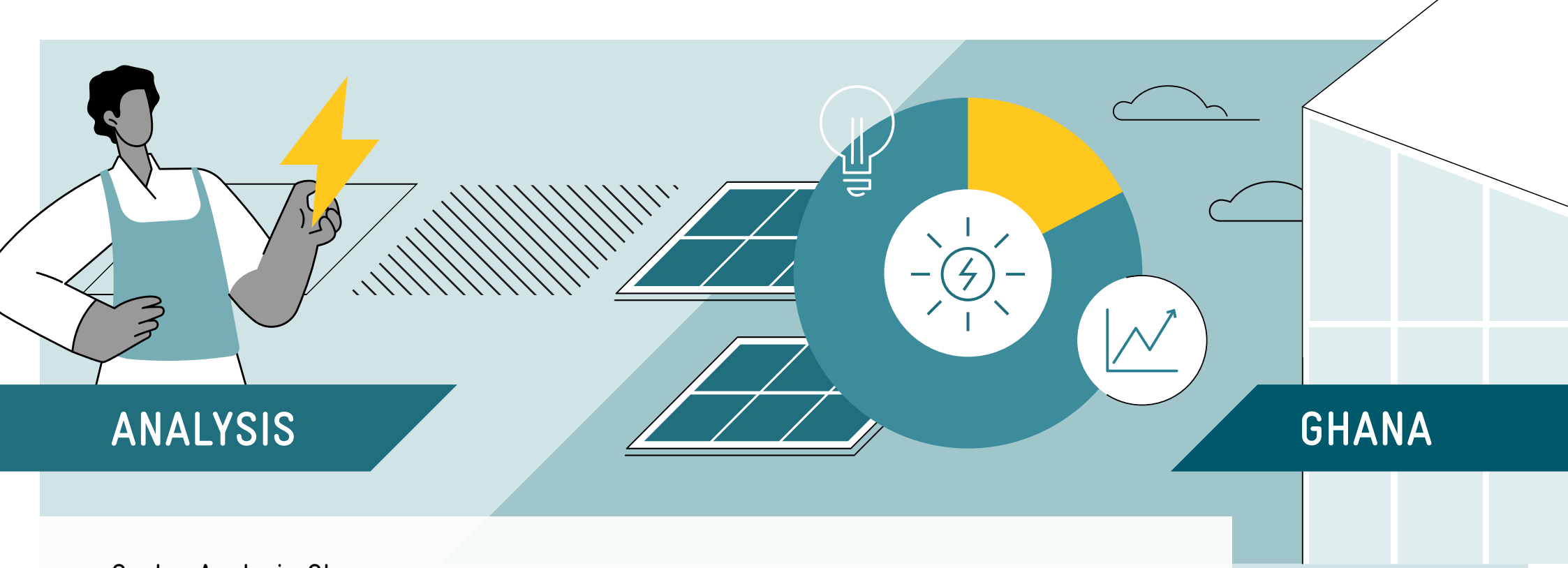

ANALYSIS

GHANA

Sector Analysis Ghana

Market Potential for Sustainable Energy Solutions in the Commercial Building Sector

giz Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH

This publication was commissioned by the German Energy Solutions Initiative of the German Federal Ministry for Economic Affairs and Energy (BMWE)

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Currency units

GHS	Ghanaian cedi
EUR	Euro
USD	United States dollar

Conversion rate as of 26.09.2025
EUR 1 = GHS 14.5073
USD 1 = GHS 12.4062

Source: Bank of Ghana, https://www.bog.gov.gh/treasury-and-the-markets/historical-interbank-fx-rates/

Technical units

GWh	Gigawatt hour (unit of energy)
kWh	Kilowatt hour (unit of energy)
kWp	Kilowatt peak (solar system size)
MVA	Megavolt-ampere (unit of apparent power)
MW	Megawatt (unit of power)
MWp	Megawatt peak (solar system size)
m²	Square metre (unit of area)

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Abbreviations/acronyms

CAPEX	Capital expenditure
ECG	Electricity Company of Ghana
EDGE	Excellence in Design for Greater Efficiencies
EPC	Engineering, procurement and construction
ESG	Environmental, social and governance
FiT	Feed-in tariff
GIPC	Ghana Investment Promotion Centre
GRIDCo	Ghana Grid Company Limited
HV	High voltage
IRR	Internal rate of return
LCOE	Levelised cost of electricity
LV	Low voltage
MV	Medium voltage
NEDCo	Northern Electricity Distribution Company
NPV	Net present value
PPA	Power purchase agreement
PURC	Public Utilities Regulatory Commission
PV	Photovoltaic
REF	Renewable Energy Fund
SLT	Special load tariff
WACC	Weighted average cost of capital

ENERGY SOLUTIONS – MADE IN GERMANY

The German Energy Solutions Initiative

The German Energy Solutions Initiative of the German Federal Ministry for Economic Affairs and Energy (BMWE) aims to globalise German technologies and expertise in climate-friendly energy solutions.

