GreenStreet Africa Development Company

LAB INSTRUMENT ANALYSIS

September 2020

DESCRIPTION & GOAL —

A new approach using public-private partnerships (PPPs) to provide predevelopment, project preparation, and financing arrangement for aggregated portfolios of shovel-ready clean energy projects for public facilities. Portfolios would be tendered to reliable developers to be built and operated under an energy-as-a-service (EaaS) model and financed through local capital markets. Targets rapid deployment at healthcare and education facilities to provide energy access for critical public services.

SECTOR —

Sustainable energy access

FINANCE TARGETS —

Local institutional investors; impact investors

GEOGRAPHY —

For pilot phase: Nigeria
In the future: Sub-Saharan Africa

The Lab identifies, develops, and launches sustainable finance instruments with the potential to drive massive investment in a low-carbon economy. The 2020 Global Lab cycle targets four specific sectors across mitigation and adaptation: nature-based solutions; sustainable agriculture for smallholders in sub-Saharan Africa; sustainable energy access; and sustainable cities, as well as three regions: India, Brazil and Southern Africa.

AUTHORS AND ACKNOWLEDGEMENTS

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- The proponents: Clifford J. Aron, Ifechukwude Uwajeh, Adanma Anizoba, and Alejandro Neira (GreenMax Capital Advisors), and Dr. Kabir Salihu (Nigeria REF).
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SUMMARY

GreenStreet Africa provides an innovative approach to finance and develop distributed solar energy installations for public facilities, such as healthcare clinics, hospitals, schools and other government buildings in Sub-Saharan Africa. Many of these facilities lack grid access due to technical or funding challenges, and even grid-connected facilities often rely on dirty, expensive, and inefficient diesel backup generation to supplement unreliable local grids.[1]

- Innovative: By bundling projects into portfolios, the idea addresses several barriers to deployment of solar distributed generation for public facilities, including regulatory challenges, high upfront development costs, difficulty in obtaining financing, and challenges maintaining systems after initial installation. When GreenStreet's public-sector partners tender out rights to build, own and operate the portfolio, the developer also gains access to local-currency debt financing to fund project construction. Both the debt financing and energy supply contracts are backed by third-party guarantees to further reduce risk to institutional investors.
- Financially Sustainable: GreenStreet will use grant funding for setup and development of an initial portfolio and will subsequently achieve long-term financial viability by charging development fees to the private service providers such as independent power producers (IPPs) and energy service companies (ESCOs) who acquire portfolio development rights and credit agreements.
- Catalytic: The pilot targets a 12:1 ratio of private capital mobilized to initial grant funding. GreenStreet will continue to increase this ratio in subsequent portfolios as the firm builds additional capacity to predevelop projects more efficiently and attracts co-investors.
- Actionable: GreenStreet offers a unique combination of GreenMax Capital Advisors' expertise in international clean energy project development and local government partners' detailed knowledge of local markets and regulatory structures. This partnership enables rapid identification, financing, and development of shovel-ready clean energy portfolios, fast-tracking large-scale deployment of clean energy projects to the public facilities most in need of high-quality energy access solutions.

The Lab Secretariat recommends endorsement of GreenStreet Africa as a potentially catalytic approach to public facility energy access finance in Sub-Saharan Africa.

The instrument is ready for pilot deployment, with potential to generate economic, environmental, and social returns amidst COVID-19, positioning it as a green recovery solution in a hard-hit region. GreenStreet is currently seeking grant funding of approximately $2 million to launch the pilot.

[1] 1 in 4 health facilities in Sub-Saharan Africa lacks any access to electricity and fewer than 3 in 10 hospitals have reliable electricity (USAID 2020).

TABLE OF CONTENTS

CONTEXT

To fill the vast energy access gap affecting public facilities in Sub-Saharan Africa, we need to unlock large-scale private finance for financially and operationally sustainable distributed generation projects in the region.

In 2018, 789 million people globally lacked access to electricity. Sub-Saharan Africa is particularly affected with the largest energy access deficit, as only 47% of the region's population have access to electricity. This is both a rural and urban problem. While the rural population makes up the majority of the deficit[2], urban electrification lags behind population growth, and Sub-Saharan Africa is home to 76% of the world's unelectrified urban population.[3] In addition, to supplement unreliable grid connections, millions of households and institutions purchase and operate fossil fuel-powered generators.[4]

While energy access is important for households and businesses, it is especially crucial for public facilities. In Sub-Saharan Africa, about 1.75 million public health centers and schools lack a reliable electricity supply. These facilities are key to improving health and education outcomes, and to enable populations to escape the cycle of poverty. According to the World Bank, electricity in schools enables educators to hold more and longer class sessions, driving increases in student enrollment. Electricity in health centers enables healthcare workers to increase the number of patients treated, the quality of care offered, and the number of procedures and services performed.[5] Moreover, in response to the COVID-19 pandemic, hospitals and health clinics are in even greater need of high-quality electricity access to perform lifesaving procedures and refrigerate key medicines and vaccines.

National governments, private investors, and other stakeholders are beginning to recognize the urgency and impact potential of this market segment, but current clean energy access approaches for public facilities have proven inadequate. Despite the growing numbers of solar energy systems being installed in health and education facilities in low- and middle-income countries, many of these systems prematurely fail or underperform because they become inoperative after 3-5 years due to poor maintenance and lack of repair services. This leads to the perception that renewable technologies are too new and unreliable, restricting available finance for onsite distributed generation projects and reducing investor interest.[6] Innovative solutions that unlock financial flows and address operational gaps needed for reliable and clean electricity are crucial to expand energy access, especially in the healthcare and education sectors.

[2] 85% of people without access in sub-Saharan Africa are in rural areas. See footnote 2 for reference.
[3] IEA et al. 2020.
[4] IFC 2019.
[5] Elahi, Srinivasan, and Murakazhizha 2020.
[6] Porcaro, Severi, and McGregor 2019.

