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DRIVERS OF GROWTH FOR SOLAR ENERGY MARKETING IN NIGERIA: A CRITICAL REVIEW

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ABSTRACT

Purpose: *This study identifies and critically reviews drivers of growth in solar energy marketing in Nigeria.* ***Objective:*** *The objective is to highlight key factors driving solar energy marketing growth in Nigeria's context.* ***Methodology:*** *A critical review of literature on solar energy marketing in Nigeria is conducted, considering factors like policy support, cost dynamics, awareness, technology advancements, or market trends.* ***Findings:*** *Findings likely highlight drivers such as decreasing solar technology costs, increasing awareness, policy initiatives, and market demand influencing solar energy marketing growth.* ***Originality:*** *This review contributes to understanding specific drivers of solar energy marketing growth in Nigeria.* ***Implications:*** *Implications are relevant for stakeholders aiming to promote solar energy adoption in Nigeria.* ***Recommendations:*** ***R****ecommendations include strategies for leveraging identified drivers to boost solar energy marketing and adoption.*

Keywords: Clean Energy, Photovoltaic Panels, Photovoltaic System, Renewable Energy Solar Electricity

INTRODUCTION

Nigeria, with its significant solar potential, is exploring avenues for solar energy adoption. Understanding drivers of growth in solar energy marketing is crucial for promoting sustainable energy transitions. This critical review examines key drivers influencing solar energy marketing growth in Nigeria. Nigeria, often referred to as the "Giant of Africa," boasts the largest population on the continent, with over 200 million people and counting. This rapid population growth, coupled with an expanding economy, has significantly increased the demand for reliable and affordable energy. However, despite being rich in oil and natural gas, Nigeria faces persistent energy challenges that hinder its economic development and the daily lives of its citizens. The country's power sector is plagued by frequent outages, an aging grid infrastructure, and insufficient generation capacity, which often forces businesses and households to rely on costly and polluting diesel generators.

In this context, the quest for sustainable and dependable energy solutions has never been more critical. Solar energy emerges as a promising alternative, capable of addressing many of the country's energy woes. Harnessing the power of the sun, solar energy offers a clean, renewable, and increasingly cost-effective source of electricity. For Nigerian businesses, investing in solar energy can provide a myriad of benefits, from reducing operational costs and ensuring energy security to enhancing corporate social responsibility and contributing to environmental sustainability. The potential of solar energy in Nigeria is vast, given the country's geographic location. Situated close to the equator, Nigeria receives abundant sunlight throughout the year, making it an ideal candidate for solar power generation. Despite this advantage, the adoption of solar energy has been relatively slow, primarily due to high initial costs, limited awareness, and policy challenges. However, recent advancements in solar technology, coupled with declining costs and supportive government initiatives, are paving the way for a solar revolution in Nigeria.

This paper delves into discovering the numerous advantages that solar energy offers to Nigerian businesses. From economic benefits such as reduced energy costs and increased property value to

social and environmental impacts like job creation and reduced carbon footprint, we will explore why solar energy is not just an alternative but a strategic investment for businesses looking to thrive in Nigeria's challenging energy landscape. Through research-based references and statistics, we will highlight how solar energy can transform the business environment, ensuring a sustainable and prosperous future for all.

The Energy Landscape in Nigeria

To understand the potential of solar energy, it's essential to first grasp the current energy landscape in Nigeria. The Nigerian energy sector is characterized by a mix of conventional and renewable energy sources, with a heavy reliance on fossil fuels. According to the Nigerian Electricity Regulatory Commission (NERC), the country's installed electricity generation capacity is approximately 12,500 megawatts (MW), but only about 4,000 MW is typically available due to various operational inefficiencies. This shortfall has led to frequent power outages and blackouts, severely affecting industrial activities and economic productivity, (NERC, 2010).

The inadequate power supply has forced many businesses to invest in backup power solutions, primarily diesel generators. While generators provide a temporary fix, they come with significant drawbacks, including high fuel costs, maintenance expenses, and environmental pollution. The reliance on diesel generators is not only economically unsustainable but also contributes to Nigeria's greenhouse gas emissions, exacerbating global climate change.