Years of promoting smart and sustainable energy solutions in Germany have led to a thriving industry known for world-class technologies. Thousands of specialised small and medium-sized enterprises (SMEs) focus on developing renewable energy systems, energy efficiency solutions, smart grids, and storage technologies. Cutting-edge energy solutions are also built on emerging technologies such as power-to-gas, fuel cells, and green hydrogen. The initiative's strategy is shaped around ongoing collaboration with the German business community.

The initiative creates benefits for Germany and the partner countries by:

- boosting global interest in sustainable energy solutions
- encouraging the use of renewables, energy efficiency technologies, smart grids, and storage technologies, while facilitating knowledge exchange and capacity building
- enhancing economic, technical and business cooperation between Germany and partner countries

THE PROJECT DEVELOPMENT PROGRAMME (PDP)

PDP is a key pillar of the German Energy Solutions Initiative and is implemented by the Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH. It connects development cooperation with private-sector engagement and supports climate-friendly energy solutions in selected developing and emerging countries, enabling local businesses to adopt solutions in energy efficiency, electricity and heat supply, and hydrogen, while facilitating market access for German solution providers.

Developing and emerging economies offer promising business potential for climate-friendly energy solutions but also pose challenges for international business partners. The PDP team works closely with local industries to develop financially viable projects by providing technical expertise, financial guidance, and networking opportunities.

It identifies project leads, collects and analyses energy consumption data, and assesses projects from both a technical and economic perspective. This includes outlining the business case, calculating payback periods, and evaluating profitability. Companies can then choose to finance projects using their own funds or explore leasing and other financing options. PDP provides cost-free advice to local companies and connects them with German solution providers for project implementation.

Additionally, by offering training, organising reference project visits, and publishing studies on the potential of climate-friendly solutions and on navigating regulatory frameworks, the programme supports market development and fosters private-sector cooperation.

Executive summary

Ghana's commercial building sector is entering a period of transformation. High electricity tariffs, daytime energy demand in offices, malls and hotels and a growing focus on green real estate are creating strong conditions for solar photovoltaic (PV) adoption. Yet, despite this potential, adoption remains low, leaving much of the market untapped.

This study was carried out to quantify that potential, clarify the regulatory environment and identify practical pathways for scaling up solar PV in commercial buildings.

Our assessment of 179 commercial properties shows more than 57 MWp on-site and 85 MWp off-site technically feasible solar PV capacity, with the largest opportunities in malls, office buildings and hotels. Current adoption in these segments remains below 15%, which highlights both the scale of the opportunity and the need for targeted solutions.

Detailed pre-feasibility studies conducted for a medium-sized reference office, mall and hotel under current market conditions present strong business cases with internal rates of return (IRRs) ranging between 27% and 28% and payback periods of less than four years, covering 23% to 50% of overall electricity demand.

Zusammenfassung

Ghanas gewerblicher Immobiliensektor befindet sich im Wandel. Hohe Stromtarife, ein hoher Energiebedarf am Tag in Büros, Einkaufszentren und Hotels sowie eine stärker werdende Nachfrage nach „Green Real Estate" sind gute Voraussetzungen für den Einsatz von Photovoltaik (PV)-Lösungen zum Eigenverbrauch. Jedoch bleibt trotz des großen Potenzials dessen tatsächliche Nutzung gering und damit ein großer Teil des gesamten PV-Marktes unerschlossen.

Das PEP führte die vorliegende Sektoranalyse durch, um das PV-Potenzial im Sektor zu quantifizieren, den regulatorischen Rahmen zu analysieren und Wege für die Ausweitung der PV-Nutzung in gewerblich genutzten Gebäuden aufzuzeigen. Analysiert wurden insgesamt 179 Gewerbeimmobilien. Das Ergebnis zeigt ein technisch realisierbares PV-Potenzial von mehr als 57 MWp für On-Site-Anlagen und 85 MWp für Off-Site-Systeme, wobei die größten Möglichkeiten bei Einkaufszentren, Bürogebäuden und Hotels gesehen werden. Die Nutzungsraten von PV-Lösungen in diesen Segmenten liegen aktuell unter 15 Prozent, was sowohl das Ausmaß der Möglichkeiten als auch die Notwendigkeit angepasster Lösungen verdeutlicht.

In der Studie wurden detaillierte Vormachbarkeitsstudien anhand realer Marktbedingungen für einen mittelgroßen Bürokomplex, ein Einkaufszentrum und ein Hotel durchgeführt. Die Ergebnisse zeigen sehr robuste Business Cases mit einer internen Verzinsung (IRR) zwischen 27 Prozent und 28 Prozent sowie Amortisationszeiten von unter vier Jahren. Die PV-Systeme decken dabei zwischen 23 Prozent und 50 Prozent des gesamten Strombedarfs der Gebäude ab.