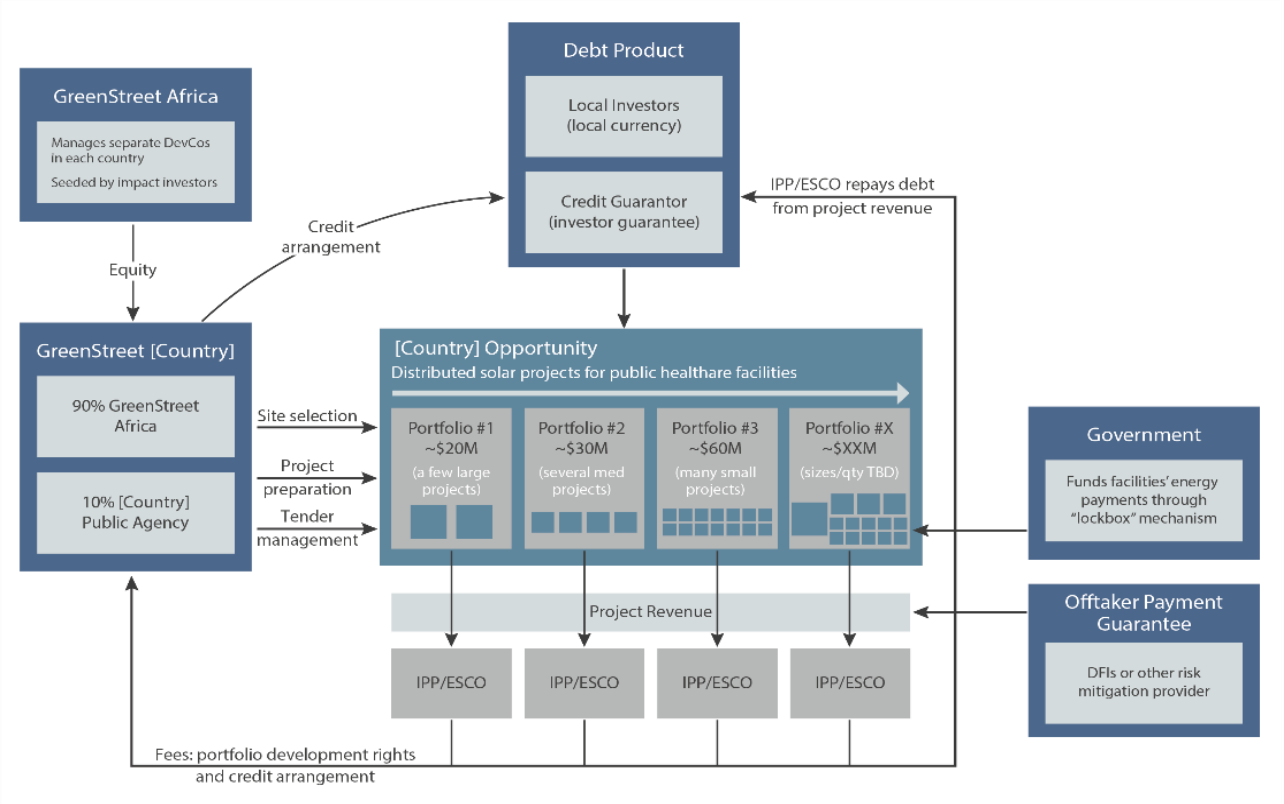
CONCEPT

1. INSTRUMENT MECHANICS

GreenStreet Africa will establish country-level development companies to rapidly aggregate, finance, and develop solar DG projects serving public facilities.

GreenStreet Africa is a parent entity that establishes public-private partnerships (PPP) with local public agencies, creating new country-level joint ventures in the form of GreenStreet "Country DevCos.," focused on expanding energy access for public facilities in each new target market. These PPPs will combine regulatory environment research and advocacy, site selection, project preparation and credit arrangement functions to set up bundled portfolios of shovel-ready projects. In particular, the public-private approach to developing an enabling environment for solar distributed generation (DG) development is a keystone of the GreenStreet approach. By creating portfolios large enough to appeal to institutional investors, this bundled model will drive the development of distributed generation (DG) projects that would otherwise struggle to access affordable funding. In the initial pilot, GreenStreet will partnering with the Nigeria Rural Electrification Fund (REF) to set up the GreenStreet Nigeria DevCo, which will develop the first portfolio.

Figure 1. Instrument mechanics



GreenStreet first works with a public-sector partner or group of partners to prepare the proper regulatory framework, develop each of the portfolio's project sites, and arrange debt financing for project construction. Next, GreenStreet manages the tendering process through which IPPs and/or ESCOs bid on the rights to install, own and operate a portfolio of projects. Once operational, the projects will provide energy services to the government facilities under prearranged power purchase agreements (PPAs) or energy services

agreements (ESAs) set up by GreenStreet. The government directly pays the IPP or ESCO that owns the portfolio, locking in high-quality clean energy service with a predictable, affordable monthly payment.

In return, GreenStreet will receive fees for the portfolio development and credit arrangement services provided. The fees received provide GreenStreet with working capital to develop additional, larger portfolios. In subsequent rounds, GreenStreet anticipates raising capital from impact investors to enable accelerated growth in the quantity and/or size of future portfolios.

The instrument is designed with several risk mitigation features. To mitigate off-taker payment risk borne by the portfolio owner/operator, there is a two-layer system:

- First, a "lockbox" mechanism obligates the government off-taker to fund energy payments in advance as protected budget line items.
- Second, an off-taker payment guarantee from a DFI or another risk mitigation provider backstops the government's lockbox commitment.

To mitigate repayment risk borne by bondholders, the debt product that GreenStreet sets up to finance portfolio development will be backed by a credit guarantor. In the Nigeria pilot, for example, GreenStreet is partnering with InfraCredit to issue a fully guaranteed local-currency bond.

This multilayered approach will allow GreenStreet to quickly develop and aggregate project portfolios, enabling rapid deployment of clean energy solutions and unlocking more favorable financing terms compared with an individual project development approach. The benefits of this approach are especially important to address the energy access needs of small, off-grid public health and education facilities in rural areas, which will be the focal point of future portfolios beyond the pilot.

2. INNOVATION

GreenStreet combines project preparation and aggregation, local-currency credit arrangement, and development rights tendering to create a unique energy access finance solution to be deployed in Sub-Saharan Africa.

2.1 BARRIERS ADDRESSED: OVERCOMING FINANCING, TIMING, AND MAINTENANCE CHALLENGES FOR ENERGY ACCESS PROJECTS

GreenStreet Africa is designed to accelerate the development of distributed solar installations sited at public facilities. Currently, several significant barriers hinder the development of these types of energy access projects, including:

- Lengthy project development cycles,
- Dependence on grant funding,
- Difficulty in financing small projects individually,
- Credit and repayment risks, and
- Challenges in ensuring the long-term viability of system operations and maintenance (O&M) arrangements.

Many of these barriers are endemic to or especially prevalent in public-sector energy access projects, and as a result existing off-grid solar developers tend to focus on more bankable projects for private customers.[7] Meanwhile, attempts to develop public facility energy access solutions using public funds have struggled to arrange for adequate long-term operations and maintenance, and have not successfully scaled to reach the tens of thousands of public buildings that need reliable, sustainable energy access.

GreenStreet addresses these barriers by combining predevelopment, aggregation, and tendering functions, assembling larger, high-quality project portfolios to avoid the higher costs and logistical difficulties associated with individually financing relatively small projects. Risks borne by the service provider are addressed by a structure combining a government payment lockbox and a third-party payment guarantee, while risks borne by bondholders are mitigated through a credit guarantee. To ensure each project is operated and maintained appropriately throughout its useful life, the private service provider owning and operating portfolio assets will integrate O&M assurances into each facility's energy services or power purchase contract, addressing the long-term operational sustainability challenge. Finally, the GreenMax Capital team's extensive experience in other markets, as well as the team's strong existing relationships with government and guarantee agency partners for the Nigeria pilot, is a major asset in navigating the regulatory hurdles associated with this type of instrument. Table 1 below provides further details on how GreenStreet's approach addresses each of these barriers.

Table 1. Barriers addressed

Barrier	Description	Strategy
Slow development process for DG serving public facilities	DG projects for public facilities are usually developed on a case-by-case basis, if at all. Project aggregation programs are usually financed through ODA (AID). When private developers are involved, they struggle to achieve scale given the scarcity of donor funding available.	The GreenStreet DevCo PPP selects sites and pre-develops aggregated, high-quality project portfolios.
Ticket sizes too small to attract cheap institutional financing	Debt investors and vehicles usually seek larger deals as transaction costs for financial intermediaries make smaller deals not attractive	Aggregating projects into portfolios drives larger deals relevant for local institutional investors.
Issuer's repayment risk	Investors will find an instrument offered by a new issuer risky. However, the fact that the underlying asset is a set of projects and are thus "diversified" unlocks credit enhancement tools.	The debt product repayment guarantee mitigates risk borne by creditors.
Off-taker's ability to pay	Gov. budget constraints, changing governments personal and policies.	Government partners' involvement and lockbox funding mechanism diminish this risk, with the DFI payment guarantee as an additional backstop.
Long-term viability (sustainability)	In the past, DG has been financed through grants mainly to install assets. Lack of proper consideration for long-term O&M has caused a high percentage of projects to fail.	The GreenStreet DevCo PPP effectively sells on the projects to a ESCO that operates and maintains the assets under an all-inclusive energy services model.

[7] Differ Group 2019.