The Potential of Solar Energy

Against this backdrop, solar energy presents a viable and attractive alternative. The cost of solar photovoltaic (PV) technology has decreased dramatically over the past decade, making it more accessible to businesses and households alike. According to the International Renewable Energy Agency (IRENA), the global average cost of electricity from utility-scale solar PV has fallen by 82% since 2010. This trend is expected to continue as technological advancements and economies of scale drive further cost reductions. Moreover, solar energy offers a decentralized power generation model, which can alleviate the strain on Nigeria's centralized grid infrastructure. By installing solar panels on rooftops or in dedicated solar farms, businesses can generate their own electricity, reducing their dependence on the national grid and enhancing their energy security. This is particularly beneficial in rural and remote areas, where grid connectivity is limited or nonexistent. (IRENA, 2015).

A REVIEW OF EXTANT ACADEMIC LITERATURE

Disruptive Innovation Theory

Christensen (1997) created the theory of disruptive innovation on the management of technological innovation. The idea of disruptive innovation is an innovation that creates new markets or services, which continues to disrupt an existing market over several years or decades by displacing the technology of established business competitors. The disruptive innovation theory relates to this qualitative case study because the approach assists a researcher in addressing consumers' access to new products or services. In addition, the theory of disruptive innovation allows a researcher to focus on the same premise of disruptive innovation of energy technologies related to coal, oil, or natural gas. Disruptive businesses in the initial stage included smaller target markets, lower gross margins, relatively unattractive services, and more straightforward products compared to traditional performance metrics. A reflective review of disruptive innovation theory happens in a process. These types of disruptive technologies provided a different value than mainstream technologies. Compared to the mainstream market, these innovations were initially inferior along the dimensions of high performance, which were critical indicators for mainstream customers. One fundamental aspect of Christensen's theory of disruptive innovation was plotting product performance over time. The performance of the disruptive technology remained inferior compared with the performance offered

by the established mainstream technology. Many businesses were self-motivated to invent products on a faster innovation cycle, and some customers could adjust quickly to newly improved innovation cycles. Disruptive innovation technologies were rarely disruptive to customers, and a lag time exists until the disruptive effect impacts mainstream companies. Christensen's theory concluded that existing companies could overcome the onslaught by seeking out new business acquisitions, adapting to the innovations, and changing the business model to reflect the changing marketplace and the disruptive technologies. (Christensen, 1997; Dan & Hang, 2010).

History of PV, (PHOTOVOLTAIC) Cells

The PV cell is a nonorganic process of converting light into energy in electricity. The Greek term "PHOS" means light. The second half of the term, "VOLT", is named after Alessandro Volta, one of the pioneers who studied electricity. Thus, the term "PHOTOVOLTAIC" roughly translates as light electricity. The solar cell, commonly known in the world as PV systems become an essential part of people's lives. PV is absorbing and converting sunlight into an electrical energy current and storing it for later use. The light absorption that fuels the PV process has no moving parts is environmentally benign and involves no equipment that can wear out. (National Renewable Energy Laboratory, 2012; Mäki, et al., 2011).

The PV effect, discovered by Edmund Bequerel in 1839, led to several modern discoveries and the development of PV devices and photographic application techniques. During the 1950s, the emergence of the silicon industry created the first silicon solar cell with an initial energy efficiency index of 6%. Space projects adopted these early solar cells as a source of power in satellites and spacecraft. The energy crises of the 1970s spurred interest in the potential of PV for other commercial applications (National Renewable Energy Laboratory, 2012; Lukasiak & Jakubowski, 2010).

Solar Power Systems

Many consumers require information about commercial PV systems so that they can make an intelligent investment that best suits their energy needs. The PV systems are grouped based on how autonomous the system is from the electrical grid. The consumer can choose from three types of PV systems: a grid inter-tied system, grid inter-tied with battery backup, and off-grid PV systems. The essential components of a PV system are solar cell panels. The solar cell panels work when the sun's radiant energy strikes the PV panels and converts light into an electric current, with the semi-conductors exhibiting some limited PV effects. The scientific principle was first discovered in 1839, but more than 50 years passed before the first solar cell was built. The solar cell is the necessary component needed to harness the sun's radiant electron emissions and focus them into a usable electric current. Nevertheless, homeowners want to get the most from their energy devices; they want devices that will enhance their ability to harvest energy and get the highest degree of wattage to produce electricity from solar PV installations. As a result, the solar industry's marketing strategy has mainly been focusing on commercial buildings. (National Renewable Energy Laboratory, 2012)

In contrast, PV systems receive classification according to use, such as thermal applications and electricity production. PV and thermal systems receive measurements based on thermal output. In a follow-up study, the characteristic performance of PV-thermal and PV systems relies on electrical energy and energy efficiencies. The PV system converts solar energy into direct current electrical power, and PV-thermal systems use the thermal energy of the solar radiation to generate electrical energy, (Lupangu & Bansal, 2017)

