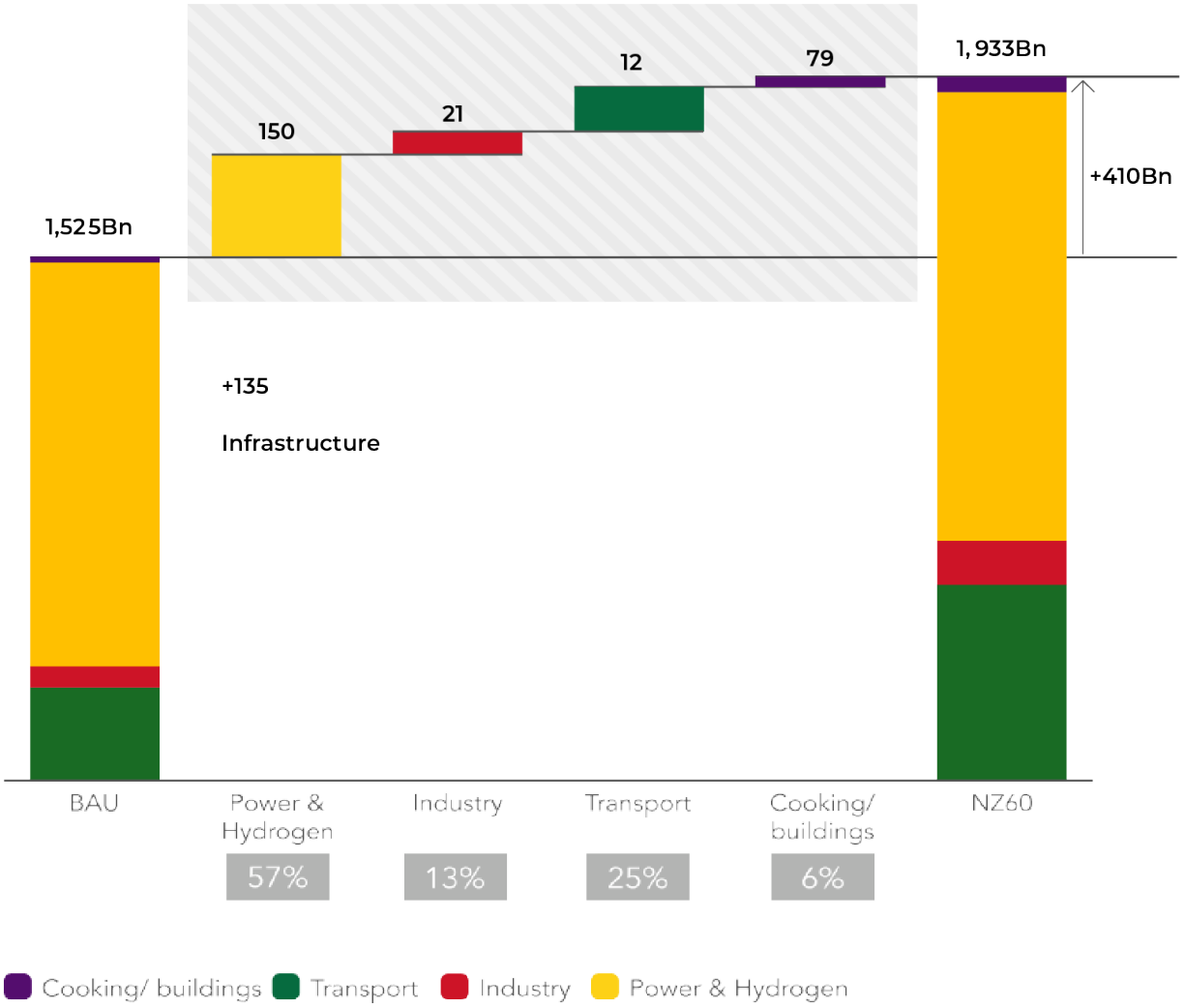


Source: World Bank data (2022) | Nigerian Energy Transition Plan (2023)

KEY MESSAGES

- Most of the effort will be needed in the power sector: an extra CAPEX of at least $200Bn will be needed to finance the power sector generation capacity.
- Significant savings in terms of fuel costs for power, considering the switch to 90% renewables.

