Financing Sustainable Energy in the Ghanaian Energy Market – A Comprehensive Policy Review and Recommendations

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Abstract

The paper keeps sustainable development goal (SDG) 7 – affordable and clean energy – as its focal point, primarily focusing on enabling "affordability" of sustainable and clean energy sources. The goals of this paper are threefold. The first is to provide an overview of Ghana's energy policy and apparatus. The second is to evaluate and highlight design flaws in the policy support mechanisms and financing constraints that dampen investor confidence and affect the risk profile of RE projects. Moreover, finally, to recommend alternative policies and fiscal mechanisms such as tax-based incentive structures that stimulate a broader base of equity financing participation; financially engineered securitization model of renewable energy assets to offset the inadequacies of the traditional means of project financing in order to create an enabling environment to accelerate the transition to affordable and clean energy.

Keywords: Ghana, SDG 7, renewable Energy, cost of financing, liquidity shortfalls, securitization.

Abbreviations

AAGR…… Average Annual Growth Rate

ABS…… Asset-backed Securities

BoG…… Bank of Ghana

CAGR…… Compounded Annual Growth Rate

CAR…… Capital Adequacy Ratio

CSP…… Cross-Sector Partnership

EC…… Energy Commission

ECG…… Electricity Company of Ghana

EPPs…… Emergency Power Producers

ERP…… Economic Recovery Program

ESLA…… Energy Sector Levy Act

ESRP…… Energy Sector Recovery Program

FDI…… Foreign Direct Investment

FiT…… Feed-in-Tariff rate

GDP…… Gross Domestic Product

GEDAP…… Ghana Energy Development and Access Project

GH₵…… Ghanaian cedi

GoG…… Government of Ghana

IMF…… International Monetary Fund

INR…… Indian Rupee

IPPs…… Independent Power Producers

IRR…… Internal Rate of Return

KW…… Kilowatt

kWh…… Kilowatt per hour

LIBOR…… London Interbank Offer Rate

LLC…… Limited Liability Company

MBS…… Mortgage-backed Securities

MFI…… Microfinance Institutions

MFL…… Microfinance Loans

MoE…… Ministry of Energy

MoF…… Ministry of Finance

MW…… Megawatt

MWh…… Megawatt per hour

OBSV…… Off-balance-sheet Vehicle

OPEC…… Organization of the Petroleum Exporting Countries

PAYGo…… Pay-as-you-go

PPA…… Power Purchase Agreement

PSL…… Priority Sector Lending

PURC…… Public Utilities Regulatory Commission

PV…… Photovoltaic

PWD…… Public and Words Department

RBI…… Reserve Bank of India

RE…… Renewable Energy

REA…… Renewable Energy Authority

REC…… Renewable Energy Certificate

REMP…… Renewable Energy Master Plan

RPO…… Renewable Energy Purchase Obligation

RPS…… Renewable Portfolio Standard

SBUs…… Strategic Business Units

Scfd…… Standard cubic feet per day

SDG…… Sustainable Development Goals

SHS…… Solar Home Systems

SNEP…… Strategic National Energy Plan

SOEs…… State-owned enterprises

SPV…… Special Purpose Vehicle

USD…… United States Dollar

VALCo…… Volta Aluminum Company

VGF…… Viability Gap Funding

VRA…… Volta River Authority

WACC…… Weighted Average Cost of Capital

WAGP…… West African Gas Pipeline

Introduction

The agenda of energy sustainability has been at the forefront of global development, reiterated on numerous national and global platforms. The most prominent one is the adoption of the Sustainability Development Goal 7 (SDG 7) under the United Nations 2030 agenda for sustainable development. The agenda aims to facilitate universal access to reliable, affordable, and clean energy, further driving nations towards a sustainable energy future. According to the World Bank 2017 SDG targets review, SDG 7 has synergistic effects on 125 out of 169 SDG targets. (World Bank, 2017). Therefore, a state that understands the synergistic effects of access to modern energy services on economic growth, alleviating poverty, and national development, highly prioritizes mobilization of renewable energy (RE) into its energy mix.

The paper focuses on the renewable energy sector of the Republic of Ghana – a country that is often seen as a model for other emerging African countries. (UNDP, n.d.) With abundant and favourable natural conditions, Ghana is well-suited to adopt a sustainable energy model. However, historical trends show that Ghana faces significant sectoral issues concerning inefficient capital allocation, policy inconsistency, insufficient fiscal incentives, financing limitations, and an overall lack of institutional support to develop a sophisticated renewable energy model. With the energy sector financing potential bottled up by unprofitable tariff structures, operational inefficiency, and contingent liabilities adding to its public debt stock, there is a massive disconnect between the need for SDG 7 financing and the availability of capital resources. This has called for a need for unleashing vast amounts of private capital to bridge the financing gap needed to accelerate the deployment of RE assets.

The following study is divided into three sections – section I presents a historical correlation between economic growth and energy demand in order to highlight the inadequacy of the current energy model, and recommends adoption of a macro-scaled RE model to meet future energy demand. Secondly, section II dissects the strengths and weaknesses of the current renewable energy model. Finally, Section III recommends alternative regulatory frameworks and financing

structures that hold the potential to resolve sector weaknesses and enable Ghana to meet its SDG 7 goals.

Methodology

The paper primarily utilizes a mixed-method research approach from secondary sources to identify and review the key drivers of the Ghanaian renewable energy market. This research implements an inductive approach to identify the bottleneck factors that prevent Ghana from achieving its SDG 7 targets.

In addition, a qualitative approach is implemented to recommend alternative methods to incentivize the Ghanaian renewable energy apparatus. Data for this study is gathered from the World Bank database and country reports, Government of Ghana reports, Bank of Ghana database, annual reports of Volta River Authority, and from the existing literature and documents on the sector.

Results

Section I

Background: Historical Economic Trends and its Effects on the Ghanian Energy Sector

Embryonic Phase (1900s – 1970s)

Under the Volta River Development Act, 1961, the government of Ghana (GoG) established the Volta River Authority (VRA). Its primary function – to construct and operationalize the Akosombo Dam over the Volta River and take charge of the duties of energy production; supply produced electricity to the Volta Aluminum Company (VALCO); and transmit the remaining energy to the transmission system. The construction of the Akosombo Dam in 1972 gave rise to the first phase of the Ghanian energy sector – hydropower.

During this period, Ghana followed a macroeconomic policy of lax fiscal management coupled with expansionary credit policy. In December 1972, the Bank of Ghana set the monetary interest rate to a historic low of 6.0% (Bank of Ghana, 2021c). Between 1972 and 1982, the money supply grew at an average of 39.1%. (World Bank, 2020a) As low-interest rates worked their way into the economy, industrial expansion and consumer spending fueled by cheap credit led to inflationary economic growth. Inflation between 1972-83 averaged at 57.3%, peaking at 122.9% in 1983 (World Bank, 2020c). With a rapidly rising urban population and the industrial and service sector expansion due to monetary expansions of the late 70s, energy demand surged nearly sixfold. By 1976, the total domestic energy consumption peaked at about 3917GWh from 540GWh in 1967, growing at an average annual growth rate (AAGR) of 10%. (Volta River Authority, 1980)

Second Coming (1980s – 2000s)

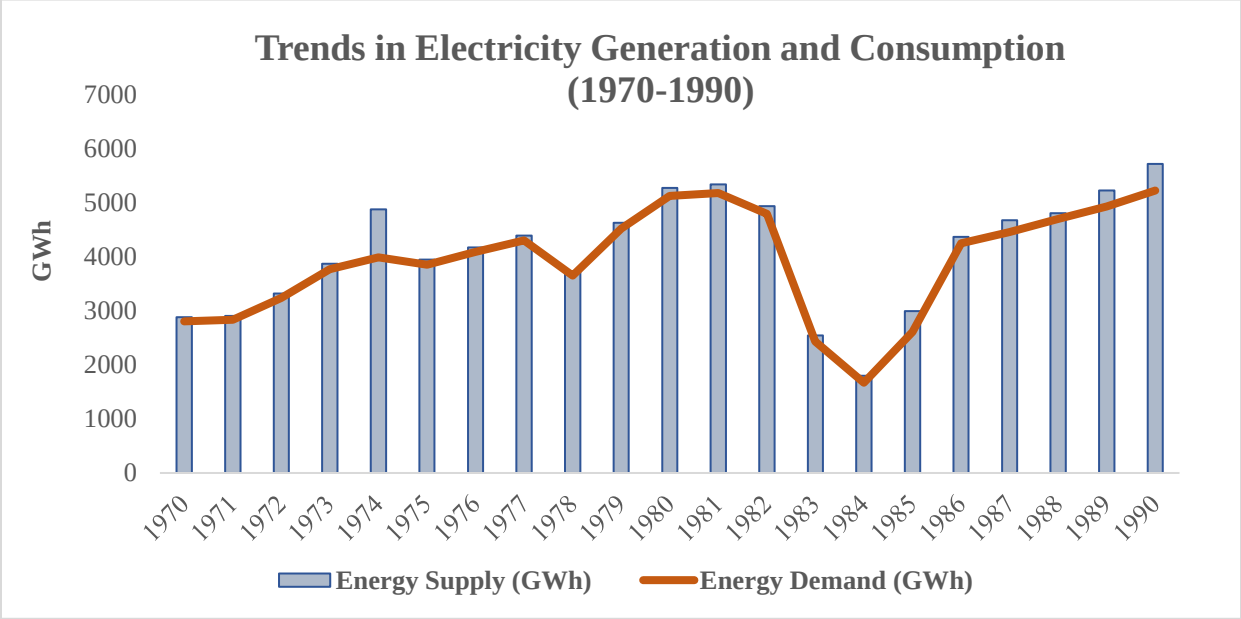

Fig 1. Trends in Energy supply and demand from 1970 to 1990
Source: (VRA, 1980); (VRA, 1991).