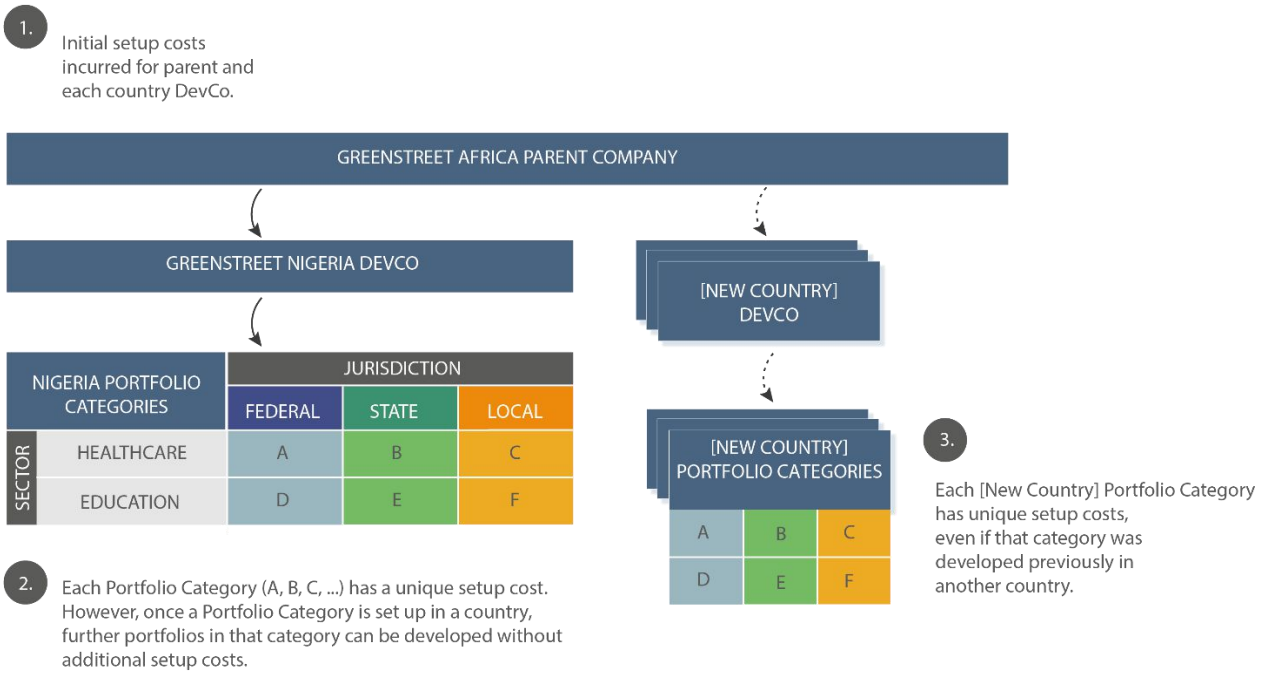
2.2 CORE INNOVATION: A PPP TO IDENTIFY, DEVELOP, AGGREGATE, AND ARRANGE LOCAL FINANCING FOR PROJECTS

By aggregating projects into portfolios and amortizing one-time setup costs across multiple future portfolios in the same market segment, GreenStreet will leverage economies of scale to enable rapid project development. The GreenStreet model is uniquely positioned to expand energy access for public facilities in Sub-Saharan Africa by combining this aggregation approach with three additional innovative features:

- Local-currency financing solutions
- Guarantee mechanisms to address creditworthiness of African public institutions
- Adaptation of the energy-as-a-service model for African markets

As seen in Figure 2 below, developing projects usually entails incurring setup sunk costs both at entity level and at project category level. Further portfolios that are developed under a category for which these sunk costs have already been incurred will benefit from these savings and improve the financial profile of the underlying projects. This makes the GreenStreet model more efficient over time, allowing subsequent portfolios to be developed with less time and money.

Figure 2. Setup costs and economies of scale



GreenStreet would be the first Africa-specific approach focused on rapidly scaling solar DG for public healthcare and educational applications through the combination of private local-currency financing and rapid development of aggregated project portfolios, and therefore offers a unique value proposition in the African energy access space. Especially important to the innovative nature of the instrument is the degree to which it involves private entities in the development, construction, operation, and financing of project portfolios. In Annex I, the Lab has adapted a visualization developed by SEforALL to illustrate the greater role of private enterprise in GreenStreet, as compared with several other energy access programs.

2.3 CHALLENGES TO INSTRUMENT SUCCESS: INVESTOR INTEREST, PROFITABILITY, AND RISK MITIGATION

To reach its catalytic potential, GreenStreet Africa faces four main challenges. This section summarizes these four challenges, as well as GreenStreet's approach to address each challenge in the Nigeria pilot. As the instrument continues to progress, it will be critical to develop a comprehensive launch strategy for each new country-level DevCo to assess and mitigate each of these challenges to the extent that they arise.

Local entity appetite to participate: GreenStreet's ability to attract local government partners in each target market is a key feature of the idea that will significantly reduce go-to-market regulatory and legal barriers, provide a steady pipeline of high-quality project sites for development, assist in obtaining buy-in from high-level policymakers, and act as a signaling device to attract investors interested in the stable returns associated with a government-backed investment product. The Nigeria pilot will serve as a proof of concept, establishing a track record of successful portfolio development to obtain buy-in from potential public agency partners in other countries.

Cost-effectiveness of energy services: Each portfolio's success will rely on the profitability of the individual projects in the portfolio, which in turn depends on the price of energy services provided to the client public facilities. While government agency partners will help to build a solid project pipeline, this does not guarantee that potential projects identified will be economically viable while still charging a price for energy services that government is willing to pay. The Lab's financial model outputs, as discussed in Section 4 and further detailed in Annex V, show that a six-project portfolio containing one, two, or even three nonviable projects can still provide attractive returns without charging a higher electricity price to the client facilities.

Guarantee provider offerings: Without the risk mitigation features provided by guarantee providers, project debt arranged by GreenStreet for portfolio development is unlikely attract risk-averse institutional investors, and private IPPs and ESCOs will not accept government facility off-taker payment risks. To ensure that the pilot portfolio can obtain these guarantees, GreenStreet has already engaged in advanced discussions with InfraCredit, a Nigeria-based credit guarantee agency, and is currently exploring potential partnerships with DFIs for the payment guarantee.

Regulatory challenges: GreenStreet will confront unique regulatory challenges in each new market it enters. Overcoming these challenges will require extensive research and legal support in order to adapt GreenStreet's portfolio development approach to local laws and policies. In Nigeria specifically, GreenStreet has already conducted much of the research required to launch of the pilot project, and expects to sign a memorandum of understanding with the Rural Electrification Fund in the next few months that will enable further regulatory knowledge sharing.

3. IMPLEMENTATION PATHWAY AND REPLICATION

The pilot portfolio will focus on federally owned healthcare facilities in Nigeria, with potential to expand to additional countries, jurisdictional levels, and sectors over time.

GreenMax Capital Advisors (GreenMax), an international clean energy investment advisory and management consulting firm, leads the GreenStreet initiative. GreenMax has been working closely with the private, public and NGO sectors to plan and launch sustainable energy finance initiatives in the clean energy space for more than 25 years. In particular, GreenMax has helped design and implement EaaS aggregation energy efficiency programs in New York State and Eastern Europe.

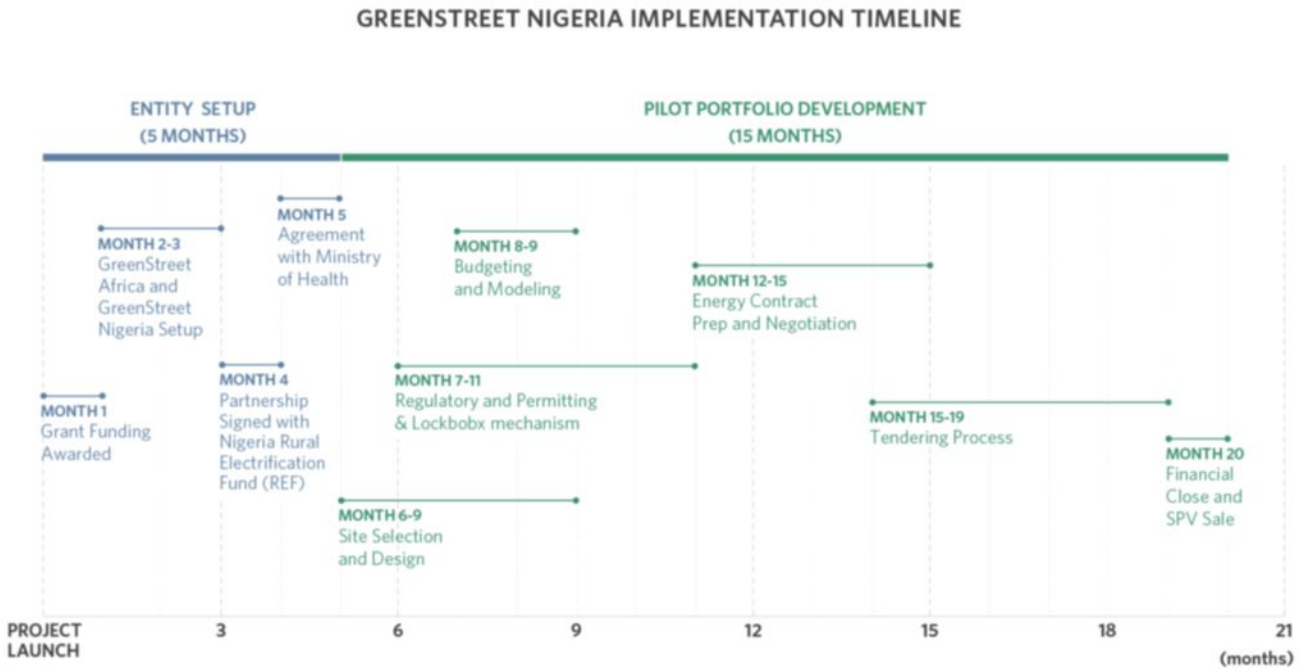
GreenMax's goal is for the GreenStreet instrument to ultimately be used to aggregate portfolios of distributed generation projects for public facilities throughout Sub-Saharan Africa. Nigeria was selected for the pilot portfolio, as the country has made a major commitment to implementing off-grid energy solutions, and GreenMax has a local team that has built strong collaborations with public and private stakeholders.