Sensitivity analyses also indicate that PV investments remain financially strong across different scenarios. Net metering helps offices and malls manage curtailed energy (although with rather small effects on IRR), while higher capital expenditure (CAPEX) reduces returns, although projects remain financially viable. Changes in the cost of debt have only minor effects on net present value (NPV), and project IRRs remain largely stable.

In contrast, higher electricity prices have the largest impact, boosting both IRRs and NPVs, confirming the robustness of the business case for PV adoption.

The findings are particularly relevant for companies offering integrated energy solutions. Success in Ghana requires more than engineering and procurement; it also depends on financing models, contract structures suited to multi-tenant buildings and business models that enable cost recovery without breaching electricity resale restrictions.

Firms with experience in leasing, energy performance contracting and storage integration will find a receptive market.

Sustainable growth in Ghana will hinge on partnerships that combine international expertise with local market knowledge. Solution providers must work with Ghanaian developers, banks and property managers to navigate licensing, cost recovery and bulk customer thresholds.

Zudem zeigen Sensitivitätsanalysen, dass PV-Investitionen auch in unterschiedlichen Szenarien finanziell attraktiv bleiben. Net-Metering hilft für Bürogebäude und Einkaufszentren überschüssige PV-Erzeugung zu managen (wenn auch mit eher geringen Effekten auf die IRR), während höhere Investitionskosten (CAPEX) die Renditen zwar reduzieren, die Projekte jedoch weiterhin wirtschaftlich tragfähig bleiben. Änderungen bei den Fremdkapitalkosten wirken sich kaum auf den Kapitalwert (NPV) aus, und die Projekt-IRRs bleiben weitgehend stabil.

Im Gegensatz dazu haben steigende Strompreise den größten Einfluss auf die Wirtschaftlichkeit des Projekts. Sie erhöhen sowohl IRRs als auch NPVs, was die Robustheit des Business Case für PV im Gewerbesektor bestätigt.

Die Ergebnisse der Studie sind besonders für solche Unternehmen relevant, die integrierte Energielösungen anbieten. Wer in Ghanas gewerblichen Immobilienmarkt erfolgreich sein will, braucht mehr als Engineering und Beschaffung; der Erfolg hängt auch von Finanzierungsangeboten, Vertragsstrukturen für Gebäude mit mehreren Mietparteien und Geschäftsmodellen ab, die eine Kostendeckung ermöglichen, ohne dass gegen Vorschriften zum Weiterverkauf von Strom verstoßen wird.

Unternehmen, die Leasing und andere Energiedienstleistungen sowie eine Integration von Speicherlösungen anbieten, treffen in Ghana auf einen aufnahmebereiten Markt.

Approaches that bundle technical solutions with financing, offer GHS-denominated options and build local capacity will align well with national priorities. With net metering expected by the end of 2025 and demand for green-certified buildings on the rise, those who establish early partnerships will be well positioned to capture the market's growth.

In short, Ghana's commercial building solar PV market is still at an early stage, but conditions for growth are favourable. High electricity costs, supportive policies and very low adoption create a window of opportunity. Solution providers that combine technical expertise with strong local partnerships can capture significant value while shaping one of West Africa's most promising clean energy markets.

Ein nachhaltiges Wachstum hängt in Ghana von Partnerschaften ab, die internationale Expertise mit lokalem Marktwissen verbinden. Lösungsanbieter müssen mit ghanaischen Entwicklern, Banken und Immobilienverwaltern zusammenarbeiten, um Fragen der Lizenzierung, der Kostendeckung und der Schwellenwerte für Bulk Customer umfassend zu klären.

Ansätze, die technische Lösungen und Finanzierung bündeln, Finanzierung in GHS anbieten und lokale Kapazitäten aufbauen, stimmen gut mit en nationalen politischen Prioritäten Ghanas überein. Mit der erwarteten Einführung von Net-Metering bis Ende 2025 und einer steigenden Nachfrage nach grün zertifizierten Gebäuden sind diejenigen Unternehmen, die frühzeitig Partnerschaften aufbauen, gut positioniert und können vom Marktwachstum profitieren.

Zusammengefasst: Der Einsatz von PV in gewerblich genutzten Gebäuden in Ghana steht erst am Anfang, aber die Voraussetzungen für ein nachhaltiges Wachstum sind gegeben. Hohe Elektrizitätskosten, ein förderlicher Rechtsrahmen und eine bisher sehr geringe Marktdurchdringung von PV-Lösungen eröffnen vielfältige Möglichkeiten. Auf Anbieter klimafreundlicher Energielösungen, die technische Expertise mit starken lokalen Partnerschaften verbinden, warten attraktive Geschäftsaussichten, wenn sie Westafrikas vielversprechendsten Markt für grüne Energie mitgestalten wollen.