In late 70s – early 80s, the Ghanian economy went into a downward spiral, due to a series of exogenous shocks, particularly, the second OPEC crude price hike of 1978-79 – where the spot price shot up from $12.70 in 1978 to $40 per barrel by June 1979 (The New York Times, 1979). As a result, weak industrial production, and government failure to adjust domestic petroleum prices to the rising global prices of crude, led to an increase in the budget deficit by 44.94% (Dadson et al., 2018); (Ocran, 2007).

Failing to recover from the oil crisis, Ghana was hit by another energy and labour supply shock in 1983 – when Nigeria decided to clamp down on the oil supply (Brydon, 1985), and expel one million Ghanaians, which increased the domestic labour supply by 10% (World Bank, 1985; Van Hear, 1992). The economic crisis was further exacerbated by a severe drought that led to the devastation of agricultural production; widespread bushfires destroyed cocoa production – a cash crop whose export revenues the Ghanaian economy heavily relied on (Kolavalli and Vigneri, 2011). The drought of 1983 caused severe distortion in the generation capacity of the Akosombo dam – a primary energy production apparatus. Between the periods of 1982 and 1984, the total inflow was less than 15% of the projected total (ISSER, 2005). As represented in Figure 1, the total electricity production went down from 5180GWh in 1981 to 1670GWh in 1984 (VRA, 1985). The following episode revealed a major electricity supply security issue within the Ghanaian energy apparatus.

Crumbling economic infrastructure and energy systems led the government to adopt the Economic Recovery Program (ERP), a market liberalization approach supported by the Fund and

the World Bank (Nowak et al., 1996). The fundamental principles driving economic reform were – a progressive shift away from state intervention; enhancement of institutional reforms to boost private investment and activity; and restoration of fiscal prudence (Nowak et al., 1996). The program's initial phase brought about economic stabilization – the real GDP growth rate (%) went up from -6.9% in 1982 to 8.6% in 1986, further stabilizing at the target rate of 5% a year (World Bank, 2020b). Consequently, economic recovery was on the way, and so was the rise in power demanded. As a result, the energy consumption shot up from 1670 GWh in 1984 to 5110 GWh in 1991 (VRA, 1991).

In 1993, Ghana experienced another drought, leading to power rationing and loss in industrial output. The ’93 power crisis sent a message to the VRA and the Government of Ghana (GoG) that the policy of over-reliance on hydropower was flawed, and there was an urgent need to diversify the energy production mix of the country (Martin et al., 2001). A capital injection of USD 1.5 billion would be needed to finance the development of electricity apparatus to keep up with the rising power demand (Martin et al., 2001). Calls for reforms in Ghana came when World Bank installed a policy of “commitment lending” – where there was a systematic relationship between the volume of aid granted and the extent to which African countries were committed to economic reforms (Devarajan et al., 2001). Urgent need to develop power production capacity and attract World Bank and private capital into the sector led to the power reforms of 1994. The government of Ghana (GoG) opted for a “competitive model” for its power sector, which entails *inter alia* private participation in energy production and unbundling of the vertically integrated monopoly of VRA into Strategic Business Units (SBUs) (Martin et al., 2001). By 1997, GoG implemented significant sectoral structural reforms such as the establishment of independent regulatory bodies – Public Utilities Regulatory Commission (PURC) (Act 538), overseeing and setting of end-user energy tariff prices; and the Energy Commission (EC) (Act 541) overseeing licensing and regulatory environment of the sector (Energy Commission, n.d.). Satisfied with the GoG's commitment to reform the energy sector, the World Bank approved a USD 176 million credit facility for the 330 MW Takoradi Thermal Plant, leading to the second phase of the energy sector - diversification of energy mix into thermal energy (Martin et al., 2001).

By the mid-2000s, Ghana had undergone several climatic shocks – 1983-84, 1997-98, 2003, 2006-07, which directly affected energy production and, consequently, industrial production and economic growth. Economic growth was cut down by about 2%, from 6.4% in 2006 to 4.3% in 2007 (World Bank, 2020b). According to Databank Ghana, the power outage and rationing of 2007 forced companies to spend about USD 744 million a year to offset power deficiencies, which was about 6% of Ghana’s economic output (Phillips, 2007).

Sector Maturity (2010s-present)

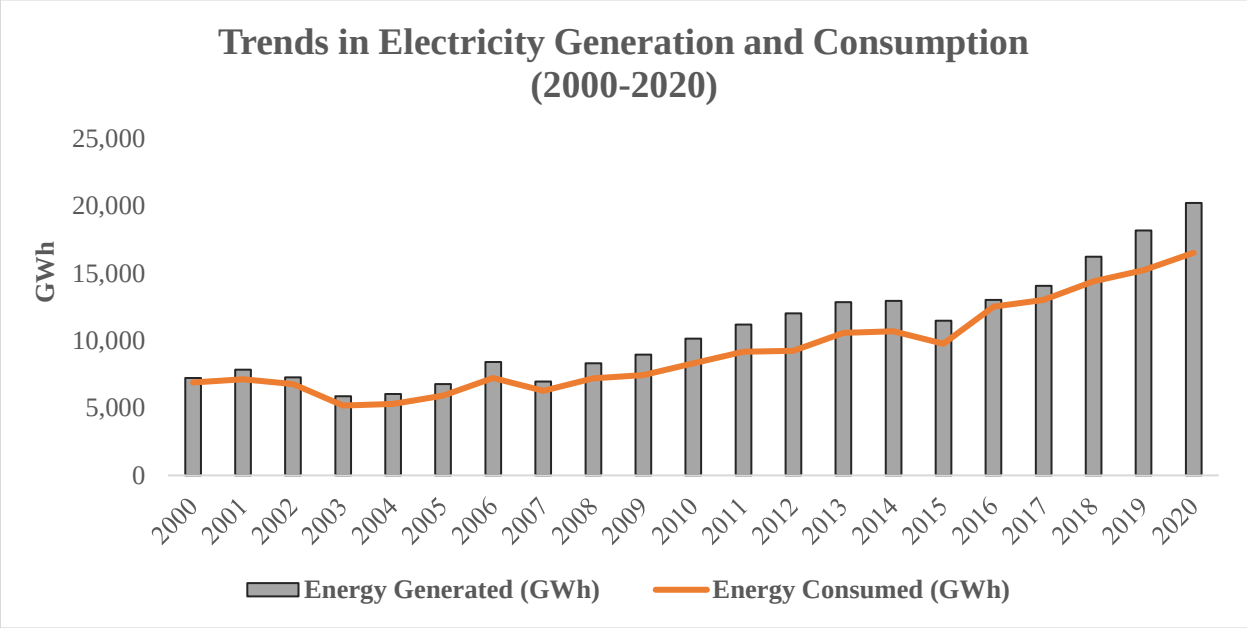

Fig 2. Trends in Energy supply and demand from 2000 to 2020
Source: (Energy Commission, 2020b)

Since the 2010s, the country's energy sector is in its third phase of hydro-thermal energy production model – about 51.8% and 48.2% of the total generation capacity (2010 data), respectively (EC, 2020b).

Ghana has experienced a repeating climatic trend of rainfall shortage during the dry season of 2012, lowering the water levels at Akosombo. Alternatively, the majority of the thermal power generating systems rely on Nigerian gas via the West African Gas Pipeline (WAGP). In 2013, due to infrastructural damages, Nigeria diverted gas to its domestic market, leading to a severe gas supply shortage – 30m-50m standard cubic feet per day (scfd) compared to 123m scfd as per the WAGP agreement (Oxford Business Group, 2017). The combined effect of low water levels at hydro-dams and difficulty in fuel acquisition for thermal plants resulted in severe power shortages and extended periods of blackouts, leading to the local adoption of the word "*Dumsor,"* which literally translates to "*on and off."* The energy crisis had a significant impact on the total factors of productivity – the manufacturing shrunk by about 8% during Q4 of 2014 (Mensah and Smith, 2018). In response to the crisis, the Electricity Company of Ghana (ECG) hastily signed 42 "take-or-pay" based Power Purchase Agreement (PPA) with the IPPs. In addition, the MoE signed three additional PPAs with emergency power producers (EPPs) (Ackah et al., 2021). The fiscal ramifications of this erratic response to the power crisis trickled down in subsequent years.