For the Nigeria pilot, GreenStreet will partner with the Nigerian government's Rural Electrification Fund (REF) to form the country-level PPP, the GreenStreet Nigeria DevCo. The venture will focus on developing an initial portfolio of five to ten solar distributed energy projects sited at healthcare facilities. GreenStreet will also organize the public tender to select a private IPP/ESCO to build own and operate the new generation plants. Financing will be provided by a local private placement bond issue guaranteed by InfraCredit. The pilot will serve as a proof of concept to test the instrument with larger, grid-connected, federally owned facilities, while subsequent portfolios will serve smaller state and local government facilities, some of which may lack grid connections altogether. Annex II shows the pilot portfolio instrument mechanics in greater detail.

The proponents envision receiving grant funding in the range of $2 million to support setup of the PPP entity and preparation of the pilot portfolio, which is envisioned to have a total value of between $20-30 million. GreenStreet will recoup development costs through fees received from the winning IPP/ESCO bidders in the tendering process. GreenStreet would then recycle most of these earnings into developing the next portfolio to be tendered. Annex VI contains a breakdown of GreenStreet's anticipated grant funding needs, as well as a broad summary of its overall investment requirements.

Figure 3 below provides key project implementation milestones and timelines for the Nigeria pilot. A more detailed timeline of project tasks is presented in the Gantt chart in Annex III.

Figure 3. Pilot Implementation Timeline



COVID-19

The COVID-19 crisis has emphasized the importance of critical public health infrastructure and the recovery phase is providing an opportunity for governments to redirect efforts towards building greener, more resilient economies. Public healthcare and education facilities provide a unique opportunity to achieve these outcomes.

However, the reality on the ground is that the economic contractions arising from the crisis are placing further constraints on government budgets, especially in low- and lower-middle-income countries. At the same time, governments looking to stretch scarce resources due to COVID-induced budget shortfalls may become more amenable to novel partnership or blended finance models for social services, opening up opportunities to implement novel PPP approaches like GreenStreet. In this context, partnerships with local governments, non-governmental institutions and/or philanthropic organizations are critically important, especially in a pilot stage where impact and private investors may shy away from new ventures because of the current uncertainty.

Post-Pilot Portfolios

In Nigeria, healthcare facilities operate under three jurisdictional frameworks depending on whether they are owned and operated by federal, state, or local government entities. Depending on the specific potential project sites and facility types presented by REF, subsequent portfolios could target any of these three jurisdictional levels. More specific planning and evaluation of future projects and portfolios will be undertaken at the appropriate time once the pilot is completed.

In addition to flexibility in targeting health facilities at different jurisdictional levels, subsequent portfolios could also target clean energy access for public education facilities, which are also grouped in the federal, state and local level. However, individual

project size is expected to remain below 5 MW irrespective of jurisdiction or facility function, and for portfolios of rural healthcare or education facilities the sizes will go down as low as only a few kW.

Expansion to other Target Countries

The proponents envision that after executing multiple successful portfolio development and tendering processes in Nigeria, GreenStreet will be ready to expand to other countries, adapting its business model and approach to building government partnerships according to the specific target market context. GreenStreet's key criteria to consider for expansion to new markets include:

(1) Adequate public facility project investment needs,
(2) Local capital market sophistication and/or local banking sector liquidity[8], and
(3) Willingness of the relevant public institutions to participate in such a venture.

The third criterion in particular will be assessed based on the interest level of the relevant local authority or authorities at the time of project scoping.

The Lab conducted preliminary market research on countries in Sub-Saharan Africa, identifying three potential countries into which GreenStreet could expand after successful implementation in Nigeria. Table 2 below lists these countries' total numbers of primary public healthcare facilities and total value of banking sector deposits.

Table 2. GreenStreet pilot market and potential expansion markets

Country*	Total public primary care health facilities[9]	Banking sector deposits (million USD)[10]
Nigeria	30,098	103,786
Kenya	4,556	25,488
Uganda	2,696	5,084
Ghana	1,150	10,137

*All members of the Africa Stock Exchange Association (ASEA)

[8] The proponents recognize that there are few deep local bond markets in the SSA region outside of Nigeria, Kenya and Ghana, especially for non-sovereign issues, and thus can adapt financing to a bank syndication financing model.
[9] Nigeria: Federal Ministry of Health 2019; Kenya and Ghana: PharmAccess Foundation 2016; Uganda: Ministry of Health 2014.
[10] African Development Bank Group 2020.

4. FINANCIAL IMPACT AND SUSTAINABILITY

4.1 QUANTITATIVE MODELING

The Lab secretariat prepared illustrative modeling[11] of the GreenStreet Nigeria pilot portfolio to explore four key questions:

(1) Can the idea develop a portfolio that will generate a sufficient return to attract IPP/ESCO bidders?
(2) Can the idea deliver energy services at a cost that is attractive to public facility owners and managers?
(3) Can the portfolio support a local-currency debt issuance with terms that are attractive to institutional investors?
(4) Can the economics of the portfolio provide sufficient fee income for Guarantors, Credit Arrangers, and GreenStreet?

4.1.1 PORTFOLIO/SPV RESULTS

To address these questions, the Lab took a two-step approach to financial modeling, first creating a project-level model template and then aggregating multiple hypothetical projects into a portfolio-level model. Using the base case inputs outlined in Annex IV, the Lab team modeled a sample portfolio of six healthcare facilities, each with peak electricity demand of 2 megawatts. This portfolio would be developed by GreenStreet and credit arrangement for a Naira-denominated bond to fund project costs would be executed by InfraCredit. The portfolio, placed under a single SPV, would be tendered out to an IPP/ESCO which in turn will contribute equity amounting to 30% of the total portfolio value in order to access the financing.

Highlights of the model outputs for this portfolio are shown in Figure 4 below, in both US dollars and Nigerian naira.