1

Regulatory framework

This chapter reviews Ghana's regulatory framework for solar PV in commercial buildings. It sets out the key institutions, legislative acts and provisions that shape project development, business models and landlord–tenant arrangements, drawing on both legal texts and stakeholder perspectives.

1.1 Regulatory bodies

This section introduces the main agencies responsible for regulating, licensing and supporting solar PV in commercial buildings, outlining their mandates in policy, compliance, grid integration and investment facilitation.

1.2 Regulatory framework

The analysis is rooted in a review of several critical legislative texts that shape Ghana's commercial solar PV landscape.

FIGURE 1. Key regulatory and supporting agencies for commercial solar PV in Ghana

Policy & Planning

Ministry of Energy & Green Transition

- sets national energy policies
- coordinates renewable energy (RE) development strategies
- engages donors and investors in RE projects

Licensing & Compliance

Energy Commission (EC)

- issues licenses for RE projects and service providers
- develops technical guidelines and standards

Ghana Standards Authority (GSA)

- develops and enforces standards for RE equipment ensures quality assurance

Environmental Protection Agency (EPA)

- EPA issues environmental permits for projects exceeding 5 MW
- manages PV waste and recycling policies

Grid integration

Electricity Company of Ghana (ECG) / Northern Electricity Distribution Company (NEDCo) / Ghana Grid Company Ltd (GRIDCo)

- approve grid connections and interconnections for solar systems
- oversee net metering implementation
- ensure grid stability and compliance

Public Utilities Regulatory Commission (PURC)

- sets electricity tariffs and handles consumer complaints

Investment & Incentive

Ghana Investment Promotion Centre (GIPC)

- offers tax waivers for solar equipment imports
- fast-tracks business registration

Source: Authors' own compilation, Clement K. Quansah (2025)

TABLE 1. Key legislative acts and implications

Key acts	Relevant information	Implications
Renewable Energy Act, 2011 (Act 832)	• Mandates 10% renewable energy in national mix by 2030 • Establishes Renewable Energy Fund (REF) for project financing • Authorises feed-in tariffs (FiTs) for utility-scale projects	• REF grants can subsidise solar installations but currently not funded • FiTs irrelevant as outright sale and lease models dominate
Renewable Energy (Amendment) Act, 2020 (Act 1045)	• Introduces competitive bidding for utility-scale solar (≥30 MW) • Formalises net metering in law	• No direct impact on the commercial buildings space (too small for bidding) • Net metering is expected to be operational by end of 2025
Energy Commission Act, 1997 (Act 541)	• Wholesale electricity supply licence required to sell power to grid/bulk customers • Bulk customer defined as user with ≥3 MVA demand or 6 GWh/year	• Only large commercial buildings qualify as bulk customers
GIPC Act, 2013 (Act 865)	• Foreign investors must meet minimum capital requirements (USD 200,000 for joint venture or USD 500,000 wholly foreign) • Tax waivers for solar equipment imports	• Leverage tax waivers for project costs
Local Content Regulations, 2018 (LI 2354,)	• ≥15% local equity in projects • Priority given to Ghanaian labour/materials	• Foreign developers need local partners
Electricity Transmission Rules, 2008 (LI 1934)	• Permits power wheeling for renewable energy under bilateral contracts with case-by-case fees, subject to utility approval and regulatory compliance	• Opens off-site solar projects for large commercial buildings but requires navigation of non-standardised fees and utility approvals
Rent Act, 1963 (Act 220)	• Landlord consent required for rooftop modifications	• Tripartite agreements (landlord–tenant–developer) critical
Land Act, 2020 (Act 1036)	• Customary land leases require chief/stool approval • Foreigners cannot own land (max. 50–99-year leases)	• Land disputes may delay project development
Private/contract law	• Lease/service contracts must define liability, payment terms and termination clauses	

Source: Authors' own compilation, Clement K. Quansah (2025)

1.0.1 Power wheeling

Power wheeling for solar projects in commercial buildings is legally permitted in Ghana under the Renewable Energy Act, 2011 (Act 832) and its amendment, Act 1045 (2020). It allows solar power producers to transmit electricity through the national grid to off-site end users under bilateral arrangements, subject to regulatory approval.

To implement wheeling, developers and clients (depending on the business model) must obtain the relevant licences (wholesale electricity supply licence and bulk customer licence respectively) from the Energy Commission, negotiate wheeling agreements with GRIDCo or ECG, based on the network level, and comply with applicable grid codes and technical standards.