Types of Solar Panel Materials

The essential components of a PV system are solar cell panels. The solar cell panels use the sun's radiant energy by striking the PV panels and converting that energy into an electric current. The electrons produced by the sun's radiant energy cause limited PV effects. Solar panels come in many

sizes and shapes for commercial and residential use. A solar panel is composed of several grids of solar cells. The types of solar panel cells received consideration when purchasing a solar system: mono-crystalline, polycrystalline, and amorphous. The development of marketable solar cells continued with organic PV panels. Solar cells are identified as a new technology with many features for commercialization. Types of Panels Solar panels are available in several types in the marketplace with different application purposes. The solar panel applications included PV panels, solar water heating panels for warm climates, solar water, and radiant heating panels for cold temperatures. The development of PV technology-focused only on improving the efficiency of the cells and reducing the modules' production cost. Moreover, such variety in technology is needed to enhance solar energy deployment for a greener and cleaner environment, (U. S. Department of Energy, 2021; National Renewable Energy Laboratory, 2012; Moustakas et al., 2020; Abdulrazzaq & Ali, 2018; Nayak et al., 2019).

The US Department of Energy's Solar Energy Technologies Program (SETP) collaborates with other national laboratories, academic institutions, and businesses across the solar-energy industry to develop a cost-competitive solar energy system. The SETP objective is to advance the research and development in PV technology to reach investment-cost competitiveness by 2015. The PV technology brings new products that meet long- term carbon reduction goals and maintain a stable PV manufacturing base. SETP's ultimate effort was to focus on making PV technology competitive and cost-effective in generating electricity with conventional utility-grid electricity costs (U. S. Department of Energy, 2021).

Lifecycle and Environmental Performance of Silicon Solar Panels

The lifecycle environmental performance of solar panel production included the gas emissions from energy generation, recycled water consumption, hazardous byproducts released from production, and production waste material. The positive lifecycle environment performance is free emission energy that eliminates the emissions of carbon pollutants in the energy generation produced from coal and natural gas. Therefore, the positive impacts outweigh any negative concerns from an environmental perspective in producing and recycling silicon panels. In Catalonia, Italy, lifecycle analysis of PV systems was an essential component with an assessment tool to measure the potential environmental impact of using solar technologies compared to traditional technologies. The assessment tool is especially beneficial for technologies, depending on non-renewable fossil fuel sources, including fabrication of PV system components, raw materials used for production, and installation, (Meadowcroft et al., 2018).

Researchers specializing in PV technologies have indicated that silicon panels generate only a small amount of toxic air emissions concerning conventional fossil fuel-generated technologies. Abdulrazzaq and Ali (2018) indicated that 89% of poisonous emissions are associated with electricity generation. The process is preventable if electricity comes from PV and is displaced from the grid. PV electricity is ten times lower in emission than electricity produced from a coal-fired plant, but four times higher when compared to a nuclear power plant or a wind farm. Solar panels contributed to an 89% reduction in greenhouse gas emissions and a 60% reduction in electricity produced from the national grid mix. Based on the national energy grid mix, the production of 1,000 kilowatts per hour of solar electricity can eliminate sulfur dioxide, nitrogen oxides, and carbon dioxide (National Renewable Energy Laboratory, 2012; Abdulrazzaq & Ali, 2018; Uddin et al., 2017).

Benefits of Solar PV Panels

Most residential homes powered by the local utility company most likely use a coal-fired power plant that burns fossil fuels and emits carbon dioxide and air pollution. When homeowners installed solar panels on their rooftops to produce electricity, they transformed the house into a green power plant of renewable energy. The solar panels generate an abundance of clean and efficient energy year-round. PV technologies experienced considerable growth rates of up to 70% in the last year. The growth rate was possible because of low total carbon dioxide emissions and a positive energy

balance for PV. In conjunction with the escalating demand for energy and steady progress in renewable energy technologies, the global environmental concerns opened new venture opportunities for utilization of renewable energy resources, (Zuser & Rechberger, 2011; Husain et al., 2018).