Figure 4. Model output highlights for sample portfolio[12]

Portfolio Overview: SPV (USD)

Model Output Highlights		
Number of projects		**6**
Portfolio IRR		**22.9%**
Portfolio NPV	**$**	**7,298,869**
Energy Price, $/kWh	**$**	**0.175**
Total solar capacity installed (MW)		27.6
Annual revenue	$	11,717,197
Annual net income*	$	5,306,025
Loan amount	$	17,944,702
Debt-equity split		70/30
Debt service coverage ratio		1.67

Portfolio Overview: SPV (NGN)

Model Output Highlights		
Number of projects		**6**
Portfolio IRR		**22.9%**
Portfolio NPV	**₦**	**2,810,064,638**
Energy Price, NGN/kWh	**₦**	**67.38**
Total solar capacity installed (MW)		27.6
Annual revenue	₦	4,511,121,019
Annual net income*	₦	2,042,819,557
Loan amount	₦	6,908,710,201
Debt-equity split		70/30
Debt service coverage ratio		1.67

It is important to note that InfraCredit's involvement in the structuring process and subsequent backing would be expected to result in a strong rating for the Naira-denominated bond, allowing local institutional investors to invest in the issue. The

[11] Inputs and assumptions for the GreenStreet Africa financial model were obtained from a variety of sources, including academic literature, expert interviews, desktop research, and the proponents' and Lab team members' own expertise. Annex IV summarizes the general assumptions being used to develop the preliminary model.
[12] Annex V contains additional discussion of financial model outputs and sensitivity tables

aggregated project cash flows have been modelled to include both a local-currency guarantee and fees for an off-taker payment guarantee.

4.1.2 GREENSTREET RESULTS

GreenStreet envisions that its fee will be constituted of three components, listed below:

- Total development cost incurred in setting up and tendering the portfolio
- A development fee, calculated as a percentage of development cost
- A portfolio value fee, calculated as a percentage of portfolio net present value

In the Nigerian pilot, considering all funding needs will be raised through grants for proof of concept, Greenstreet plans to charge a fee to cover all expenses (i.e. all grant funding provided) and provide a modest net income. However, GreenStreet and the Lab were also interested in modeling how the pilot would perform on a commercial basis, which GreenStreet will deploy for future portfolios and which is key to the venture's long-term financial sustainability. Key model results for both the pilot and commercial cases appear in Figure 5 below.

Figure 5. GreenStreet model outcomes

GreenStreet Overview (USD) - Pilot Case

Initial investment details		
Total investment need	**$**	**2,339,533**
Grant funding need	**$**	**2,089,533**
Sunk Costs	**$**	**740,259**
Entity set-up costs (parent + local)	$	300,000
Portfolio development	$	190,259
GreenStreet in-kind contributions to date	$	250,000
Portfolio-specific costs	**$**	**1,599,274**
Portfolio development	$	1,248,287
Travel and other related to portfolio dev.	$	184,320
Admin expenses (20 months)	$	166,667

Returns		
Months to financial close		20
Portfolio fee	$	1,866,778
Portfolio cost	$	(1,789,533)
Portfolio net income	$	77,245
Annualized return on GreenStreet contribution		18.5%
Annualized return on total capital		2.0%

GreenStreet Overview (USD) - Commercial Case

Initial investment details		
Total investment need	**$**	**2,339,533**
Grant funding need	**$**	**490,259**
Sunk Costs	**$**	**740,259**
Entity set-up costs (parent + local)	$	300,000
Portfolio development	$	190,259
GreenStreet in-kind contributions to date	$	250,000
Portfolio-specific costs (commercial investment)	**$**	**1,599,274**
Portfolio development	$	1,248,287
Travel and other related to portfolio dev.	$	184,320
Admin expenses (20 months)	$	166,667

Returns		
Months to financial close		20
Portfolio fee	$	2,360,920
Portfolio cost	$	(1,789,533)
Portfolio net income	$	571,387
Annualized return on commercial equity		18.5%
Annualized return on total capital		14.7%

These results show that once GreenStreet proves out the concept with grant funding, there is a clear follow-on opportunity for impact investors to invest in GreenStreet and achieve favorable commercial returns.

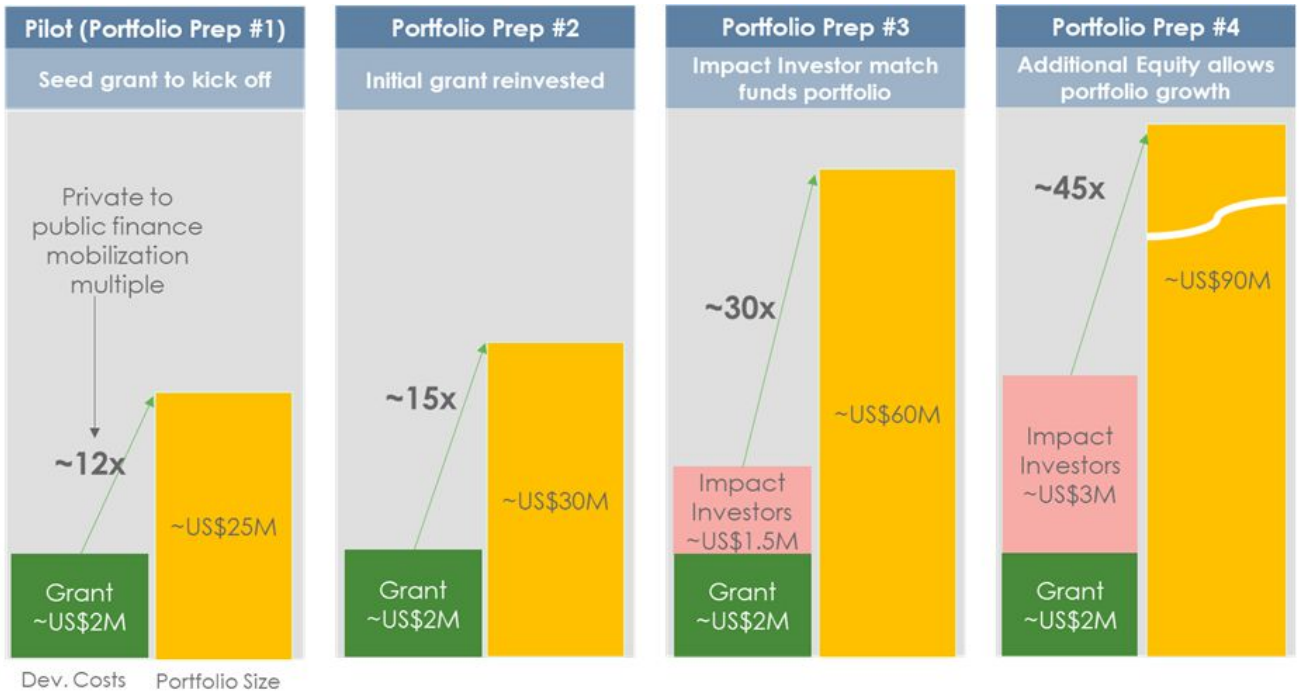
4.2 PRIVATE FINANCE MOBILIZATION AND REPLICATION POTENTIAL

From the beginning, the debt provided by the local institutional investors, and the equity provided by winning bidder, are obtained from private sources. In addition, GreenStreet's pilot is anticipated to recover all development costs initially funded through grants,

meaning that this grant funding could be "rolled over" into the development of future commercial portfolios without the need for additional fundraising.

A grant injection of USD 2 million will enable development of a pilot portfolio with an estimated value of USD 25 million. Beginning with the third portfolio, GreenStreet's development funds will be capitalized with increasing quantities of equity from impact investors, enabling the size of portfolios developed to grow over time as grant funding represents a decreasing share of overall capital required to set up and tender the portfolio to private service providers. This growth will enable the private-to-public mobilization multiple to increase in each subsequent portfolio, as seen in Figure 6 below.[13]

Figure 6. Indicative private finance mobilization over time



5. ENVIRONMENTAL AND SOCIO-ECONOMIC IMPACT

*GreenStreet's Nigeria pilot is expected to **deploy 28 megawatts of distributed solar capacity, reducing CO2 emissions from client facilities by approximately 14,000 metric tons annually, the equivalent of eliminating the electricity emissions footprint of over 40,000 Nigerian households.***

5.1 ENVIRONMENTAL IMPACT

Our environmental impact modeling compares current emissions from the targeted facilities' electricity consumption to the future emissions profiles of the distributed generation systems to be developed by GreenStreet and constructed by the winning private service provider bidder(s). Table 3 below shows annual CO_2 emissions reductions

[13] These estimated multiples assume that by the third portfolio, GreenStreet would have established a track record allowing it to attract impact investment, enabling larger, higher-value portfolios.

for the pilot portfolio. Reductions are shown relative to three different emissions profile assumptions for the existing generation serving future project sites:

- "Diesel gen" assumes onsite diesel generation provides existing energy supply.
- "50-50 split" assumes that existing supply is an equal mix of onsite diesel generation and grid service.
- "Grid" assumes that grid service provides existing energy supply.