Although Ghana's legal and policy frameworks support power wheeling, there is no standardised policy document or fee structure, as charges are negotiated on a case-by-case basis.

1.0.2 Electricity resale

In Ghana, electricity resale is governed by Section 11 of the Energy Commission Act, 1997 (Act 541), which states that *'a person shall not, unless authorised to do so by a licence granted under this Act, engage in a business or a commercial activity for (a) the transmission, wholesale supply, distribution or sale of electricity or natural gas'*.

This provision requires that any individual or entity engaged in the commercial resale or distribution of electricity, such as reselling power to tenants, charging above ECG/NEDCo tariffs or distributing electricity beyond one's premises, must hold a valid licence from the Energy Commission which permits the billing of end users in kilowatt-hours (kWh) under regulated conditions.

The Commission interprets 'commercial activity' to include billing for electricity in a way that generates profit or exceeds regulated tariffs. However, integrating solar or backup generation within a facility for captive use and cost recovery (without exceeding ECG or NEDCo tariffs and without a profit motive) may not require a licence.

Landlords may recover electricity costs through cost-sharing models, such as flat monthly service fees, charges based on floor area, submetering data or embedded management fees, provided the charges remain within the utility tariff and are not based on kWh consumption. Additionally, third-party solar developers may install and operate solar or backup power systems for tenants under lease or service agreements, but if they intend to bill in kWh, they must obtain the appropriate licence from the Energy Commission. These rules are designed to protect consumers, ensure transparency and uphold the integrity of Ghana's regulated electricity market.

Practical example

A solution implemented by a solar developer for a network of fuel stations. In this arrangement, the solar developer installs a solar system and charges the fuel station owner a fixed monthly lease fee for the solution. The fuel station, in turn, uses submetering data to prorate total energy costs among multiple vendors operating within the station, not as a sale of electricity in kWh but as a means of cost allocation. The energy cost allocated to vendors is typically lower than the standard ECG tariff, creating savings without violating resale regulations. Since the developer does not bill vendors in kWh and the fuel station does not profit from reselling power, this setup aligns with regulatory requirements.

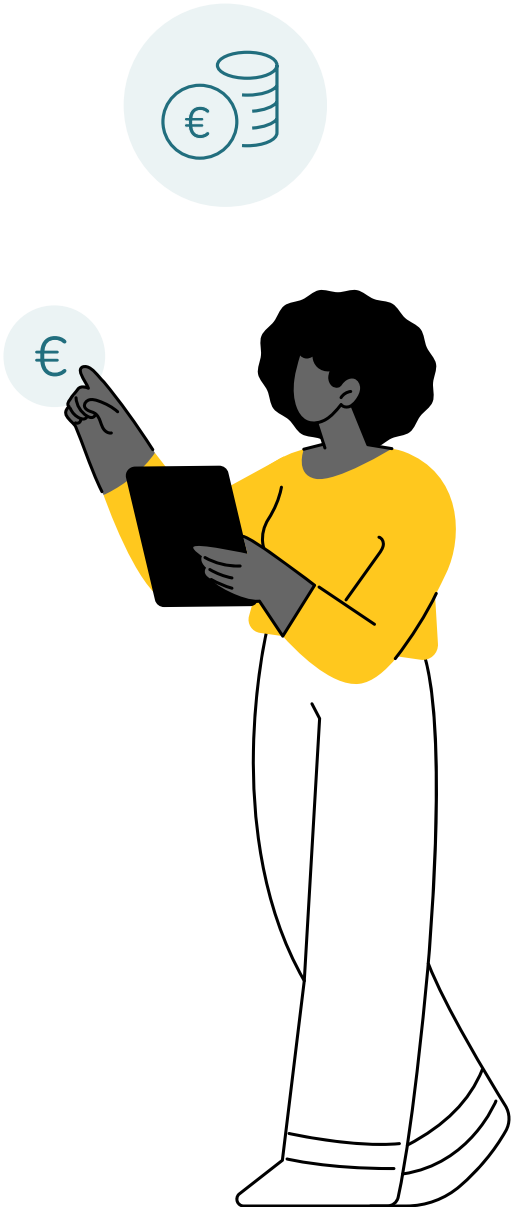
1.1 Permitted business models

The regulatory framework accommodates several business models to facilitate the adoption of solar PV systems in commercial buildings.