The following years were dominated by government policy of sectoral debt management and fiscal adjustment programs to improve the financial sustainability of the energy sector. Due to inefficient operational management and uneconomic end-user tariff structure, the energy sector

SOEs experienced heavy financial losses – 32.1% of the total revenue in 2014 to 40.7% in 2015 (Institute for Fiscal Studies, 2018). As for VRA, two primary sources of financial losses were due to quasi-fiscal subsidies provided to VALCo and heavy discount in wholesale tariff that accounted for only 78% of the cost recovery levels (International Monetary Fund. African Dept., 2021). The build-up of excess energy capacity payment offloaded by the IPPs under the "take-or-pay" based PPAs signed during the 2012-2015 power crisis began to take a heavy toll on the bottom line of SOEs financials. In 2017, the Ministry of Finance (MoF) incorporated a special purchase vehicle (SPV) – Energy Sector Levy Act (ESLA) Plc. – to refinance rising sectoral debt. The SPV issues debt securities backed primarily by receivables from ESLA Act – levies imposed on goods and services. By Q1 of 2019, the net sector arrears within the energy and gas sectors were outstanding at about USD 2.75 billion – 33% of 2018 tax revenue (Ministry of Energy, 2019). Costs involving energy sector arrears rose the budget deficit from 7.5% of the GDP in 2019 to 15.2% in 2020, whereas public sector debt grew from 63% of GDP in 2019 to 79% in 2020 (IMF, 2021). In 2020, the government paid more than USD 1 billion for unused electricity (The Energy Year, 2022). Hence, the Ministry of Energy (MoE), in collaboration with MoF, initiated a comprehensive debt restructuring and sector stabilization and recovery program – Energy Sector Recovery Program (ESRP) (MoE, 2019). The key recommendations of the program involve aggressive renegotiations of PPAs with IPPs; review of plausible increase in power sector tariffs; oversee sector stabilization payments to ensure the financial viability of SOEs; and shift from practice of "take-or-pay" basis to a competitive procurement of future PPAs (MoE, 2019).

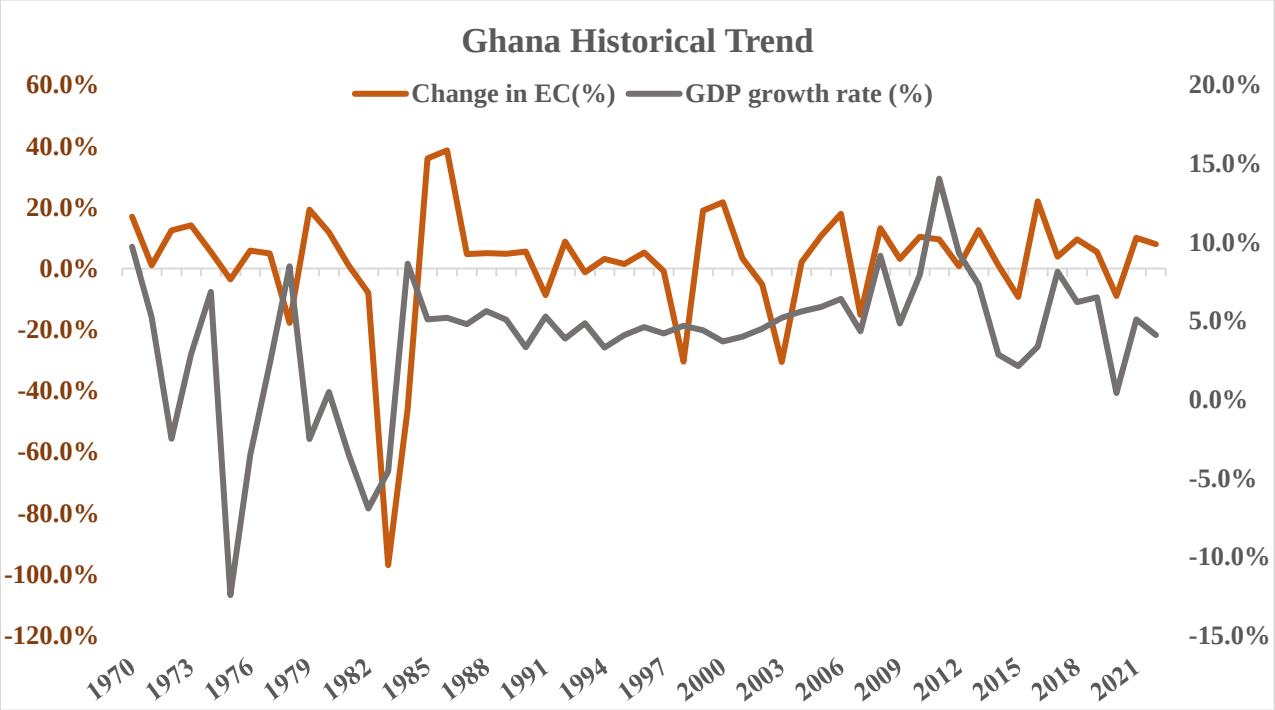

Fig 3. Trend between GDP growth rate (%) and Change in Energy Consumption (%) (1970-2021)
Source: (World Bank, 2020b); (Energy Commission, 2020b)

Proactive management and effective implementation of the recovery program yielded in commendable results – just by the end of 2020, the government had saved USD 5 billion in PPA renegotiation (Glover, 2021); (GhanaWeb, 2022). With fiscal deficits narrowing from 15.2% in 2021 to 9.1% in 2022; forecasted average inflation slowing at 9.0% in 2022 from 9.8% in 2021; and projected GDP growth rate climbing up to 5.5% in 2022 from 0.4% in 2020, economic recovery is underway. (FitchRatings, 2022a).

Historical trends, as seen in Figure 3, show a strong correlation between economic recovery and increasing energy demand. In the past five years, peak power consumption has risen at an AAGR of around 10.3% - largely due to rapid urbanization expansion of the industrial and service sector (especially banking and hospitality subsectors). Therefore, while supply apparatus meets current power demand, total demand is estimated to outpace supply capacities by 2025, further outpacing by 392 MW (The Energy Year, 2022). The current MoE policy of ESRP shows a huge potential for the sector to recover from its financial distress, creating opportunities to implement innovative incentive structures and use the available financial dry powder into diversifying its energy production portfolio. Rising power demand, sectoral improvement, and governmental commitment to promote energy security and efficiency opens up a new opportunity for Ghanaian energy sector to transition into the final phase – renewables.

Section II – Efficiency of Renewable Energy Act and Financing Shortfalls.

To transition towards the next phase of energy production and achieve the SDG 7 targets, there is a need to develop a long-term integrated roadmap and a guiding framework that incentivizes rapid development of RE apparatus. In Ghana, the policy inertia started to build up in the renewable energy sector after the power crisis of 2012-2016. To create an incentivizing fiscal and regulatory regime, the Ghanaian parliament enacted the Renewable Energy Act 2011, Act 832. Support instruments and incentive mechanisms developed under the act include:

Feed-in-Tariff (FiT) Scheme (Amended to Competitive Procurement Scheme)

FiT scheme is considered as one of the most effective price incentive policies adopted around the world for stimulating the rapid development of RE activity. The central principle behind the scheme is to create a stable and predictable cash flow by setting a fixed price or by providing a premium over the current market tariff for every kWh of power generated by renewable sources. FiTs guarantee fixed premiums over the lifetime of RE projects that generally have high upfront costs and overall high fixed to variable cost ratio. Therefore, FiTs can dramatically offset the price variability risk of a project and create an enabling environment for sectoral growth.

Under the RE Act 2011, Ghana opted for the “fixed price model,” where the FiT rates chargeable are guaranteed for a period of 10 years and thereafter subject to review every two years. (Renewable Energy Act, 2011).

However, one of the key issues with the FiT scheme is difficulty optimizing tariff rates that offer “fair” compensation. Unfavorable tariff rates create competitive distortions in the energy markets

as financially distressed state utilities are obligated to procure electricity at too high a price when compared to underlying competitive market prices. The Ghanaian tariff structure offered about 0.15-0.18 USD per kWh, significantly higher as compared to the other developing countries (Nii, 2016); (PURC, 2016).

In order to drive down the financial burden on utilities and consumers, Ghana replaced the FiT scheme with the Competitive Procurement Scheme, also known as demand auctions. (RE (Amendment) Act, 2020); (Parliament of Ghana, 2020). The procurement takes place according to annual energy supply and demand projections. A fixed capacity (kW) or power generation quantity (kWh) is auctioned for competitive bidding, and a producer that offers to generate at the lowest cost obtains the government tender. The shift towards demand auction model resulted in a reduction of tariff rate from 0.18 USD per kWh to less than 0.10 USD per kWh (Afful, 2020).

Renewable Energy Purchase Obligation (RPO)

RPO acts as an ancillary mechanism to the FiT scheme, which mandates the distribution utilities to procure a specified percentage of its electricity from renewable sources (RE Act, 2011). The PURC, in consultation with the EC, determines the specific percentage of required obligation. RPO framework is supplemented with Renewable Energy Certificates (RECs) – tradable certificates that account for verifying compliance with the purchase obligation. Purchase of a REC verifies procurement of 1MWh of energy by a bulk customer; the following certificate can be traded and exchanged in order to meet the regulatory compliance. Joint implementation of FiT scheme, RPO, and an exchange market for RECs are globally used to create an effective RE market.

However, the entire system collapses if the regulatory bodies are ineffective in enforcing RPO compliance unto power utilities. The RE Act specifies penalties charged for non-compliance but remains ambiguous regarding how the obligations are supposed to be met – whether utilities can trade RECs or do they need to self-generate to meet their purchase obligation. In addition, the public utilities are under severe financial distress, resulting in failure to meet its purchase obligations. Even though the legislation has deployed a definite Renewable Portfolio Standard (RPS), regulatory failure to enforce purchase obligations and financial incapacity to effectively procure electricity from RE sources has rendered the entire incentive system ineffective.