Around USD 410bn capital investment is additional to investment needs in a BAU scenario



Source: Energy Transition Plan (2023) | Rocky Mountain Institute (2021)

KEY OUTCOMES

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Year	Law, Strategy, Policy	Institution Responsible for Implementation	Short Description
2023	Constitutional amendment permitting states to supply grid-based electricity	National Assembly	Allows state to generate and distribute electricity within their own borders, which could help to improve access to electricity in rural areas.
2023	Electricity Act	Nigerian Electricity Regulatory Commission/ Ministry of Power	Modernizes the Nigerian electricity sector, with a focus on increasing acess to electricity and reducing energy costs, devolving regulatory power to states, & creating independent system operator.
2021	Petroleum Industry Act	Department of Petroleum Resources	Reforms the Nigerian oil and gas industry, with a focus on increasing transparency and accountability, and reducing gas flaring.
2021	Climate Change Act	Federal Ministry of Environment	Establishes a National Council on Climate Change and sets out a framework for mainstreaming climate change actions into national development planning, and creates Climate Fund, carbon tax etc.
2023	Renewable Energy Roadmap	Energy Commission of Nigeria	Sets out a roadmap for the development of renewable energy in Nigeria, with a focus on solar and wind power.

Source: The Nigeria Energy Transition Plan (2023)

KEY ALIGNMENT

- Office of the VP established a working group to support the Energy Transition Office, staffed by SEforALL and funded by GEAPP.

KEY MISALIGNMENT

- Lacked adequate buy-in from the President, NNPC and Ministry of Environment.
- Reduced investors' confidence due to the development of multiple energy transition policies.
- Competing Legislative Priorities. Climate Change Act and Petroleum Industry Act enacted within 60 days of each other.

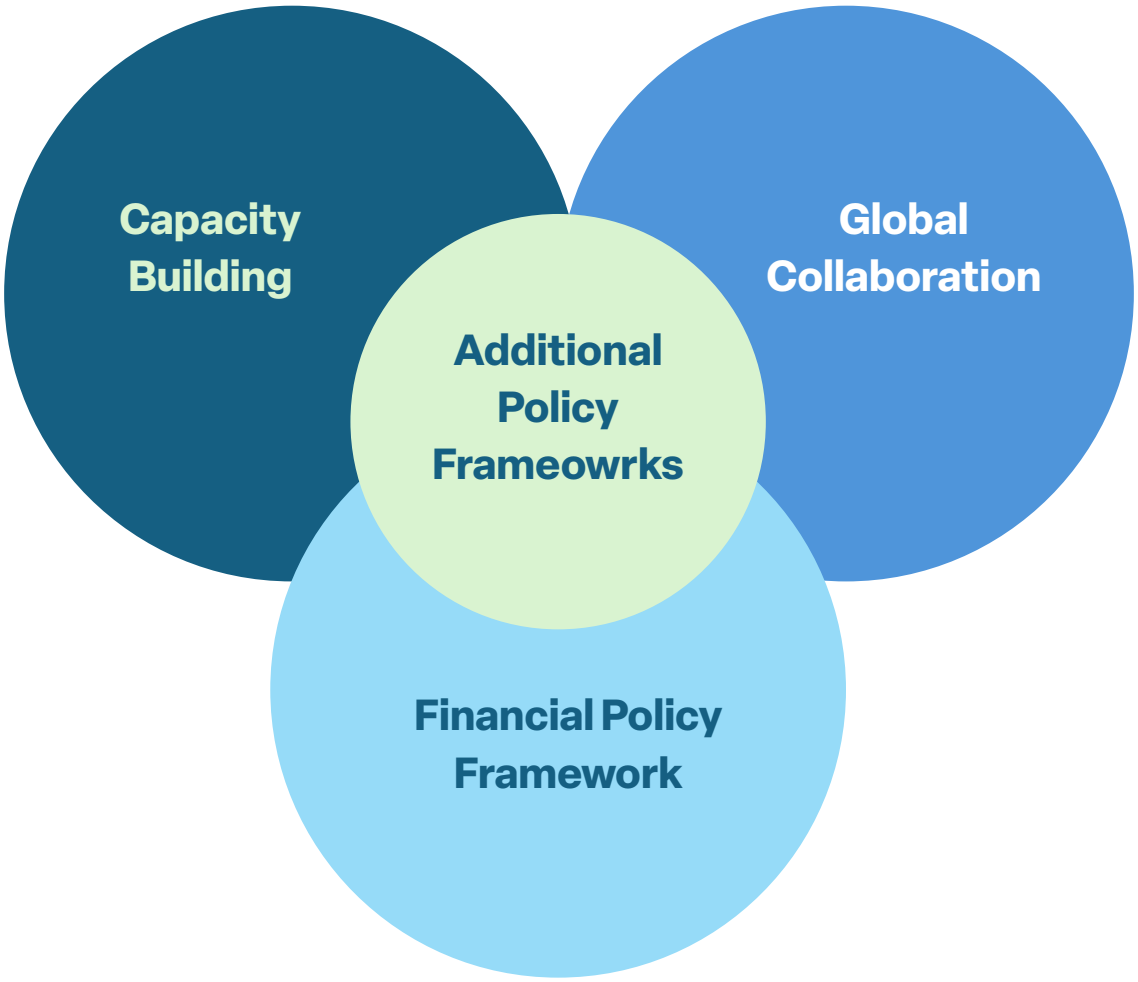
Capacity Building

Implement more government funded training programs to enhance the technical and institutional capacities required for effective climate action.