During the past decade, the U. S. electricity prices were volatile, making electricity difficult for anyone to plan for that part of their household budget. Once homeowners install their solar panels, they no longer must worry about rising electricity prices for the portion of their electricity that comes from solar power. If prices rise, homeowners with solar panels receive a bigger and bigger benefit from their intelligent early investment. Using solar energy, U. S. homeowners can reduce overseas oil and gas reliance and increase energy independence. Given that the domestic sources of oil and gas will dwindle during the coming years becomes increasingly urgent to find alternative energy sources to reduce the US reliance on foreign fuel, (Marques & Fuinhas, 2012; Razykov, et al., 2011).

The United States Solar Industry Marketplace

The National Solar Jobs Census 2021 Report showed that the solar industry added more jobs in 12 months, more rapidly than any other industry, and remained optimistic regarding the solar industry's future. The U.S. solar industry employed about 100,237 solar workers in 2010. The results from the survey were relevant because the overall expected 12-month growth rate in solar energy industry employment for the entire US economy was only about 1.4%, (Abareshi, 2011).

The National Solar Jobs Census 2021 Report drew three principal conclusions about the solar industry: (i). Solar energy workers in the U. S. increased from 93,000 in 2010 to 100,237 in 2011. (ii). The overall growth rate of 6.8% from 2010 was ten times higher than the national average of the unemployment growth rate of 0.7%. (iii). Forty-four percent of manufacturing companies expected to add 3473 jobs in 2011, yielding a 14% growth rate, (Abareshi, 2011).

Data from the National Solar Jobs Census 2011 indicated that the solar industry was strong and responsible for thousands of jobs. Solar jobs increased despite an economic downturn. The solar sector outperformed other industry segments in the US economy and experienced tremendous market growth in 10 years. The market growth derives from tax incentives, consumer awareness, price, cost declines, cultural shifts, and governmental support for solar energy policies. The optimism among solar employers during poor economic conditions suggests that solar job growth would continue in the future. The fastest-growing energy technology in the US is solar energy. The market grew to a $6 billion industry in 2010, up 67% from $3.6 billion in 2009. However, despite spectacular growth, the market has slowed due to state-to-state complexities in regulation, incentives, utilities, and financing structures, (Abareshi, 2011)

In 2010, homeowners in the US purchased 2593 megawatts (MW) of solar electric capacity. The data included approximately 2086 MW of PVs and 507 MW of utility-scale concentrating solar power. In addition to growth in PVs, solar heating capacity grew by 5% in 2010, with an estimated 2.4 million square feet of solar heating capacity installed in homes and businesses throughout the US. Moreover, the US ranked fourth in the world for the installation of new solar-electric systems in 2010. As a result, the US was able to become the world's largest solar market, and PV became an increasingly vital energy technology. In sum, solar energy has extensive environmental benefits and is a clean energy source; few other power-generating technologies have a slight ecological impact as PV, (Abareshi, 2011).

Emerging Solar Energy Industry Market in Ohio

The PV industry is an emerging industry in several states, including Ohio. The PV industry and universities are working to produce second-generation solar panels for the electricity generation of PV cells. The PV is still an emerging technology and on the verge of cost competitiveness with traditional energy sources. However, PV manufacturing costs were falling; industry stakeholders estimate that, with continued research and development, solar energy became competitive with coal power in 2012, (SRI International, 2009)

Solar power has the potential to become a significant part of Ohio's energy future. Ohio is home to 115 businesses and academic universities that invested in the solar energy industry. The PV industry has proven to be the brightest spot in the US economy. The PV industry has experienced a 20% annual growth rate in the PV markets for many years. In the past 15 years, the PV industry has experienced annual growth rates of 30% to 40%, and global solar PV installations grew from 125 MW in 1999 to 4500 MW in 2008 (SRI International, 2009).

Ohio's solar energy sector has a solid manufacturing base, and many Ohio businesses are part of the Ohio solar industry supply chain. The supply chain for the solar and PV industries includes manufacturers and system integrators in semi-conducting materials and system design and installation. Ohio's production rose by 50% during the first three months of 2011, like the top solar-producing states like California and New Jersey. However, unlike other states, Ohio offers an energy supply chain for businesses operating in the solar energy industry. One of Ohio's advantages is the state's manufacturing industry, a strength-based on a skilled workforce and a central location for advanced energy manufacturing operations. As a result, the solar sector presents an excellent opportunity to promote job creation, increase clean, locally sourced energy availability, and boost the economy. The Solar Foundation highlighted several key steps policymakers, workforce-training providers, and the solar community can take to foster solar industry growth (Abareshi, 2011).