Renewable Energy Fund (RE Fund)

The RE Act has provided for the establishment of the RE Fund. Its primary objective is to enable capital for ‘the promotion, development, sustainable management, and utilization of renewable energy sources’ (RE Act, 2011). The Act specifies that the funds are to be channelled into renewable energy activities such as – payment of FiT rates, financing of grid integration and infrastructure, providing resources for off-grid and mini-grid RE power systems, and equity participation.

Capital for the Fund comes from – budget allocations approved by the Parliament; premium paid to the EC for failure to meet RPO compliance; donations and grants received for RE activities;

funds approved by the Board of Energy Fund under the EC Act, 1997 (Act 541); funds approved by the MoF; and levies collected from the export of biofuels as approved by the Parliament (RE Act, 2011).

That said, under the Renewable Energy Master Plan, 2019 (REMP), the government acknowledged the lack of concessional funding sources for RE activities; in turn, the MoE signaled a strong intention to operationalize the Fund during the first cycle (Cycle I) of the REMP (EC, 2019). However, as of today, the RE Fund is yet to be operationalized (MoE, 2020).

Renewable Energy Authority (REA)

To enter the energy market, renewable energy IPPs need to go through complex bureaucratic procedures to obtain various licenses and approvals to initiate final operation. A typical licencing process goes as follows - the IPPs initiate the procedure by undertaking pre-feasibility studies and conducts detailed studies on the technical and financial viability of the project; after the project is deemed viable, IPPs go through three stages of acquiring various licenses – Stage 1 involves the acquisition of a provisional license; Prior to construction, Stage 2 involves obtaining siting clearance permit, and a permit to authorize construction of the project; Stage 3 deals with the permit to authorize the operation (EC, 2012). Throughout this cumbersome licensing process, IPPs deal with various regulatory agencies such as, PURC, EC, the Environmental Protection Agency (EPA), MoE, MoF, and the Ghana Investment Promotion Agency. The complexity of the licensing regime leads to high transactional and administrative costs, adding to the already high upfront costs.

Furthermore, the onsite deployment of RE projects has been minimal due to the absence of a “one-stop-shop” system to streamline and fast-track the project approval process (Climate Investment Funds, 2015). As of 2020, 130 proposals were submitted for Wholesale Electricity Supply Licenses with a total capacity to produce 7030.6 MW of electricity from RE sources. 40 Licenses were approved for the siting clearance permit; further, 13 licenses were issued with Construction Permit; however, only four licenses were granted with the Operational permit, which is about 3% of the potential IPPs waiting for approval (EC, 2020a).

Therefore, to streamline the bureaucratic and regulatory process, GoG made provisions for the establishment of an independent regulatory body. Section 53 of the RE Act called for the establishment of Renewable Energy Authority (REA). Its functions – to oversee implementation of RE activities, execute state-sponsored RE projects, and manage the state assets related to renewable energy (RE Act, 2011).

However, 11 years after the adoption of the RE Act in 2011, REA is yet to be established (MoE, 2020). Under the plans laid out for cycle I (end of 2020) of the REMP, the government affirmed to operationalize the REA. Nonetheless, as of 2022, these efforts remain futile. Failure to institute an independent sectoral regulatory body points at legal and political noncommitment, in effect, hampering investor confidence.

Liquidity and Interest Rate Shortfalls Towards RE Project Financing

One of the major disabilities with RE projects are its high upfront and installation costs; due to this fundamental characteristic of capital requirement, access to long-term, low-cost debt financing is vital for the development of RE projects. However, The Ghanaian project financing market is riddled with high lending rates and liquidity shortfalls. For commercial banks, when liquidity risks, prime rate, and minimum reserve requirement regulations are taken into consideration, funding capital intensive renewable energy projects becomes less appealing.

For instance, credit institutions need to comply with liquidity requirements such as Capital Adequacy Ratio (CAR), a metric of a bank's capital in relation to its risk-weighted assets and current liabilities (BoG, 2021a). This metric aims to promote short-term credit resilience to potential financial risks. The following ratio is reproduced as:

$$CAR = \frac{Tier\ 1\ Capital + Tier\ 2\ Capital}{Risk\ Weighted\ Assets} \geq 21\%$$

As of March 2021, the Bank of Ghana set the minimum CAR at 21% (BoG, 2021b). Financing capital intensive energy projects worsen the institution's capital adequacy ratio due to their perceived risk, raising the cost of capital for the intended project.

Further, looking at the demand side of the debt market, users of capital are primarily companies, individuals, and the government. Fiscal deficits and a government with a huge appetite for borrowing, influence the prices and lending rate of the available capital. To enable borrowing, the government issues securities with high coupon rates, attracting capital towards government bonds, further crowding out private borrowers (Kwakye, 2010). For example, EcoBank Ghana PLC, Ghana's second-largest bank, has a significantly high sovereign exposure (about 43% of its total assets) to public sector lending (FitchRatings, 2022b).

	Solar PV Projects				**Government Securities (T-bills)**		
Description	BXC	GCP	Nzema	Navrongi	91-day	182-day	364-day
Rate Of Return (RoR)	21.3%	10.5%	7.5%	16.4%	14.7%	15.2%	18.2%

Table 1 – RE project RoR v/s Ghanaian T-bill coupon rate
Sources: (Pueyo, 2018); (Aguilar, 2015) ; (Bank of Ghana (BoG), 2021c).

International financing, including concessional financing, offers an average lending rate of 7.5%; in comparison, the domestic lending rates are between 21% to a whopping 37%. (Pueyo, 2018). Though, the commercial lending rate averaged at about 21% by 2021 (BoG, 2021c). Targeted Internal Rate of Return (IRR) demanded by equity investors can be as high as 30% to consider the RE project economically viable (Pfan et al., 2015). Comparing the risk-return profiles of RE

projects in Ghana with other investment alternatives such as government securities, as illustrated in (Table 1), energy projects fail to act as lucrative investments. Two elements keep the returns low - on one side, high cost of capital, whereas on the other, governmental intervention in keeping electricity prices below market level, further eroding the price competitiveness of renewable energy.

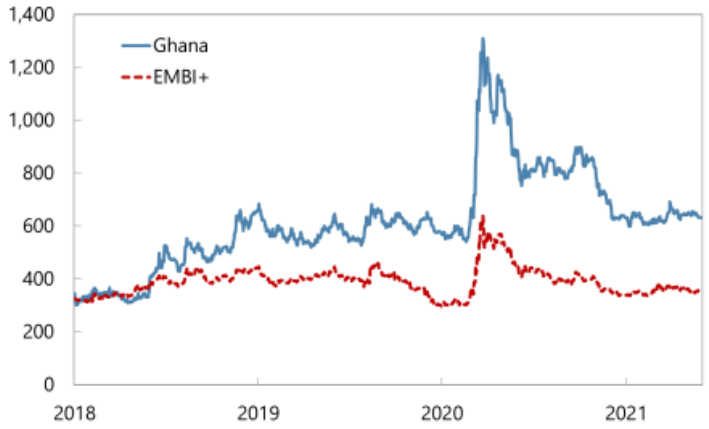

Fig 4. Eurobond Spreads between Ghana and JP Morgan Emerging Market Bond Index (EMBI+) (basis points)
Source: (IMF, 2021)

The only project that seems economical, as seen in Table 1, is the 20MW solar PV plant developed by the Beijing Xiaocheng Technology (BXC) China – USD 30 million project financed by the Chinese development banks that offer soft loans and credit at an interest rate of 4% to 5% (LIBOR + country risk premium) (Pueyo, 2018). Significantly lower when compared to the rates offered by the international concessional loans and domestic credit institutions. On top of low borrowing costs, the project was able to access low construction costs due to Chinese construction contractors; the factoring effects of low financing and factor costs led to the production of cost-competitive electricity (Pueyo, 2018).

Finally, macroeconomic stresses on liquidity have put pressure on domestic borrowing costs (FitchRatings, 2022c). Ghana, during the COVID-19 pandemic, has experienced tightening of external credit conditions – Foreign Direct Investment (FDI) has fallen from 4.4% of GDP in 2019 to 2.7% of GDP in 2020; whereas Net foreign portfolio flows bottomed down to 2.3% of GDP in 2020 from 3.4% of GDP in 2019 (IMF, 2021). Public sector debt has risen from 63% of GDP in 2019 to 79% in 2020, having sharply increased debt service costs and the governmental need for credit (IMF, 2021). To meet its debt obligations, Ghana has heavily relied on international capital markets; for example, the Euro-denominated bond series issued by the GoG dating back to 2018, raising a cumulative of about USD 8 billion in 2020 (Graphic Online, 2021). However, increasing bond spreads between the Ghanaian Eurobond and Euro-denominated bonds from other emerging markets, as illustrated in Figure 4, show faltering investor confidence towards the Ghanaian security. For example, The Eurobond series issued in 2021 totalled USD 3.03billion at 8% with an average maturity of 11years; comparing that to the issuance of USD 3billion Eurobond,

in 2020, which offered 7.5% with an average maturity of 17years, it can be concluded that the cost of external financing has significantly increased (IMF, 2021).