Institutional Framework

Policies that would attract more technological collaborations.

Develop international emission standard to ensure strict adherence to decarbonization goal.



Some additional financial frameworks

Carbon tax: to incentivize emission reduction across sectors.

Climate Finance: Green Climate funds other international fundings, to create more partnerships.

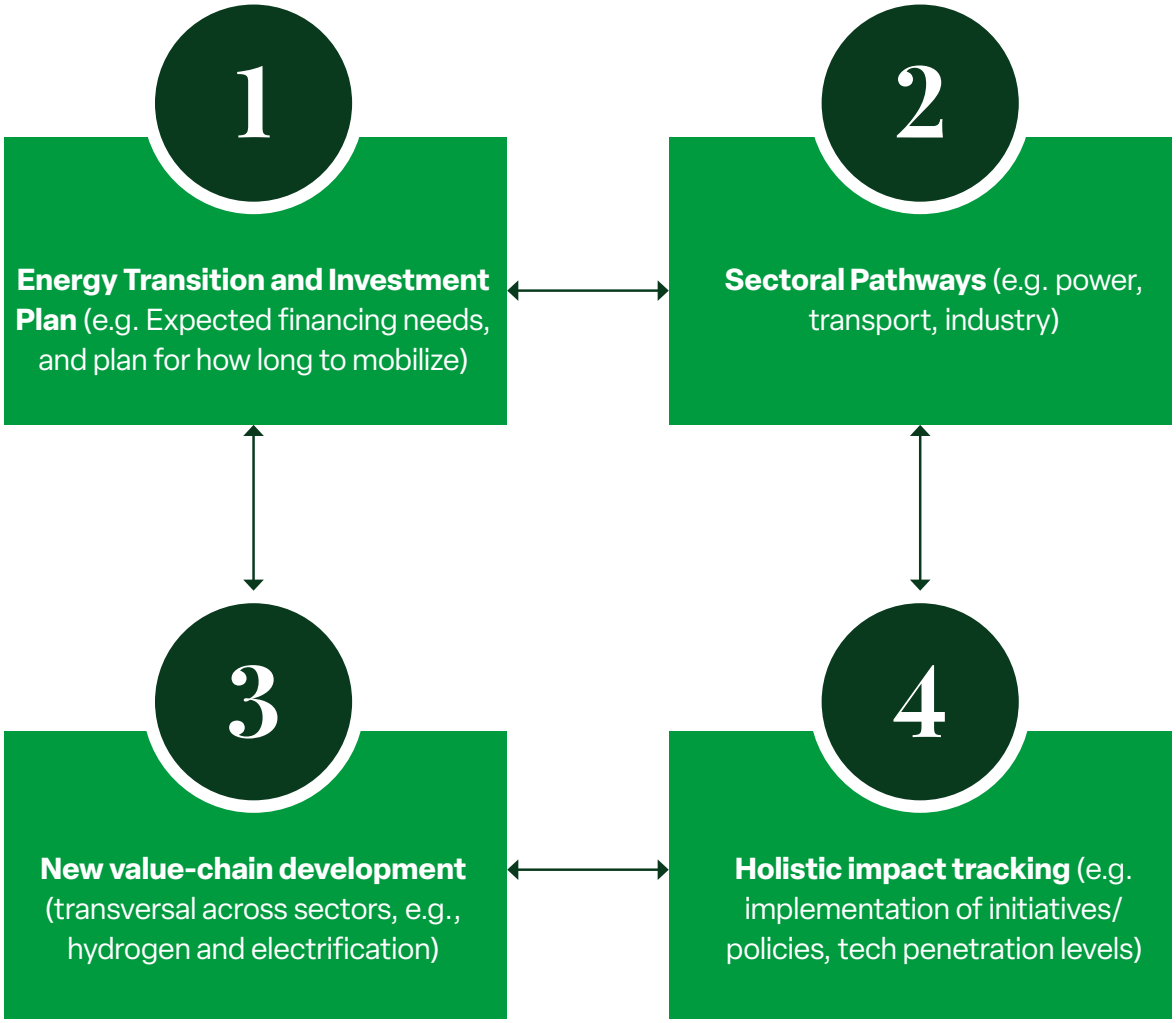
Strategies

A combination of private sector capital and de-risking instruments could help finance Nigeria's energy transition. Blended investment of both public and private sectors is needed.