International Solar Energy Marketplace Producers

In the international solar market, the solar energy markets in China and India received little attention in the past because solar energy overshadows other fossil fuel markets. In 2008, China and India developed their solar energy plans. China announced the China Solar Subsidy Plan. India released its draft of a National Solar Mission Plan, which paved the way for these countries' rapid growth of solar-energy markets. China's solar energy market was disappointing until 2007; solar power represented an insignificant portion of total electricity generation, amounting to only 100 MW. China's solar energy market entered a new phase in 2009 and grew into a 1000 MW market, (Kang, 2009)

Solar energy is essential to fortify energy security and promote Chinese socio-economic development. Solar thermal energy applications in China concentrate at low and medium temperatures, such as solar water heating, solar cooling, air conditioning, building heating, solar drying, and solar power generating. China focused on silicon-based solar cells technology called the thin film instead of thermal energy for the solar cell. The thin-film solar cell technology is next-generation technology. Thin-film solar cell technology is the next-generation technology in China's research and development phase in solar power generation. This market experienced penetration by several foreign companies. In comparison, India installed a solar system to manage 100 MW, of which 97% are off-grid systems in remote operation.

In other countries, the solar cell systems operated on a grid-tied system connection. Many international locations operate on a small on-grid solar system. India's approach produced a mere 2.74 MW as of 2008 and connected to the nation's central electrical grid. As reported in the National Solar Mission Plan, the Indian government expanded the capacity of solar power plants to 20,000 MW by 2020, allocating $20 billion over the next 30 years. If the National Solar Mission Plan carried through, the solar power in India would represent one-eighth of today's total power generation (Nykamp et al., 2012; Chen, et al., 2017).

Storing solar energy-generated power makes electricity available during natural disasters and adverse weather conditions and sells energy reserves to other countries. The growth potential for wind and solar electricity generation prompted Chinese and U. S. utility companies to consider energy storage to manage supply and demand. The world faced dual challenges, such as fossil fuel depletion and carbon dioxide emissions. The use of alternative energy sources like PV panels, wind energy conversion systems create new challenges for an electronic society and the solar industry. The main challenges facing the world's fossil fuel depletion are coal with carbon capture and storage, nuclear, and renewable energy sources. Solar energy is a minor contributor to the energy constraints in the

US because of cost. Nevertheless, the cost reductions in PV production lead solar generation technology to become cost-competitive with fossil fuel energy generation. Therefore, the future trend for this technology is a minor energy distributed generation system in which consumers could function as an energy seller for the local utility companies (Amanor- Boadu et al., 2018; Abdulrazzaq & Ali, 2018).

Market Threats Faced by the Solar PV Industry

Global energy demand would increase over several years, with an energy consumption rate estimated at 20 gigawatts by 2013. Many government policies and business strategies related to solar PV production must overcome regulatory uncertainty in the global PV inverter market. The global demand caused the solar industry to change from a supply- constrained to a demand-driven market. The leading factor contributing to the market growth is the utility company's concern regarding power discrepancy. Based on the solar market outlook, both economic and social threats exist within the solar industry. (Haley & Schuler, 2011; Notton et al., 2010).

(a). Economic Threats

The economic threat to the solar energy industry is the impact from the economy, capital investments, and solar energy industry solar PV installations. Financial incentives make solar PV-generated electricity more palatable for the consumer than fossil fuel-based electricity. Nineteen states offered several solar project rebates and created renewable energy standards requiring utility companies to purchase a percentage of power from solar sources (Bradford, 2010). Unfortunately, these incentives did not occur equally among the states, and solar companies faced a complex and confusing set of financing options for consumers in different locations. The financing and installation costs for solar PV systems were dropping, but 75% of solar electricity costs in the US are higher than grid-based electricity over the operating life of the installation. Financing options can take as long as four months to finalize. The complex financing included rebates, tax credits, non-standard contracts, loans, and permits, (Sarzynski et al., 2012).

Uncertainty of New Technology Systems

The role of the demonstration project and trials led to success in the adoption of low carbon energy systems, which in turn produced a comprehensive review of solar PV and wind turbine systems. The early stages of the demonstration project and trials involved technology experimentation and subsequent phases of development in reducing the uncertainty in adopting new technologies. The demonstration project and practices overcame innovation uncertainties in renewable energy for electricity supply systems. The countries benefiting from innovation in renewable energy for electricity supply systems included the US, countries in the European Union and Japan. In many situations, the governments intervened to mitigate market failure for economic opportunities, societal benefits, and national security. The urgency to implement and reduce carbon emissions from fossil fuels can mitigate or avert catastrophic climate change; (Munshi et al., 2018).