TABLE 2. Business models

Model	Key features	Licensing schedule	Licensing fee
Leasing	Third-party owns or maintains system; client pays fixed fee throughout lease term	Developer: • Installation and maintenance licence from Energy Commission • Procurement licence from Energy Commission • Environmental compliance Client: • No licence required	Installation and maintenance licence: ~EUR 400
Power purchase agreements (PPAs)	Developer sells power to bulk customers (≥3 MVA or 6 GWh/year)	Developer: • Installation and maintenance licence from Energy Commission • Procurement licence from Energy Commission • Environmental compliance Client: • Bulk customer permit	• Installation and maintenance licence: ~EUR 400 • Wholesale electricity supply licence: ~EUR 4,400
Outright sale	Client owns system; bank loans or REF grants fund upfront costs	Developer: • Installation and maintenance licence • Procurement licence • Environmental compliance Client: • No licence required	Installation and maintenance licence: ~EUR 400

Source: Authors' own compilation, Clement K. Quansah (2025)



1.1 Landlord–tenant analysis in commercial buildings

Landlord–tenant relationships strongly shape how solar PV systems are owned, financed and operated in commercial buildings. This section outlines key ownership scenarios, associated risks and practical mitigation strategies to support informed investment decisions.

1.0.3 Scenarios and implications

The framework differentiates among various landlord–tenant configurations that have a direct bearing on investment decisions and risk allocation.

TABLE 3. Scenarios, setup and implications

Key acts	Relevant information	Implications
Owner-owned, self-use	Property owner installs solar for their own consumption	• Simplest model as no tenant consent required • Full control over savings and system maintenance
Owner-owned, self-use and tenant use	Solar powers both owner-occupied and tenant spaces	• Requires submetering or pro rata billing clauses • Landlord must define savings split
Owner-owned, tenant only use	Landlord installs solar solely for tenant(s)	• Lease terms must specify if solar costs are factored into rent or billed separately
Tenant-owned	Tenant funds or owns rooftop solar	• Requires explicit landlord consent for modifications

Source: Authors' own compilation, Clement K. Quansah (2025)

1.0.4 Risk matrix and mitigation strategies

Ownership models for commercial PV systems introduce varying degrees of risk and complexity. Table 4 outlines these risks and propose targeted mitigation strategies to support informed deployment decisions.

TABLE 4. Risk matrix

Risk category	Owner-owned, self-use	Owner-owned, shared use	Owner-owned, tenant only use	Tenant-owned
Billing complexity	Simple; single internal user	Moderate; requires submeters or rent based on energy savings	High; must separately track and bill tenants for solar savings	High; tenants need to manage billing; may lack expertise/ resources to navigate billing, leading to inefficiencies or disputes
Maintenance and liability	Owner responsible; full control over quality and upkeep	Same as self-use, but shared impact may cause tenant disputes over downtime	Owner bears maintenance risk, but tenant benefits; potential misalignment	Tenant responsible; requires owner's permission to access and maintain system
Stakeholder coordination	None; single stakeholder	Moderate; clear communication and contracts needed with tenants	High; tenants benefit without ownership; requires strong terms to avoid disputes	Very high; tripartite agreement essential; risk of landlord disapproval or interference
Revenue/savings recovery	Direct savings for owner	Indirect; requires structured model to recover costs from tenants	Indirect; must factor solar cost into rent or charge separately	Tenant saves on energy but may face recovery issues if lease ends early
Contractual complexity	Low	Moderate; billing and maintenance terms must be included in leases	High; solar clauses must be included in rental agreements	Very high; requires long-term lease with transfer/exit provisions
Flexibility and exit risk	High flexibility for owner	Moderate; tenant turnover may disrupt shared-use agreements	High; if tenants leave, system underutilised	High; lease termination could cut short solar payback; risk of stranded asset

Source: Authors' own compilation, Clement K. Quansah (2025)

TABLE 5. Mitigation strategies

Risk category	Owner-owned, self-use	Owner-owned, shared use	Owner-owned, tenant only use	Tenant-owned
Billing complexity	No billing required; owner uses solar directly; no regulatory issues	Use flat service fees or space-based cost allocation Avoid kWh billing to comply with resale rules	Recover costs through rent premiums or fixed energy fees Use submeter data for reference only – not for billing in kWh	Self-use by single tenant; no billing required For shared use (multiple tenants), avoid resale by using fixed fees or cost sharing – not kWh billing Lease must define ownership, access and cost allocation clearly
Maintenance and liability	Sign operation and maintenance contract with performance guarantees Monitor system via digital dashboards	Allocate maintenance costs proportionally via service fees Include service level agreement clauses in lease	Use tripartite agreements with shared responsibilities clearly defined Offer remote monitoring to resolve issues quickly	Require tenant to purchase maintenance contract with certified provider Secure landlord's written access approval in lease
Stakeholder coordination	N/A	Use template memoranda of understanding and addenda to lease agreements Hold quarterly energy performance review meetings	Set clear expectations in lease Use digital dashboards for transparency	Formalise a tripartite agreement (landlord, tenant, installer) Engage landlord early during system design and approval
Revenue/savings recovery	Full internal savings Track return on investment through energy accounting and utility bill offsets	Recover costs through rent adjustments, flat service charges or cost sharing based on floor area or usage ratios – not kWh billing	Build solar costs into rent or fixed energy fees Reference ECG/NEDCo tariffs for parity, but avoid kWh-based billing unless licensed	Align lease duration with system payback Include asset buyout or transfer clauses and early termination penalties to protect investment
Contractual complexity	Use standard solar procurement or engineering, procurement and construction (EPC) contract templates; low complexity	Include solar terms in leases (cost-sharing method, no kWh billing, access rights); legal review needed to ensure resale compliance	Insert clear solar clauses into rental agreements Specify fixed energy fees or service charges – not usage-based billing	Use long-term lease with asset access, maintenance rights and early exit or transfer clauses Lease must reflect landlord's permission for installation and system upkeep
Flexibility and exit risk	Minimal risk; system fully controlled by owner; high flexibility	Use flexible, non-kWh-based tenant contributions Adjust service fees or rent based on occupancy changes	Include fallback clauses (e.g. new tenant absorbs solar cost or owner takes over usage) Avoid stranded systems	Protect tenant investment with lease-aligned payback, early exit penalties and asset transfer/buyout options Ensure clarity on landlord's approval