Consequently, the government has heavily relied on domestic credit markets to absorb its credit requirements. This overreliance has pushed domestic absorption capacity to the limit; with over 40 per cent of the domestic banking sector assets exposed to sovereign credit, the supply of money relative to demand has decreased, further raising the risk of interest rate pressures (IMF, 2021). In turn, the supply of appropriate financing for renewables has nearly vanished.

That being the case, there should be a systematic attempt to explore innovative alternative debt financing mechanisms, tax-based incentive structures, and regulatory measures to improve the current condition of capital flows towards the RE sector.

Section III - Recommendations

Bundling and Viability Gap Funding (VGF) Scheme

The following federal policy practices recommended in this subsection takes inspiration from the action plan of the Government of India's 2009 National Solar Mission (Government of India, 2008). The mission unfolds into two phases – with Phase 1 primarily dealing with the bidding for RE project development and Phase 2 dealing with reverse bidding for government capital grants.

Phase 1 implemented procurement methods such as competitive auctions and the bundling scheme. As discussed in the previous section, Ghana has the necessary experience with competitive procurement auctions, which has lowered the tariff rates by 44% (Afful, 2020). Ghana, as implemented in India, can adopt the bundling mechanism that has helped reduce the effective procurement costs for the Indian distribution companies by 70% (Thapar et al., 2016). Under this scheme, a regulated intermediary would carry out price auctions where IPPs can bid with a composite tariff rate for RE-based power combined with a single conventional means of power (gas or coal) (Government of India, 2008). The Indian scheme mandates an electricity supply of at least 51% from RE sources. Ghana can adopt a more gradual approach of periodically increasing the mandated supply mix, which can help ease out challenges associated with energy transition.

Furthermore, phase 2 of the mission introduced equity grants for solar projects. The Viability Gap Funding scheme was implemented to lower the equity financing burden on project developers. The exact amount of capital grant was determined by employing reverse auction, where developers bid down on the required funding per MW. VGF lowered the equity investments made by project developers from 30% to 15% (Thapar et al., 2016). Further, reducing the weighted average cost of capital (WACC) from 13.9% to 11.5% (Thapar et al., 2016). The scheme fuses market competition with the need for government financing. The implementation of reverse auctions for capital grants can help further reduce financing pressures on the government's coffers.

The paper recommends implementing the following schemes together, as their synergies can have a significant impact on reducing upfront equity as well as financing costs for RE developers.

Tax Equity Financing Structure

Governments conventionally subsidize sector activities through implied taxes. In project financing, tax subsidies are claimed directly by the developer engaged in the subsidized activity. However, under several other tax credits, the developer is often encouraged to partner with a third-party investor. These partnerships happen partially due to the intended party having minimal tax liabilities to offset, making the tax credits redundant, or because the tax credits are delivered over a long period, whereas, the developer needs short-term upfront financing to develop the project. The following conundrum can be solved by tax-equity partnership structures, where the primary tax beneficiary agrees to transfer rights to the tax credits to an investor in exchange for equity. The main objective behind developing tax-equity structures is to incentivize equity financing participation into the project's capital structure. A typical capital structure for financing RE projects – about 35% (±5%) of equity comes from the tax-equity investor, whereas the developer finances the rest via equity and debt (Martin, 2021).

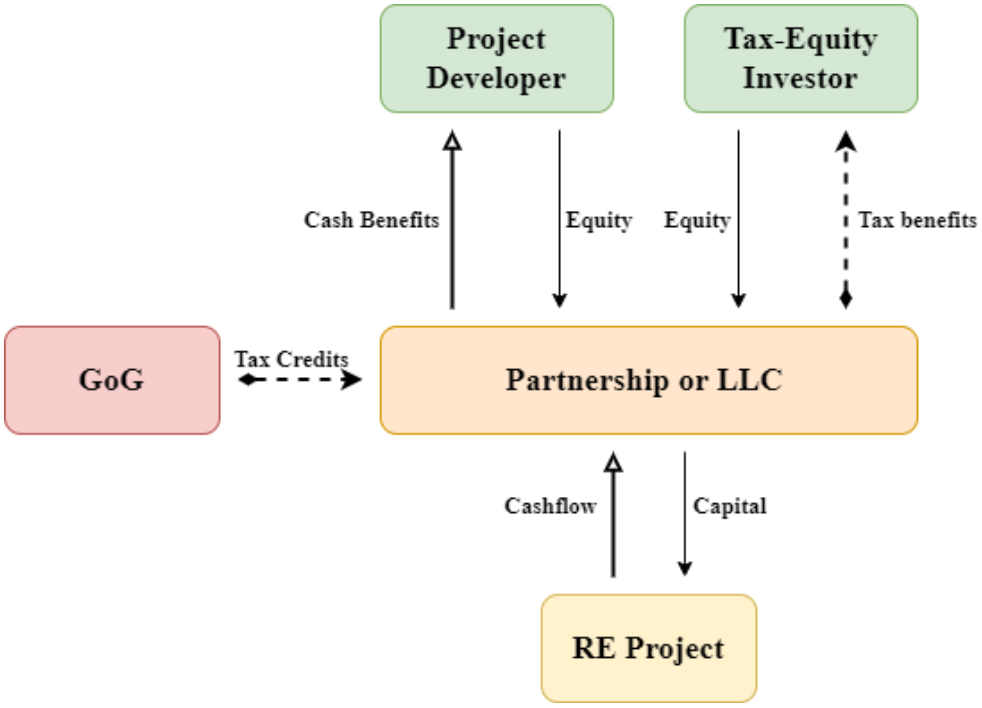

Fig 5. All-equity partnership flip example structure

While multiple tax equity structures can be implemented – partnership flips, sale lease-backs, and inverted leases – varying per transactional needs, they often share standard structural features. Due to the scope of this paper, the section focuses on arrangements that use partnership flip structures. Figure 5 provides a visual summary of how the transaction works (debt not included

for simplicity). The transactional structure is relatively simple – a developer and a tax-equity investor, usually large financial institutions with a large tax liability, create a partnership or a joint LLC. The tax-equity investor injects equity into the LLC for 99% of the tax benefits upfront and with some agreed-upon percentage of cash benefits. Whereas the project developer retains most of the cash benefits associated with the project until full investment recovery. Thereafter, the cash benefits flow to the tax-equity investor. Once the tax-equity investor has reached a target yield (yield-based flip) or the transaction has reached a predetermined time (fixed-flip), the partnership will "flip" the allocation of the benefits. The developer will retain over 90% of the cash benefits post-flip, further having the right to buy out the remaining project interest of the tax equity investor. Thus, being the sole owner of the developed project (Bolinger, 2014).

Under the Ghana Investment Promotion Act (Act 865), investors are provided with significant tax reduction credits to the infrastructural development of RE projects (Ministry of Power, 2015 , thus providing the building block of regulatory support for structuring tax-equity transactions in Ghana. However, there is a need for a comprehensive taxation framework – creating a type of tax credit that offsets the beneficiary's liabilities, cedi-to-cedi, in order to develop a sophisticated tax-equity investment market.

Microfinancing Loan (MFL) Securitization

This section recommends implementation of securitization structures to the world of microfinance lending. In order to better understand how the recommended securitization models would create an alternative financing market for the RE sector, a guided overview of the Ghanaian microfinance sector as well as introduction to securitization theory is needed.

Overview of Ghanaian Microfinancing Sector

Microfinancing infrastructure encompasses providing financial products that offer micro-credits and loans to low-income clients that are generally not catered by the formal banking institutions of the country. MFIs fill up this supply gap by employing sustainable financing practices. Microfinancing practices have significantly enhanced the financial inclusion of individuals and households at the bottom of the socio-economic pyramid, further improving social indicators such as poverty, education, and health (UNCDF, 2005).

Ghana, in the 2000s, saw a rapid growth in the spread of microfinancing activities which enabled broadening and deepening of the population base that was financially included in the banking sector. Clients catered by MFIs increased to around 8million by the end of 2013, rising from 1.3 million in 2001, while deposits and loans grew at a compounded annual growth rate (CAGR) of 21% and 26%, respectively (GHAMFIN, 2014). According to the (Global FINDEX, 2017 , about 57.7% of Ghana's adults had a bank account in a formal financial institution in 2017 compared to 29% in 2011.

The period of boom oversaw major financial collaborations, in terms of liquidity and capacity building, between banking institutions and MFIs. For example - Barclays partnering with the

Ghana Co-operative Susu Collectors Association (GCSCA , a non-bank financial institutions' association, to supply MFIs with capital injection and wholesale funding (Fig 6.) (AAE, 2013); collaboration between EcoBank and ACCION, a global microfinancing non-profit that employs a financially-sustainable lending model (Earne, 2015); (Chu, 2006); and, Fidelity Capital's acquisition of ProCredit Savings and Loans (Agbugah, 2014). From the following examples, it can be inferred that commercial banks expanded their activities in the MF sector due to the potential profitability of micro-lending.