CORE FINANCE PROVIDERS					**PROVIDERS OF DE-RISKING INSTRUMENTS e.g., guarantees/insurance, first-loss-capital, etc.**				
	Private sector			Domestic public sector	International institutions				
Actors	Commercial financial institutions	Corporations	Households and individuals	Public institutions	Multilateral DFIs1	Bilateral DFIs1	National DFIs1	Green finance funds	Private foundations
Examples	Nigeria Commercial Bank FirstRand Ban BNP Paribas Blackrock Major pension funds	BHP Billiton Royal Dutch Shell	N/A	Nigeria Ministry of Finance	World Bank African Development Bank	French Agency for Development UK FCDO USAID GIZ	Development Bank of Nigeria	Green Climate Fund Global Environment Facility Adaptation Fund Clean Technology Fund	Rockefeller Foundation Climate Works Foundations IKEA Foundation Bezos Earth Fund

KEY DERISKING INSTRUMENTS

		RISK								
		MACRO		CREDIT			TECHNICAL		MARKET	
		POLITICAL/ COUNTRY RISK	CURRENCY RISK	CREDIT RISK	LIQUIDITY RISK	DEMAND RISK	CONSTRUCT-ION RISK	OPERATIONAL RISK	LACK OF PIPELINE	OFF- TAKE TISK
INSTRUMENT	1. Guarantees	■		■	■		■	■		■
	2. Insurance	■			■		■	■		
	3. Hedging		■			■				
	4. Securitization			■	■					
	5. Results-based incentives							■		
	6. Grants				■				■	



Level 1: Target setting. A national Net Zero ambition provides an overall target and vision for the country. The more concrete the end goals are, and the clearer the country is on the required pre-requisites to achieve them, the better private and public actors can act in accordance with them.

Level 2: Coordination and enabling. An integrated Energy Transition and Investment Plan (ETIP) ensures transparency and coordination across the ministries, and sectoral policies are consistent with national objectives.

Level 3: Implementation. Private and public actors responsible for the implementation at the sector level (mandates, price incentives, controls, enablers). This includes sectoral pathways with clear mechanisms to ensure policies are owned by the relevant ministries (but roll up to the overall target). It also includes the development of new technology and fuel platforms for themes that transcend sectors – such as Carbon Capture and Storage.

Level 4: Impact Tracking. Holistic impact tracking, from tracking emission impact and clean technology uptake, to optimizing socio-economic ("just transition") and fiscal impact.

Some potential barriers that could hinder an orderly energy transition.

Sector	Potential Barriers	Actions Required
O&G	High cost of reducing oil and gas sector emissions, particularly in refining	**Regulation and standards:** Institute penalties per mcf of gas flared to ratchet up pressure for operators to decarbonize. Set mandatory gas flare reduction required for operating licenses renewal. **Price incentives or regulations:** Create tax holidays for operators to invest in gas monetization infrastructure and emissions reduction technology (e.g. LDAR, VRUs), or investment in CCS (e.g. pioneer status) Co-invest or help finance required natural gas infrastructure (e.g. gas trunkline, treatment/processing infra) which in turn helps make it attractive for companies to monetize the gas vs. flaring or re-injecting. **Enabling programs:** Play orchestration role to launch collaborative decarbonization projects (e.g. CCS hub pilot project) which would reduce the cost of decarbonization to individual O&G operators.
Transport	High cost of sustainable aviation fuels and low-carbon shipping fuels Deployment of electric vehicles will depend on consumer preferences. High capital costs of electric and hydrogen vehicles Limited charging and fuelling infrastructure may slow growth of passenger and freight low emission vehicle markets.	**Price incentives or regulations:** Implement incentive mechanisms to drive uptake of low-carbon fuels in aviation and shipping. Ensure infrastructure is in place to enable low- carbon fuels usage near ports and airports. Building on ambition of National Electric Mobility Roadmap, implement incentive mechanisms to ensure consumers shift to electric and fuel-cell vehicles when cost-competitive (e.g. purchasing tax credits, low-emission zones, vehicle trade-in programs, free parking, lower vehicle registration costs)

		Enabling programs: Develop and implement delivery plan for electric vehicle charging infrastructure (incl. grid assessment, regulatory framework, home charging incentives, and partnerships with the private sector) Where possible promote further efficiency and drive behavioural shift (e.g., to buses and trains
Power and Hydrogen	At high volumes solar PV and wind require battery storage, which carries a cost premium; and depress electricity prices, potentially deterring investors. Gas CCS carries capital cost premium.	**Price incentives or regulations:** Building on ambition of Renewable Energy Master Plan, create interventions to speed up deployment of especially solar PV and wind (e.g., net metering framework, renewable energy projects incentives, etc.) **Enabling programs:** Implement incentive mechanism for flexibility (for CCS in industry/ power, or batteries in micro-grids)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