Source: Authors' own compilation, Clement K. Quansah (2025)

1.1 Sector-specific business models

The regulatory and business model frameworks must be adapted to reflect the realities of different commercial sectors. These models should consider energy usage patterns, landlord–tenant dynamics, regulatory compliance (especially resale restrictions) and return on investment. Table 6 shows sector-specific applications.

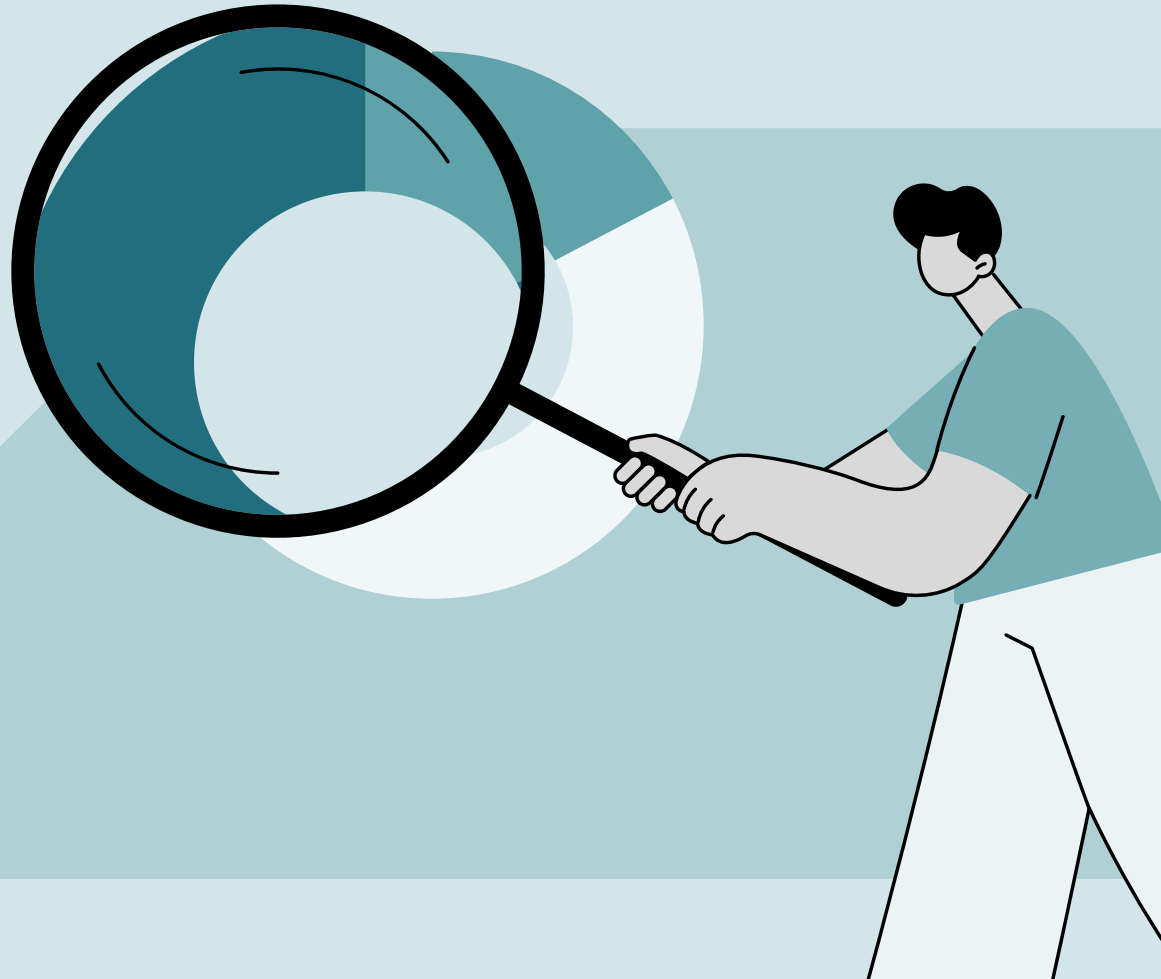
TABLE 6. Sector-specific business models