The 50-50 split can be taken as the baseline scenario, as the large federal healthcare facilities targeted for the pilot portfolio are generally served by a mix of energy generated from both onsite diesel gensets and from the grid. Under this baseline scenario, the Nigeria pilot portfolio would result in 14,000 metric tons of avoided CO_2 emissions annually, the equivalent of eliminating the electricity emissions footprint of over 40,000 Nigerian households. Table 3 below shows the full range of carbon reductions by emissions profile scenario.

Table 3. GreenStreet pilot impact metrics

Impact Metric	Nigeria Pilot Outcome
Facility peak demand served, MW	12
Installed solar capacity, MW	28
Annual CO_2 emissions reduction (vs. diesel gen)	24,000 metric tons
Annual CO_2 emissions reduction (vs. 50-50 split)	14,000 metric tons
Annual CO_2 emissions reduction (vs. grid)	5,000 metric tons

The Lab's long-term modeling indicates that within five years, GreenStreet has the potential to drive the development of 150 MW of distributed solar and eliminate 40,000 tons of CO2 emissions per year.

5.2 SOCIAL AND ECONOMIC IMPACT

Progress toward SDGs 7 (Affordable and Clean Energy) and 13 (Climate Action) positively impacts several other sustainable development goals as well. Energy access is particularly essential in driving progress across SDG 3 (Good Health and Well-Being) and SDG 4 (Quality Education). Electricity access enhances access to quality essential health care services while making health systems more resilient.[14] Moreover, in response to the COVID-19 pandemic, hospitals and health clinics have even greater need of high-quality electricity access to perform lifesaving procedures and refrigerate key medicines and vaccines. For SDG 4, access to electricity in the education sphere enables lighting for extended study hours, implementation of information and communications technologies (ICT), and enhanced staff retention and teacher training capabilities, among other benefits.[15]

Finally, GreenStreet contributes to SDG 5, Gender Equality. By improving healthcare outcomes in underserved areas and allowing schools to expand enrollment and provide a higher-quality learning experience, GreenStreet will empower women and girls to live healthier lives and pursue education opportunities.

[14] Elahi, Srinivasan, and Mukurazhizha 2020.
[15] Porcaro, Severi, and McGregor 2019.

5.3 SECTORAL IMPACT: ENERGY ACCESS

The Lab's energy access focus area, with support from The Rockefeller Foundation, aims to accelerate innovative financial instruments to address market barriers and support the scale-up of sustainable energy access for both residential and commercial applications. There is a key need to identify, develop, and scale financial solutions that enable private sector capital to flow into energy access investments, including solutions like off-grid distributed generation, mini-grids, and last-mile grid connections, thereby creating viable markets for energy generation and delivery in emerging economies. These sustainable finance vehicles must offer attractive returns for investors while reducing emissions, providing local employment opportunities, enhancing access to education and social services, and reducing negative health impacts associated with carbon-intensive forms of energy production. In the context of these energy access goals, the Lab finds that GreenStreet Africa holds great potential to deliver attractive returns to all stakeholders, significantly reduce emissions from each of the facilities it targets, and directly improve quality of life for thousands of people by improving outcomes in both the healthcare and education sectors.

NEXT STEPS

GreenStreet has engaged in advanced discussions with REF and InfraCredit, explored potential partnerships with DFIs regarding guarantee products to backstop energy contract payments, and opened discussions with the Ministry of Health for the Nigeria pilot. In order to move forward into the pilot phase, GreenStreet is seeking grant funding to cover setup costs and enable development of the first portfolio in Nigeria. The GreenStreet team is currently pursuing grant funding opportunities oriented toward energy access, healthcare, and education, with a special emphasis on green recovery programs given the instrument's potential to address healthcare needs arising from the COVID-19 pandemic.

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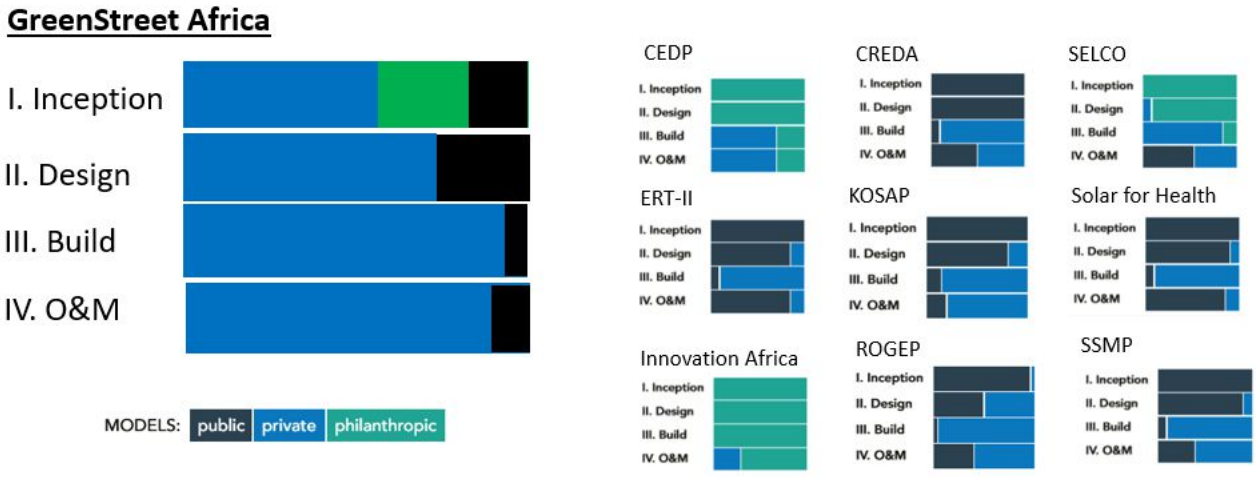
ANNEX I. ELECTRIFICATION PROJECT DELIVERY MODELS

SEforALL, in its report "Lasting Impact: Sustainable Off-Grid Solar Delivery Models to Power Health and Education[16]," briefly summarizes an electrification project's lifecycle as follows:

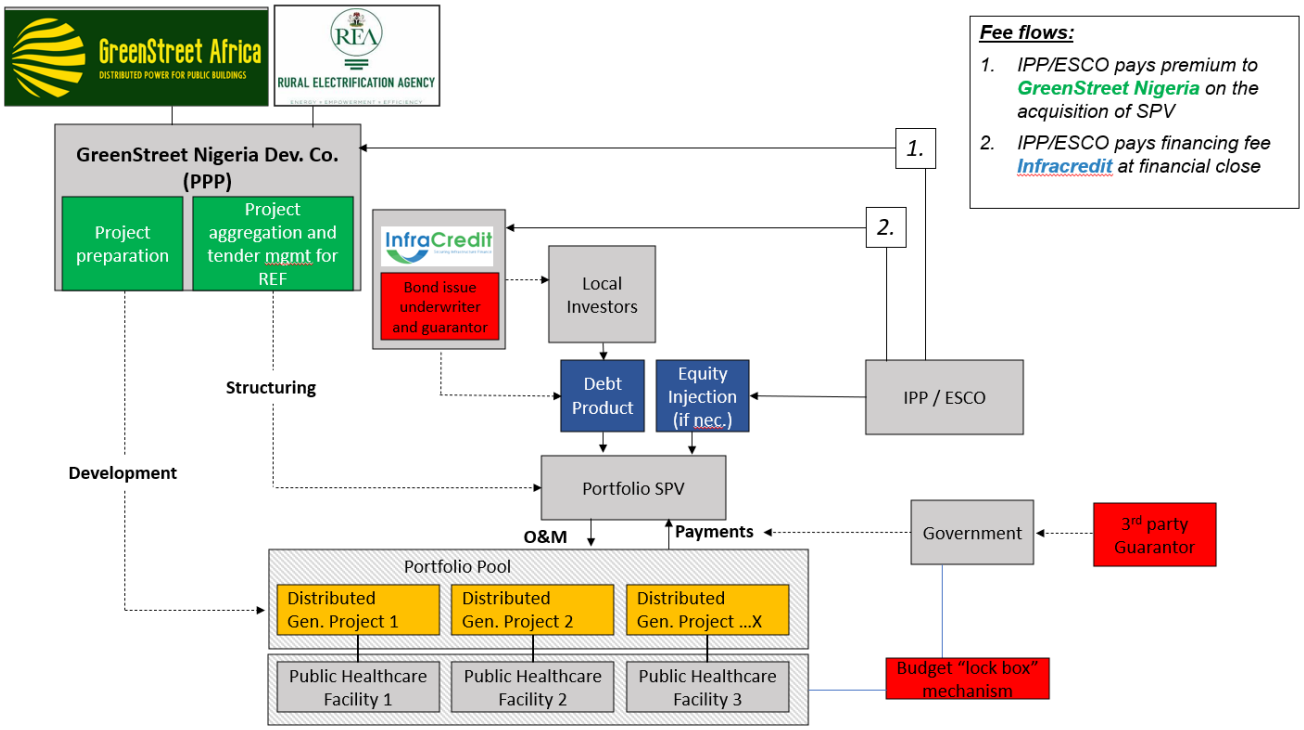
Project Lifecycle Phases	Description
I. Inception	Define project goals and approach, including target outcomes and expected mandates and responsibilities of implementation partners
II. Design	Select facilities and assess needs, including system sizing. Draft procurement documents and other project development materials for contract bidding.
III. Build	Procure hardware, execute installation contracts, deploy PV assets.
IV. O&M	Conduct or contract out routine and ad hoc maintenance. Replace components, including batteries, as necessary. Continue until asset has completed 10- to 15-year lifetime. At this point, assets are either considered obsolete, and would either be extensively refurbished or replaced entirely (more typical). This would then signal the return to the lifecycle inception phase.