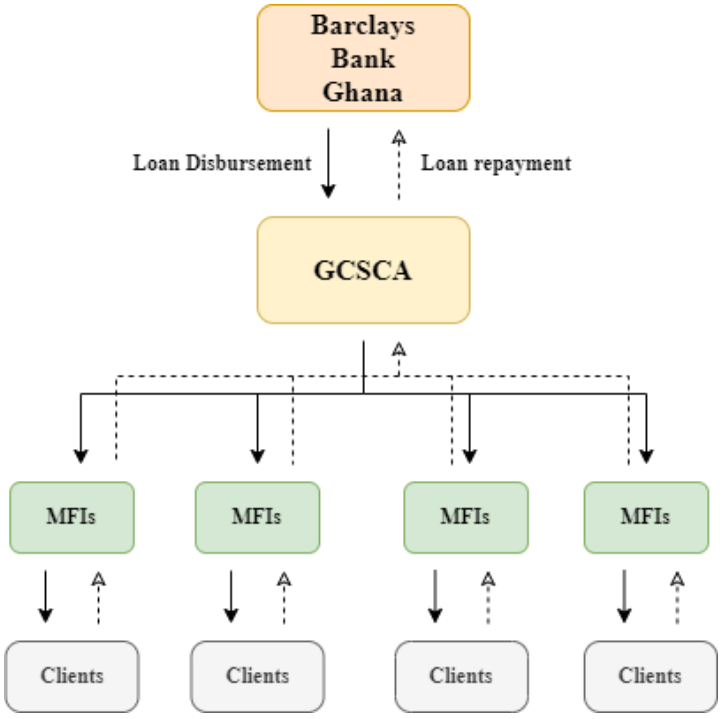

Fig. 6 Barclays Bank Ghana & GCSCA Partnership Model

In 2011, the Bank of Ghana issued regulatory and operational guidelines to bring varying types of MFIs under a consistent legal framework. The sophistication of the MFI sector was done by developing a tiered structure to classify MFIs according to their capital size and perceived risk to the financial stability; a licensing regime was implemented with the aim to weed out insolvent and structurally weak MFIs; subsequently, minimum capital requirements were introduced to ensure transition towards a more robust MF sector (World Bank, 2016).

Linking Microfinance Institutions (MFIs) with RE Financing

Access to modern electricity among low-income households can be greatly enhanced by enabling a robust and sophisticated microfinancing sector.

Globally, several energy-lending activities and programs related to microfinancing solar home systems (SHS) improved electricity access to rural households. For example, in 2009, a pilot project, known as Ghana Energy Development and Access Project (GEDAP), was launched to

improve energy access to households by financing the distribution of SHS with commercial loans. World Bank's Global Partnership in collaboration with the ARB Apex Bank Ltd., a government-run banking syndicate for rural MFIs, funded a solar lending project. Credit received from the World Bank aid was distributed among 12 participating MFIs. MFLs offered by the program were varied according to energy capacities and cost options. The program saw an active participation of private vendors to supply the households with the necessary hardware, installation, and further servicing of SHS. The financing conditions were tailored as – 10% down payment, and the remaining with monthly interest payments. This result-based financing program resulted in over 100,000 households benefiting from off-grid solar energy with a repayment rate of over 90%; about 93% of the clients further expressed willingness to solely pay for the costs associated with maintenance and repair (GPOBA, 2016).

Another example of microfinancing renewable energy comes from Bangladesh. Founded in 1996, Grameen Shakti, a company with the aim of providing electricity to low-income households at affordable prices. The comprehensive package offered stand-alone SHS, including a warranty of 5 years on the battery and 20 years on the panel system. In 2003, Grameen Shakti partnered with Infrastructure Development Company Limited (IDCOL), a non-bank financial institution, to bridge the financing gap for SHS deployment in low-income households (Grameen Shakti, n.d.). The financing terms entailed a loan amount of 80% of the project cost with up to 10-year maturity at 6-10% annual interest rate (IDCOL, n.d.). The results were – as of 2022, over 18million SHS deployed, benefiting more than 8million people in Bangladesh (Grameen Shakti, n.d.). The staggering success of these energy-lending programs highlights that if effective cross-sector partnerships are developed, and liquidity shortfalls in the microfinancing sector are resolved, Ghana can see a rapid mobilization of private capital towards the deployment of RE assets across the country.

Introduction to Securitization

The Subprime meltdown of 2007 gives securitization a bad name and undermines its capabilities to deploy vast amounts of capital and further democratize sector financing. In order to truly understand the potential of this financially-engineered tool to tackle financing barriers faced by RE funding, an overview of securitization theory is needed.

In the simplest term, asset securitization is a form of structured financing process where relatively homogenous cash-flow producing illiquid assets are pooled and repackaged into tradable securities and transferred to third-party investors who can now claim the impending cash-flows or any other financial benefits the pooled assets may generate (Fabozzi and Kothari, 2008). The four main phases of the securitization process include – (1) Pooling of assets (2) Transfer of pooled assets from originator to a bankruptcy-remote entity, such as a trust, or a special purpose vehicle (SPV) (3) Structuring of assets into credit pools offering varying risk/return profiles (credit enhancement) (4) Sale of securitised assets to third-party investors.

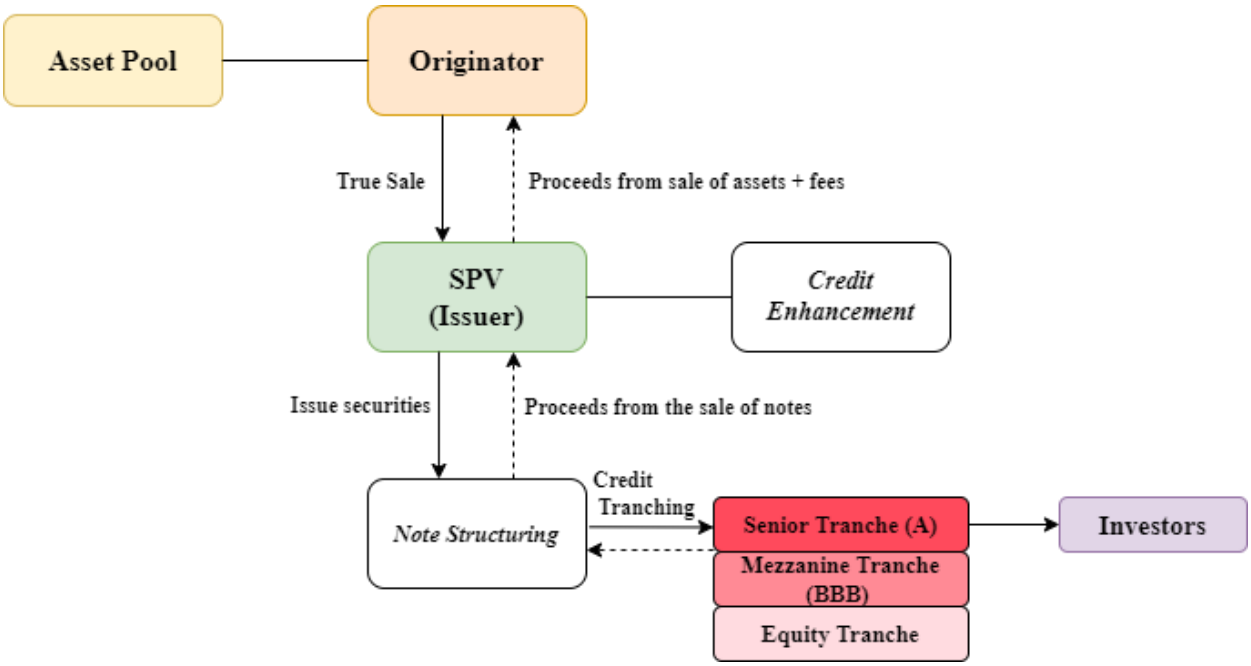

Fig. 7 Securitization Transaction Structure

A typical transaction (Fig. 7) goes as follows: a loan-originator, typically a credit institution, extends a loan to a borrower in compliance with the underwriting standards of the institution; The originator or a sponsor, typically an investment bank, creates an off-balance-sheet vehicle (OBSV), referred to as an SPV, which has a legal status of a separate corporate entity with its own balance sheet. The creation of an SPV is critical for the securitization transaction to take place. It separates the originator from the risk associated with the creditworthiness of the pooled assets, further insulating the originator from bankruptcy claims on the SPV. Another benefit of creating an SPV is that it can obtain favourable financing as its creditworthiness is solely dependent on its underlying assets and not on the financial performance of the parent company (Originator); The originator transfers the pool of assets to the SPV by means of a “true-sale,” which entails that the pool of assets was legally sold, and not pledged as collateral for a financing (Fabozzi and Kothari, 2008); The SPV purchases the pooled assets from the funds received from issuance and sale of securities with varying bond classes (or tranches) to third-party investor; the following bond payments are serviced with the payments (i.e. interest and principal repayment) made by the borrower. The bond payments are made according to the varying cash distribution arrangements specific to the transactional needs.

Securitizing a pool of assets can provide various financial and legal benefits for all the parties involved in the transaction.

For the originator – due to turning on-balance-sheet financing into an off-balance sheet fee-based revenue model that is less capital intensive, originators can solely focus on lending and originating loans without assuming associated risks such as credit risk and interest rate risk. The following mechanism of transfer allows the originators to free up liquidity, as it transfers and sells

off the loan pool to a sponsor in exchange for origination fees, while at the same time retaining its capital base. Financial institutions (originators) that have the necessary infrastructure to securitize the loan pool can also retain servicing fees associated with the transaction; securitization further allows credit institutions to better manage their risk-based capital requirements – such as CAR. These regulatory requirements focus on the financial cushion, such as capital reserves of the institution and credit risk associated with the portfolio assets on the institution's balance sheet. Since securitization lowers retained risk, it enables the creation of long-term financing structures with lower capital costs to create better value for its customers (borrower).