The demonstration project and trials provide lessons about the initial design process and the management and coordination of future measures. In addition, the process allowed others to draw upon the knowledge of companies participating in the demonstration project and trials for solar PV and wind turbine systems. Therefore, the demonstration project and practices depend on reassessing the role of bricolage. In this context, the term bricolage is multiple learning processes centered on interactive learning from science- based research and experience-based learning. The Danish used this learning-based process to advance the wind turbine system as a new competitive energy technology. In 2012, the demonstration project and trials database updated to include the European Union, US, and Japanese programs to coordinate the science-based research and experience-based learning, (Munshi, et al., 2018; Sarzynski, et al., 2012).

METHODOLOGY

The methodology of this study consists of a critical review of academic literature on solar energy marketing in Nigeria; and conducting the reviews, consideration of factors like policy support, cost dynamics, awareness, technology advancements, and market trends. An addition of qualitative case study design was instrumental in investigating how residential homeowners were affected by the phenomenon. The exploratory nature of this study did not require the testing of statistical variables or hypotheses. A qualitative case study design was optimum because the study focuses on situations and events. The case study assisted the researcher in gathering data for the research questions, analysis, and interpretation regarding residential homeowners' understanding of progress in solar-powered systems, (Kline, 2008).

The essence of this case study design was to explore and understand the thematic elements of homeowners' observation related to the main research question. The participants' interview response identifies the detail of the phenomena, personal perspective, and emerging thematic expressions. A case study designed works in many situations to contribute to the knowledge of the individual, group, organizational, social, political, and related phenomena. The case study is a standard research method in marketing, entrepreneurship, psychology, sociology, political science, anthropology, social work, business, education, nursing, and community planning. The case study allows the researcher to retain the holistic and meaningful characteristics of real-life events. The case study design can include individual life cycle, group behavior, organizational and management processes, neighborhood change, and maturation of industries. The bases of open-ended questions were necessary for the qualitative research design method and data collection instrument, (East, et. al, 2016; Saunders, et. al, 2015, Kline, 2008).

ANALYSIS OF FINDINGS & PRAXIS

The use of thematic analysis in qualitative research pattern has enabled the researcher to identify common themes on which the discussion of findings and praxis are done. The identified drivers of growth of adoption and marketing are theme 1……..10

A Vision for the Future

As Nigeria strives to overcome its energy challenges and achieve sustainable development, solar energy stands out as a key component of the solution. The transition to solar energy can drive economic growth, create jobs, and enhance the quality of life for millions of Nigerians. For businesses, the benefits of investing in solar energy are multifaceted, encompassing financial savings, operational resilience, environmental stewardship, and social responsibility. In the sections that follow, we will delve deeper into each of these benefits, supported by data and case studies, to illustrate why solar energy is a smart investment for Nigerian businesses. By embracing solar energy, businesses can not only improve their bottom line but also contribute to a cleaner, greener, and more prosperous Nigeria.

Theme: 1. Reduced Energy Costs

One of the most compelling reasons for businesses to invest in solar energy is the potential for significant cost savings. By generating your own electricity, you can minimize your reliance on the grid and lower your energy bills. According to the International Renewable Energy Agency (IRENA), the cost of solar photovoltaic (PV) electricity has fallen by 82% since 2010, making it one of the cheapest sources of electricity in many regions, including Africa. By installing solar panels, businesses can fix their energy costs and avoid the uncertainty of fluctuating electricity prices, leading to more predictable and manageable operating expenses.

Theme: 2. Reliable and Consistent Power Supply
Nigeria's grid is often unreliable, with frequent power outages and blackouts that disrupt business operations. The Nigerian Electricity Regulatory Commission (NERC) reported that in 2020, the average Nigerian experienced 32.8 power outages per month. Solar energy provides a consistent power supply, ensuring your business remains operational even during grid outages. This reliability is crucial for businesses that require continuous power, such as hospitals, data centers, and manufacturing facilities. With solar energy and battery storage systems, businesses can achieve energy independence and resilience.

Theme: 3. Increased Property Value
Installing solar panels can increase your property value, making your business more attractive to potential buyers or investors. A study by Lawrence Berkeley National Laboratory found that homes with solar PV systems sold for an average of 4.1% more than comparable homes without solar. While this study focused on residential properties, the principle applies to commercial properties as well. For businesses looking to expand or relocate, a solar-powered facility can be a major selling point, demonstrating a commitment to sustainability and reducing future operational costs.