SEforALL explains that the approach and delivery of electrification projects at public facilities fall under a full spectrum ranging from pure public sector model to pure private sector models. In the report, case studies were conducted on nine distinct delivery models and were summarized them with an illustration that tried to capture the how each model was supported with public, private and philanthropic efforst throughout each of the project lifecycle phases. Below we have created a visualization for GreenStreet Africa and compared them to those present in the report.



[16] The report was a collaboration of the United Nations Foundation (UN Foundation) and Sustainable Energy for All (SEforALL) and produced with external contributions from Catalyst Off-Grid Advisors with funding from UKAID. See full citation in References section.

ANNEX II. NIGERIA PILOT: INSTRUMENT MECHANICS



ANNEX III. NIGERIA PILOT: GANTT CHART

		Month																						
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
	Entity Set-ups																								
	GreenStreet Africa set-up	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	GreenStreet Nigeria set-up	1	1	1	1	1																			
	Portfolio Development																								
	Planning																								
Task 1	Work Plan Preparation and Kick-off Meeting	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Technical Assessment																								
Task 2	Selection of Sites					0	1	0																	
Task 3	Demand Studies						1	1	0	0	0	0													
Task 4	Conceptual Design							1	1		0	0	0	0											
Task 5	CAPEX and OPEX Budgets								1		0		0	0											
Task 6	Detailed Financial Model and LCOE								1	1	0				0	0									
	Interim Report										1					0	0								
	Land Use, Regulatory, Environmental and PPA																								
Task 7	Final Regulatory and Permitting Roadmap							1	1	1	1														
Task 8	Develop and Execute Lockbox/Budget Commitment Mechanisms	0	0	0	0	0	0	0	0	0	1	1													
Task 9	Establish Project SPV					0	0	0	0	0	0	1													
Task 10	Legal Support for Land Use Arrangement and Form of Land Commitment											1	0	0	0	0	0								
Task 11	Environmental Studies and Permitting						0	1	1	1	1	1	1												
Task 12	Regulatory Review of PPA/Revenue Issues, Procurement Laws & Securitization									0	1	1	1												
Task 13	Prepare Standard PPA/EaaS Contract & other Agreements												1	1	0	0									
Task 14	Negotiate Tarrifs and PPA									0	0	0		1	1										
Task 15	Generation Licencing Process													1	1	1	1	1	1						
	Interim Report														1	0	0	0							
	P&I Tender																								
Task 16	Project Management Unit (PMU) Setup										1	1				0	0	0	0	0	0				
Task 17	P&I and O&M contracts													1	1	0	0	0	0	0	0				
Task 18	Manage Tendering Process														0	1	1	1	1	1		0			
	Interim Report																				1	0			
	Financial Development																								
Task 19	Arrange Credit Enhancement															1	1	1					0		
Task 20	Lenders Financial Model															1	1	1					0		
Task 21	Project Information Memo for Bond Issue														1	1	1	1	1				0		
	interim report																				1		0	0	0

ANNEX IV. FINANCIAL MODEL: GENERAL ASSUMPTIONS

Project Level

Item	Comments
Technical specifications	The Lab modeled project technical specifications based on a technical assessment obtained from Odyssey, a technical advisory platform retained by the proponent. This technical assessment provided the ratios for facility average demand, solar kW, backup generator kW, battery inverter kVA, and battery kWh required, all relative to facility peak demand, for projects supplying either 50% or 70% of facility energy demand from solar generation. Therefore, the only user-determined technical input required to model a project is the facility's peak demand. The full financial model, which is available on request, contains a detailed technical assumptions matrix in the Inputs tab.
Supply contract	GreenStreet is still exploring whether a power purchase agreement (PPA) or an energy services agreement (ESA) will be more appropriate in the Nigerian context. The contract will be structured in accordance to the legal scoping results and enabling environment. Projects in the financial model were treated as being subject to a PPA priced per kilowatt-hour of consumption. The use of an ESA would shift the project to an energy services model and provide predictable payments to the public facility off-takers, While the application of an energy services model could introduce more variability in IPP/ESCO operating costs due to varying quantities of diesel fuel needed to meet electricity demand above what is provided by the onsite solar capacity, these differences would be expected to be relatively minor over time, such that we considered the distinction between PPA and ES models to be negligible to the portfolio's risk-return profile.
Pricing ($/kW)	According to the IFC[1] the cost of electricity in western Africa is ~$0.13/kWh for retail service from the utility grid and ~$0.28/kWh for onsite diesel generation. We therefore used an intermediate price of $0.17/kWh as the default for the base case model. This cost figure represents a slight premium over the grid rates, but would provide a significant improvement in service given the unreliable nature of the Nigerian grid.
O&M	Estimates of backup generator fuel and O&M costs were obtained from Odyssey, a technical advisory platform retained by the proponent. O&M costs for solar and battery storage were obtained from US NREL. To reflect lower labor costs in Nigeria than in the United States, the lower end of NREL's estimated cost range was used.
Procurement and Installation (P&I)	Estimates of per-unit P&I costs for the solar, battery storage, and diesel backup components of each project were obtained from Odyssey, a technical advisory platform retained by the proponent. While in reality these numbers may vary across project sites, the baseline figures used in the model provide a useful estimate of the capital and labor costs involved in the construction of distributed solar projects sited at public facilities. The full financial model, which is available on request, contains these cost assumptions in the Inputs tab.
Generation quantity and variability	To calculate each project's returns, it was assumed that projects serve a facility with constant annual demand and constant monthly energy payments throughout the 20-year project lifespan. In reality, electricity demanded will vary and is not constant. In addition, solar panel performance degrades over time such that as the project ages, a slightly lower proportion of total generation would be provided by project's

	solar arrays, with diesel backup generation filling the gap. For the sake of simplicity, this is addressed in the model by slightly overbuilding solar capacity for projects, such that after 20 years of efficiency loss, each project's solar panels are still capable of serving the assumed percentage of annual facility electricity demand. Specifically, the solar capacity modeled for each project results in an effective solar capacity factor of 14%, which stays constant over time. This conservative approach provides a lower-bound estimate for solar output from the facility, accounting for potential reductions in generation due to maintenance, weather, and efficiency degradation over time.
Administrative Expense	We assume that all admin costs are expensed at the SPV/Portfolio level, therefore the individual project cashflow do not take into account these expenses.