As for the borrower – increasing credit availability in the market, as lenders now offer loans that, under normal conditions, would not have extended due to the rigidity of traditional on-balance-sheet financing. Effects of securitization trickles down in enabling access to better financing conditions – long-term maturity at lower interest rates. Finally, as the market for securitization matures, standardization of legal frameworks and transactional processes take place; this enables an increase in specialized participants competing at various stages of the transaction, encouraging price and service competition, further driving down costs for the end-user (i.e., the borrower).

Finally, for the investor – securitized assets are often tailored according to the risk-return appetite of investors, thus making the pool of assets more attractive to a wide range of retail and institutional investors. With the development of a secondary market for trading these collateralized securities, investors would benefit from improved liquidity; Further, by application of structural credit-enhancement techniques – over-collateralization, excess spread, subordination, and third-party guarantees – these securities improve their creditworthiness by offering credit support to absorb unexpected losses and risks associated with default and payment. On the demand side, this enables broadening of the investor base, as regulated credit institutions would rather prefer to buy highly accredited securities backed by loans than hold the same individual loans with a lower credit rating; Finally, securitization provides a medium for asset diversification as it enables the democratization of investment opportunities in sectors previously inaccessible to the capital markets.

From Households to the Capital Markets (Securitization of MF Loans to Enable Deployment of RE Assets)

This section focuses solely on developing a more sophisticated form of structured financing– securitization of micro-financed loans and RE equipment leases. The financing models prescribed in this chapter take key inspiration from the past securitization transactions such as – the Bangladesh Rural Advancement Committee (BRAC) USD 180million, AAA-rated securitization deal of MFLs (Rahman et al., 2007); and the Bulgarian ProCredit Bank's EUR47.8 million, BBB-rated securitization deal of euro-denominated MFLs (MicroCapital, 2006). The section will recommend two key securitization models – the cross-sector partnership model and the Pay-as-you-go model.

Cross-sector Partnership (CSP) Securitization Model

This financing structure partly takes a key element of cross-sector partnership between the regional MFIs and the private solar vendors, as primarily seen in the 2009 Ghana Energy Development and Access Project (GEDAP) that oversaw massive successes in improving household energy access and overall broadening of RE market participation.

Like mortgage-backed securities (MBS), the CSP model solely relies on the interest payments and principal repayment, though it differs in underlying asset. Unlike MBS, which depend on mortgage payments, the CSP model relies on MFL repayments. The main characteristic of the model is the partnership agreement between regional MFI and individual RE systems providers (in this example, SHS providers), where these enterprises collaborate to provide financing and the technology needed to deploy solar systems for their clientele.

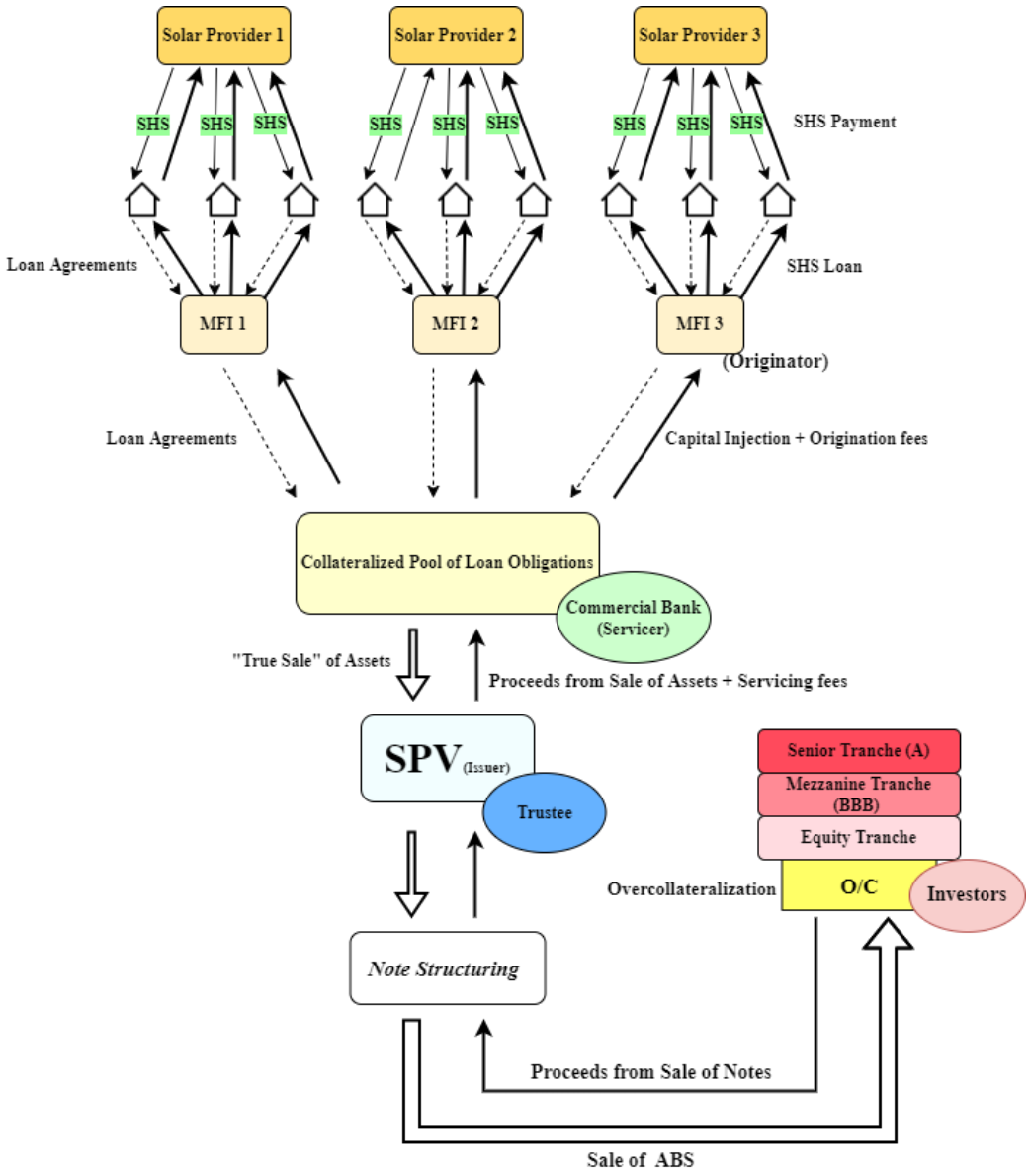

Fig 8. CSP Model Financial Flow Structure

Due to regulatory capital requirements and prevailing liquidity constraints, MFIs need to access capital from sophisticated financial institutions to meet credit demand. MFIs can play the part of “originator” and a “primary servicer” in the securitization process. In return for the transfer of loan obligations, commercial banks can compensate MFIs with origination and servicers fees, on top of purchase of loan obligations. As a primary servicer, MFIs maintain regular relations with the borrower – with the sole responsibility of monitoring and collecting interest payments; and in case of failure of loan repayment, recovery and disposal of collateral (i.e., solar system). MFIs have also transferred credit risk associated with the underlying loan obligations with the transfer of assets.

At the transaction pool level, the commercial banks create a reference portfolio of pooled assets acquired from MFIs and use it as collateral. The bank sets up an SPV and transfers the loan portfolio by the means of a “true” sale. SPV issues asset-backed securities (ABS) and structures them according to the seniority of claims on underlying cash-flows. Structuring of the senior-most tranche is vital for the execution of the transaction (Fabozzi and Kothari, 2008). The following tranches are structured as – senior tranche that entails the highest credit rating offering the lowest interest rate compared to other subordinated bonds; then comes the mezzanine tranche, which has a riskier position in the capital structure as compared to the senior-most tranche, though it offers a higher interest rate; and finally, the junior (equity) tranche that acts as first-loss tranche and minimizes credit risk for senior tranches. In conditions of high prepayment rates, the equity tranche absorbs the residual returns, further reducing prepayment risk for the senior tranches. Equity tranche investors receive the highest return to compensate for absorbing the highest risk in the capital structure.

Subordination structures are a widely used method of internal credit enhancement; the transaction can also implement other internal credit-enhancement mechanisms such as – excess spread, which is equal to the interest payments made by the asset portfolio minus funding costs, fees, and bond payments; the SPV can retain this excess profit by “trapping” it in a spread account to offset future losses. Overcollateralization, which is a form of equity that equals the price paid minus the par value of the collateralized assets. For example, the SPV purchase MFLs worth USD 50million and transfers USD55million to the SPV, further issuing bonds worth USD 50 million; the additional USD 5 million acts as excess collateral (Fabozzi and Kothari, 2008). Third-party financial guarantees can also be used as a form of external credit enhancement to improve the credit quality of the bond structure. Here, the government can play a big part in offering insurance support to these financial transactions.

The cash flows generated by the underlying portfolio are disbursed per the payment priority of the bondholders.

Future transactions will become cost-effective as the portfolio size increases and economies of scale are realized. Improvement in investor comfortability towards this esoteric asset class; market maturity with standardization of contracts, underwriting standards, and transactional processes; supply of reliable quality credit enhancers; and build-up of specialized competition at varying stages of the transaction will further lower costs and rates for the underlying RE assets.