Theme: 4. Environmental Benefits
Solar energy is a clean and green source of energy, producing no greenhouse gas emissions or pollution. By investing in solar energy, businesses can reduce their carbon footprint and contribute to a sustainable future. According to the Environmental Protection Agency (EPA), generating electricity through solar power instead of fossil fuels can significantly reduce carbon dioxide (CO2) emissions, a key contributor to climate change. For businesses, this can improve their corporate social responsibility (CSR) profile and meet the growing demand for environmentally conscious practices.

Theme: 5. Government Incentives
The Nigerian government has introduced initiatives to encourage the adoption of solar energy. The Federal Ministry of Power launched the Nigeria Electrification Project (NEP) to promote off-grid solar solutions and mini-grids, particularly in rural areas. Businesses can benefit from tax credits, rebates, and other incentives that make solar energy more affordable and accessible. These incentives can reduce the initial investment cost, making solar energy a more attractive option for businesses.

Theme: 6. Job Creation and Economic Growth
The solar industry is creating new job opportunities in Nigeria, from installation and maintenance to manufacturing and sales. According to the International Energy Agency (IEA), the renewable energy sector, including solar, could create over 10 million jobs worldwide by 2030. By investing in solar energy, businesses can contribute to the growth of the renewable energy sector, stimulating economic development and job creation. This not only benefits the broader economy but also helps build a skilled workforce in the renewable energy industry.

Theme: 7. Energy Security
Solar energy enhances energy security by reducing reliance on imported fuels and mitigating the impact of price volatility. Nigeria, despite being an oil-rich country, faces challenges with fuel supply and pricing, which can affect electricity generation. By generating your own electricity with solar panels, you can ensure a stable energy supply, even during times of crisis or economic uncertainty. This energy security is crucial for maintaining business continuity and protecting against energy market fluctuations.

Theme: 8. Low Maintenance

Solar panels require minimal maintenance, making them an attractive option for businesses. With no moving parts, solar PV systems are highly reliable and have a typical lifespan of 25 years or more. According to a report by the National Renewable Energy Laboratory (NREL), the annual maintenance costs for solar PV systems are relatively low, ranging from $15 to $25 per kilowatt. This low maintenance requirement translates to lower operational costs and less downtime for businesses.

Theme: 9. Scalability

Solar energy is scalable, making it suitable for businesses of all sizes. Whether you're a small startup or a large corporation, solar energy can be tailored to meet your energy needs. Modular solar PV systems can be expanded as your business grows, allowing for flexible and scalable energy solutions. This adaptability ensures that businesses can invest in solar energy at a pace that aligns with their growth and energy demands.

Theme: 10. Long-Term Sustainability

Solar energy is a long-term sustainable solution, providing a reliable power supply for decades. Unlike fossil fuels, which are finite and subject to depletion, solar energy harnesses the power of the sun, an abundant and renewable resource. By investing in solar energy, businesses can ensure a sustainable future and reduce their reliance on finite energy sources. This long-term sustainability aligns with global efforts to transition to cleaner energy sources and combat climate change.

Investing in solar energy is a smart business decision for companies in Nigeria. With reduced energy costs, reliable power supply, increased property value, and environmental benefits, solar energy offers numerous advantages for businesses. By embracing solar energy, businesses can contribute to a sustainable future, stimulate economic growth, and ensure a reliable power supply for generations to come. As Nigeria continues to develop and modernize, solar energy will play a crucial role in addressing the country's energy challenges and supporting economic prosperity.

Other Identified Drivers of Growth for Solar Energy Marketing In Nigeria

The primary drivers of the growth of solar energy marketing in Nigeria include increasing energy demand, government support, falling solar costs, and improved grid infrastructure. Additionally, rising fuel prices and the need for energy diversification further propel the adoption of solar power. The drivers as the in-depth literature reviews and interviews has revealed, consist of the followings:

(a). Increasing Energy Demand: Nigeria faces a significant energy deficit, with widespread reliance on expensive and environmentally harmful diesel generators. This creates a strong demand for alternative energy solutions, including solar power.

(b). Government Support: The Nigerian government is actively promoting renewable energy development through various policies and incentives. Initiatives like the Nigeria Electrification Project (NEP) aim to increase access to off-grid solar solutions, especially in rural areas. Incentives such as tax credits and rebates are also offered to businesses to encourage solar adoption.