SPV/Portfolio Level

Figure IV-1 below provides the technical characteristics and project-level IRR for sample projects included as the default configuration in the pilot model. The pilot portfolio contains six identical projects with these characteristics. The project-level IRR in this chart assumes 100% equity financing, and is therefore lower than the aggregated IRR of a portfolio using debt financing to cover a portion of upfront costs.

Figure IV-1. Sample project characteristics

Facility peak demand (kW)	Solar generation share, %	Backup capacity type	Solar gen. capacity installed, kW	Storage capacity installed, kWh	P&I costs	Assumed energy price ($/kWh)	Project pre-fee IRR
2,000	50%	Diesel	4,600	2,752	$ 3,930,794	$ 0.18	20.5%

Item	Comments
Portfolio/SPV composition	The sample project characteristic shown in table IV-1 above are illustrative as site selection has not taken place. These characteristics are based on a generic federally owned health facility in Nigeria, which is the facility type targeted for the first GreenStreet portfolio. Once sites are selected, more detailed modeling can be undertaken, as the quantity and size of the projects to be included in the pilot portfolio can be used as inputs, replacing the generic assumption of multiple identical project sites.
Guaranteed local-currency debt issue	Based on information obtained from InfraCredit, GreenStreet's credit arrangement partner in the proposed Nigerian Pilot, the bond issue for the pilot was modeled with a duration of 20 years, an interest rate of 15% (nominal), and a credit arrangement fee of 2.26% of the principal paid to InfraCredit. This fee does not include the local currency guarantee fee to be supplied by InfraCredit, which was estimated at 1% of outstanding debt balance, paid by the SPV on an annual basis.
Portfolio value	The portfolio value is the sum of the P&I costs (including capex and installation labor), development costs, and associated fees.
Guarantee assumptions	While the GreenStreet team is working directly with Nigeria-based guarantee agency InfraCredit to structure the initial Naira-denominated bond issue for the pilot portfolio, the exact terms of the guarantee have not yet been determined. As mentioned

	above, the preliminary cost assumption for the credit guarantee is an annual payment of 1% of outstanding debt. Similarly, GreenStreet is still seeking a DFI partner to provide the payment guarantee backstopping public facilities' energy services payments to the eventual portfolio owner-operators. The model uses a preliminary estimate of 1% of SPV gross revenue to calculate the annual payment guarantee cost.
Administrative Expense	We have assumed the winning service provider will need to allocate additional resources to what they otherwise have already contracted to manage admin for the projects in the SPV/portfolio. The default 100k assumption assumes an accountant, office clerk and maintenance executive.

GreenStreet Level

Item	Comments
Grant funding	The model assumes GreenStreet is successful securing grant funding to cover 100% of initial development costs for the pilot portfolio. An inability to secure this funding will prevent GreenStreet from developing the portfolio.
Development timeframe	The model assumes that GreenStreet can comply with the proposed timeframe for development of the portfolio detailed in the model's Gantt chart tab. Modifications to this timeframe would require creation of an updated model to reflect detailed financial impacts of such a change.
IPP/ESCO interest	The model assumes that the predeveloped portfolio will result in a successful sale of the portfolio development rights through the tender process. There are variables that may affect this that are not considered in the model. If the portfolio is not sold the venture will lose the total amount invested in development. Therefore, the result of development of the portfolio in terms of a successful sale is binary and the model assumes that it is successful.

ANNEX V. FINANCIAL MODEL: FURTHER DISCUSSION

Relevant to the discussion of instrument risks in Section 2.3, the model enables projects to be deleted from the sample portfolio, simulating the effect of a due diligence process that finds one or more of the proposed individual projects to be economically infeasible. Encouragingly, the modeled portfolio showed an equity IRR of over 20% even when total projects in the portfolio decreased from six to four with development costs remaining constant.[17] On the other hand, the Lab also found that the total loan amount in this case would decrease to under US$15M (dollar equivalent), under Infracredit's minimum transaction size requirement.

The Lab's modeling process also identified three key considerations GreenStreet must take into account as the idea continues to advance through the final steps of instrument design:

- The GreenStreet fee structure: The NPV component of GreenStreet's fee structure could present unintended consequences due to misaligned incentives. Specifically, it would effectively reward GreenStreet with a higher fee when a higher tariff price is offered by an IPP/ESCO in the tender. Alternative options to consider could be basing a portion of GreenStreet's fee on the energy or cost savings achieved by the portfolio facilities, as these metrics would align incentives in the tendering process such that lower-cost bids from IPP/ESCOs would benefit both GreenStreet and the government off-taker.

- Inclusion of backup generation component in the service model: Common sense and prudent operating practice dictate that the IPP/ESCO, as owner/operator of the new generation systems should directly procure fuel for the back-up generators. However, entrenched interests may make this difficult, as facility managers might oppose project development if the GreenStreet model were to remove their responsibility for fuel procurement. The Therefore, the GreenStreet team acknowledges that some flexibility in the system business model may be required.

- Clarity and comprehensiveness of contracts: A clear contractual relationship must be established between GreenStreet as the developer and the selected private service provider as the owner/operator in order to prevent any legal issues that might arise from problems during construction or operation of the projects within a portfolio. For example, the tender agreement must explicitly address issues of liability if problems arise during the construction process preventing the service provider from fulfilling its obligations to the off-taker facilities.

The sensitivity tables below show the impact of "price v. cost" and "term v. interest rate" on the overall IRR of the portfolio SPV. The bolded IRR value in each table represents the base case IRR. The tables show that SPV equity IRR is at least 17.5%, even in the most conservative model cases.

[17] Annex V contains an additional sensitivity table showing the effects of removing up to three projects of the planned six from the project portfolio, preserving total development cost but removing procurement and installation costs for these canceled projects.

Figure V-1. Energy price and capital cost impact on portfolio SPV returns

			Solar installed cost / kW		
	Portfolio IRR		High	Base	Low
	22.9%		$ 385	$ 350	$ 315
Energy price received, $/kWh	$	0.184	**27.5%**	**29.8%**	**32.2%**
	$	0.175	**20.7%**	**22.9%**	**25.2%**
	$	0.166	**13.6%**	**15.7%**	**18.0%**

Figure V-2. Debt terms impact on portfolio SPV returns

	Portfolio IRR	Bond interest rate		
	22.9%	14%	16%	18%
Term, years	20	**26.7%**	**22.9%**	**19.0%**
	18	**26.0%**	**22.3%**	**18.4%**
	16	**25.0%**	**21.4%**	**17.5%**

Figure V-3. Gearing ratio and bond yield impact on portfolio SPV returns

	Portfolio IRR	Bond interest rate		
	22.9%	14%	16%	18%
% of portfolio financed with debt	80%	**30.8%**	**25.1%**	**19.0%**
	70%	**26.7%**	**22.9%**	**19.0%**
	60%	**24.3%**	**21.7%**	**18.9%**

ANNEX VI. GREENSTREET GRANT AND INVESTMENT NEEDS

Figure VI-1. GreenStreet grant funding needs

Expense	Amount (USD)
One-time costs	$ 490,259
Entity set-up costs (parent + local)	$ 300,000
Portfolio development	$ 190,259
Portfolio-specific costs	$ 1,599,274
Portfolio development	$ 1,248,287
Travel and other related to portfolio dev.	$ 184,320
Admin expenses (20 months)	$ 166,667
Total grant funding need	$ 2,089,533

Figure VI-2. GreenStreet investment needs

Type	Role of Capital	Amount (USD)
GRANT FUNDING Philanthropies, donors	Pilot launch in Nigeria	$2m
NIGERIAN INSTITUTIONAL INVESTORS	Purchase local-currency bond issuance, funding IPP/ESCO portfolio development	~$5m per investor; ~$20m total
IMPACT INVESTORS Funds, foundations, HNIs	Purchase equity stake in GreenStreet for subsequent portfolios	TBD, depending on portfolio scale
PAYMENT GUARANTOR(S) DFIs	De-risk IPP/ESCO portfolio investment by providing off-taker payment guarantee	TBD; up to ~$11m/year in payment obligations to be covered