Pay-as-you-go (PAYGo) Securitization Model

The PAYGo model is an innovative business model that has provided sustainable energy to households at affordable prices. The model works as follows – the energy provider rents out solar PV systems to households in exchange for monthly receivables. Due to the “no-money-down” value proposition, widespread use of mobile online payments, and falling costs of RE equipment, the PAYGo business model has seen a record-breaking sales volume of 17,000 units sold in Ghana; 27% increase in annual sales recorded in 2019 (GOGLA, 2019).

With system costs averaging at USD 15,500 per 10kW rooftop installation, few Ghanaians can afford to finance solar system installations outright (Dyson Energy, n.d.). Therefore, securitization of usage-based payment model that offers energy as a service for its consumers provides a more economical alternative

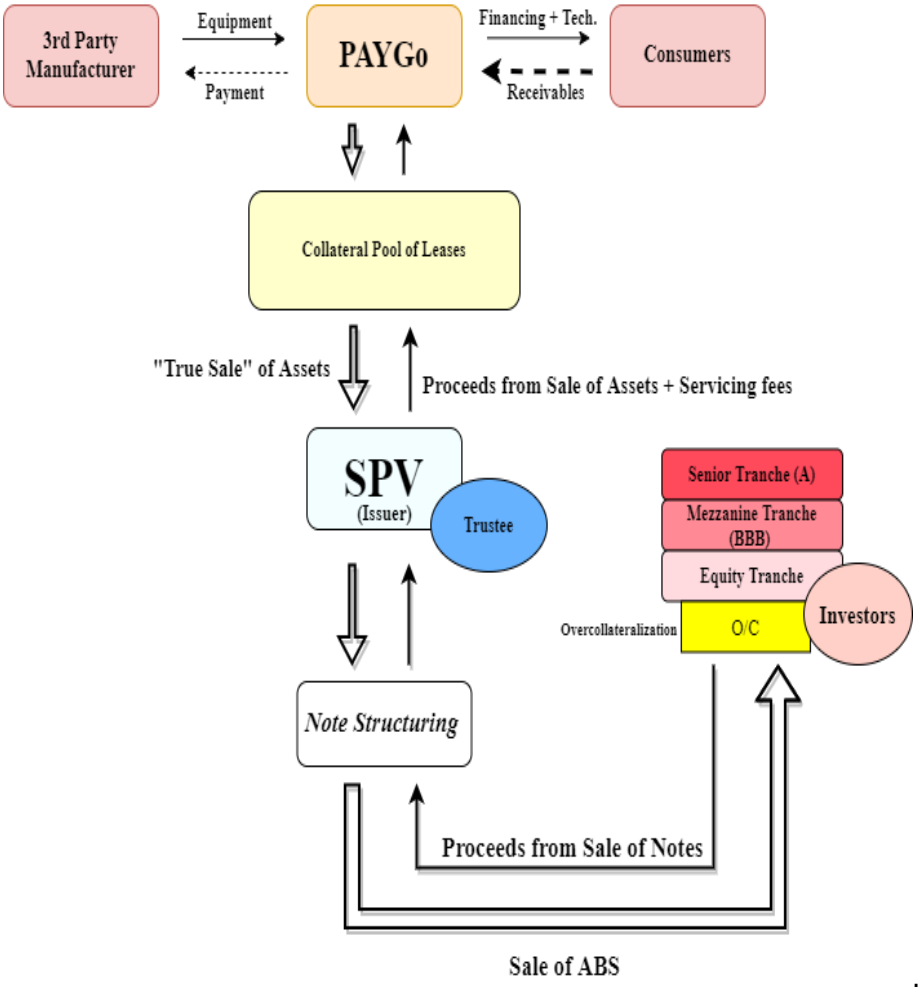

Fig 9. PAYGo Model Financial Flow

A typical securitization transaction for the PAYGo model would go as follows – A PAYGo company will buy solar PV equipment from a third-party manufacturer as per consumer demand. With installation sales, PAYGo will install, finance, and maintain the SHS for the customer in exchange for periodic payments per predetermined GH₵/kWh rate with 1-3% of annual price escalation to address the rise in electricity prices (Clark, 2014). The PAYGo company can bundle these leases and sell them to the SPV for securitization. The proceeds from the sale of underlying green-backed securities are used to purchase the bundled leases. Further recapitalization can enable PAYGo to extend its services to other households.

Securitization of these leases would have three immediate benefits to the RE industry. First, it provides PAYGo with a new means of raising capital for an asset-intense SHS installation

business, benefitting the PAYGo with recapitalization. Assuming growing demand, the PAYGo can expand lease sales to the existing portfolio for future securitization transactions. Second, the risk of default spreads among the ABS investors. Moreover finally, the development of green-ABS provides opportunities to diversify and broaden the investor base. If incentives are correctly aligned, securitization would have an additive effect on RE deployment across the nation writ large.

Ghana currently has the necessary financial infrastructure to employ securitization to develop a financing alternative for the RE industry (Asantey, 2013). Recent transactions conducted by GoG to raise capital on the international capital markets show that the concept of securitization is not foreign to Ghana. For example – Firstly, the ESLA deal, where an SPV sponsored by the GoG, E.S.L.A Plc. issued securitized bonds that denoted rights to the receivables collected from energy sector levies (E.S.L.A Plc, 2020). Finally, the Agyapa royalties deal, where the GoG created an SPV called Agyapa Royalties Ltd. and proceeded to transfer a 49% stake in Ghana's future gold royalties in perpetuity. The following deal raised USD 500 million to ease the growing debt crisis. Though the transaction was not securitized, it certainly had the building blocks of a securitization transaction (West, 2020). The following models can dramatically enhance financing practices currently employed in the RE market of Ghana.

System of Priority Sector Lending

The recommended system of Priority Sector Lending (PSL) is adopted from the playbook of the Reserve Bank of India (RBI) that mandates the banking sector to reserve and disburse at least 40% of their adjusted net bank credit of the previous year to sectors defined under the "Priority sector" category. The overarching philosophy behind mandating lending targets on financial institutions is to enable sectors of the economy that cannot receive credit either in adequate quantities or on time. PSL is synonymous with ethical financing. In India, credit institutions have made significant advancements in providing credit to green financing and social welfare (Sahoo and Goel, 2020). Under the recently revised RBI PSL guidelines, the renewable energy sector was added to the priority sector category, which enabled aligning the credit lines towards green financing. Similar to the RBI mandates, in 2015, Bangladesh Bank set up green lending requirements that dictated banks to allocate 5% of their advances into green projects (Volz, 2018). PSL guidelines and development of the RE securitization market have a synergistic effect on broadening the capital base for green financing. Debt securitization of green assets provides financial institutions with an alternative investment class to meet their PSL requirements. At the same time, further advancements in the development of a PSL framework will add to the institutional demand for PSL-asset securities. Banks prefer to invest in securitized assets that offer sufficient credit enhancement rather than risk direct exposure to underlying assets. An in-practice example that shows the synergy between the PSL framework and securitization can be seen in the Indian MBS market, where the majority of the market is driven by PSL guidelines that categorize "housing" as a priority sector for credit extension. The majority of non-banking financial institutions use securitization as a route to sell Priority sector loans to financial institutions that fall short of PSL targets (Bothra, 2014). Consequently, MBS transaction and trading volume surged to INR 950 billion as of 2018 (Sitaraman et al., 2018). From this example, it can be inferred that if

appropriate regulatory frameworks are put in place, similar effects of increasing capital deployment can be seen in the renewable energy markets.

The Bank of Ghana can adopt a similar regulatory mandate of PSL that could enable sectors of the economy with the much-needed financial inclusion. Determined legislative commitment to developing both the PSL guidelines and the securitization market can greatly help prime the Ghanaian sustainable energy market.

Conclusion

Ghana, currently, is at a critical juncture for transforming its energy apparatus into a new era of sustainability. The projected rise in future energy demand, and advancements made in the energy sector debt management program, ESRP, provides Ghana with the opportunity to develop policies and strategies to guide the transition towards renewables. Although there are incentive mechanisms and regulatory frameworks in place, they have failed to actively stimulate the development of the RE apparatus. This failure may be attributed to design flaws in the policy support mechanisms, enforcement failures of the regulatory purchase compliances, weakening of price mechanisms due to failures in the implementation of co-dependent supporting policies, institutional challenges, and lack of access to domestic and international project financing markets.

Therefore, this paper has provided a critical assessment of the deficiencies in the current Ghanaian RE market and recommend alternative structures to offset the key constraints that hinder sectoral growth. The paper suggests the following strategies:

- Bundling scheme for renewable energy with conventional energy sources under current PPAs. Viability Gap Funding to bridge equity financing gaps with auctioned government grants.

- Tax-equity structures such as partnership flip to incentivize institutional project equity participation.

- Development of financially-engineered tools such as securitization of microfinance loans to lower risk and cost of capital for off-grid renewable systems.

- Adoption of Priority-sector lending framework to mandate institutional lending advances towards the RE sector.

In conclusion, Ghana must pursue appropriate and actionable strategies in order to achieve its SDG 7 targets. It must be noted that no amount of financial and regulatory innovation can deter risks involved with an uncommitted government. Therefore, it is of utmost importance that regulatory commitment goes hand-in-hand with private RE sector advancements to expedite the acceleration of renewable energy development in the country.

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