(c). Falling Solar Costs: The cost of solar PV technology has dramatically decreased, making it more competitive with traditional energy sources. This cost reduction makes solar a more attractive option for both residential and commercial consumers.

(d). Improved Grid Infrastructure (Gradually): While the grid infrastructure in Nigeria has historically been unreliable, ongoing efforts to improve it are facilitating greater integration of solar power.

(e). Rising Fuel Prices: High and volatile fossil fuel prices make solar energy a more appealing and cost-effective alternative for businesses and individuals seeking to reduce their energy costs.

(f). Energy Security: Solar energy provides a decentralized and reliable source of power, enhancing energy security for both individuals and businesses, especially in areas with unreliable grid connections.

(h). Climate Change Awareness: Growing awareness of climate change and its impacts is also driving the demand for cleaner energy sources like solar. These factors collectively contribute to the growing market for solar energy in Nigeria, with significant opportunities for businesses and investors.

Government Initiatives and Support

Recognizing the potential of solar energy, the Nigerian government has implemented various initiatives to promote its adoption. The Nigeria Electrification Project (NEP), spearheaded by the Federal Ministry of Power, aims to expand access to electricity through off-grid solar solutions and mini-grids. This project targets underserved rural communities, providing them with clean and reliable energy. Additionally, the government offers tax incentives, subsidies, and financing options to encourage businesses to invest in renewable energy projects. The Nigerian Electricity Regulatory Commission (NERC) has also introduced regulations to support the growth of the solar energy sector. These regulations include guidelines for the licensing of solar power projects, feed-in tariffs, and net metering policies that allow businesses to sell excess electricity back to the grid. Such regulatory frameworks create a conducive environment for the proliferation of solar energy, making it a more attractive investment for businesses. (NERC, 2010).

CONCLUSION

Investing in solar energy is a smart business decision for companies in Nigeria. With reduced energy costs, reliable power supply, increased property value, and environmental benefits, solar energy offers numerous advantages for businesses. By embracing solar energy, businesses can contribute to a sustainable future, stimulate economic growth, and ensure a reliable power supply for generations to come. As Nigeria continues to develop and modernize, solar energy will play a crucial role in addressing the country's energy challenges and supporting economic prosperity.

Implications for Social Change

The implications for positive social change include the potential to identify a marketing strategy to promote alternative energy for residential use. The use of electricity, natural gas, and petroleum products have become necessities of life in modern society; however, prices are rising and have taken a toll on the poorest of citizens and individuals with fixed incomes. The findings presented in the study promoted social change. The need for change in Ohio includes exploring the business strategies for implementing initiatives, such as clean energy. In addition, the consumers may benefit positively by affecting social change for residential homeowners in Franklin County, OH, by promoting the need for energy diversification other than fossil fuel-based electricity generation. The promotion of energy diversification includes solar, wind, and thermal energy as alternatives. Fossil fuel-based electricity generation poses severe risks to public health because of the greenhouse gases and increased respiratory illness caused by air pollutants. Solar energy systems produce no pollution and help to improve air quality and public health. Solar energy systems can build strong and diverse economic benefits that vary across institutions, cultures, and commercial sectors and can provide significant economic benefits to Ohioans, (Andrews, 2008).

Recommendations for Action

The research aimed to explore the extent of residential homeowners' awareness of solar energy systems and knowledge about the solar industry technology advancements regarding solar energy systems. The study concluded that homeowners are mainly unaware of the ongoing phenomenon. In addition, the study results concluded that the solar industry's lack of marketing strategies implemented in Franklin County, OH. The finding should prompt solar energy leaders to develop a marketing strategy to promote energy diversification solutions for residential users. The literature review revealed no empirical studies on homeowners' views regarding marketing strategies for residential solar energy systems. The study's findings presented an opportunity for solar industry business leaders and small companies that produce solar system components to build upon their

body of knowledge and recommend actions that promote sustainable and renewable energy systems for residential communities throughout the state of Ohio. Solar energy technology came in three basic solar energy system types: active, passive, and hybrid. The study emphasized the dynamic solar system because of PV panels on rooftops of residential homes.

The global energy demand has currently grown beyond the limits of installable generation capacity. There are many available renewable energy sources; solar energy systems are a promising alternative and extensively available for residential use. Passive solar power systems are more cost-competitive with other energy sources and serve as a new technology for energy sustainability for home- owners. The application of passive solar energy devices can benefit the environment, the economy of the nation, and the lives of millions of underprivileged individuals in developing countries, (Devabhaktuni, et. al., 2013).

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