Sector	Applicable business models	Ideal landlord – tenant scenario	Rationale
Office Buildings	Lease	Owner-owned, shared use	• Daytime operations align with solar output; enables energy sharing and efficient cost recovery. • Owner can recoup investment via rent or service fees indexed to grid tariffs. • GHS-denominated contracts may include escalation clauses linked to ECG tariff changes or FX thresholds.
Shopping Malls/ Retail Buildings	Lease, PPA (if ≥3 MVA)	Owner-Owned, Tenant only use	• landlord's motivation to invest in solar may include marketing advantages, enhancing property value, and potentially realizing higher rents • Centralized system avoids tenant disputes over rooftop access. • Submetering or allocation by floor area enables compliant cost recovery. • Indexed contracts to USD/EUR/ grid tariff adjustments ensures Investor/ owner are protected from potential currency devaluation.
Hotels	Lease, PPA (if ≥3 MVA), Outright Sale	Owner-owned, self-use	• 24/7 operations with high energy demand support strong business cases. • Full ownership maximizes savings; leasing or PPAs provide capital flexibility. • Uptime needs align with structured performance-based agreements.
Condominiums	Lease	Owner-Owned, tenant-only used	• Condo rooftops are shared property, complicating unit-specific systems. • Best suited for a centralized owner-led model with usage-based cost allocation (non-kWh billing to avoid licensing). • Requires strong condo association governance and fair recovery mechanisms.
Laboratories	Outright Sale, Lease, PPA (if ≥3 MVA)	Owner-Owned, Self-Use	• Stable, high-load operations justify direct investment. • Lease or PPAs with performance guarantees provide flexibility while ensuring system reliability.
Data Centers	Outright Sale, Lease, PPA (if ≥3 MVA)	Owner-owned, self-use	• Mission-critical uptime needs demand full control or strong performance guarantees. • Long-term planning favors direct ownership, lease or PPAs with structured SLAs.
Cold Storage Facilities	Outright sale, Leasing, PPA (if ≥3 MVA)	Owner-owned, self-use	• Energy-intensive refrigeration justifies investment. • Solar offsets reduce long-term OPEX significantly. • Robust internal demand ensures rapid cost recovery

Source: Authors' own compilation, Clement K. Quansah (2025)

2

Market size and segments



This chapter presents the results of the market sizing study for commercial buildings in Ghana, highlighting the scale of on-site and off-site PV potential across key segments, such as offices, malls, hotels, condominiums, data centres, laboratories and cold storage facilities. The estimates illustrate both the technical potential and the extent to which demand patterns and regulatory provisions shape realisable capacity.

TABLE 7. Market sizing methodology

Step	Activity/focus	Tools/data	Outcome
Building identification	Identified operational commercial buildings (offices, malls, hotels, etc.) through public databases and media	Public databases, media, directories	Established building database
Area measurement	Measured available rooftop/ground space	Google Earth	Estimated installable PV area
Energy forecasting	Estimated energy demand by building type	EDGE App for green building design	Derived consumption profiles
Segmentation	Grouped buildings by type and size. Small buildings likely not meeting the minimum ticket size for international developers (usually >100 kWp) were excluded by defining a minimum internal floor space per category	Internal dataset	Enabled targeted analysis
Solar system sizing (key assumptions)	Applied standard ratios and operational factors	Derived assumptions	Defined consistent technical baselines for sizing PV system
Energy and space-based PV estimation	Calculated system size using both space-based and demand-based approaches	Analytical modelling	Determined feasible PV capacity per building type
Off-site eligibility	Evaluated buildings meeting bulk customer criteria (>6 GWh/year)	Energy estimates	Identified sites eligible for off-site or wheeled solar solutions
Market and adoption analysis	Compared dataset with existing installations	Public records, field observations	Assessed current adoption rates and market readiness

Source: Authors' own compilation, Clement K. Quansah (2025)

TABLE 8. Key operational and physical assumptions

Category	Working days (per week)	Hours of operation (per day)	Daytime demand ratio (%)	Holidays per year	Average occupancy rate (%)	Usable roof area (%)	Usable ground parking area (%)
Offices	5 days	10 hours	70%	15	N/A	70%	30%
Malls	7 days	10 hours	60%	0	N/A	90%	60%
Hotels	7 days	14 hours	65%	0	70%	70%	30%
Condominiums	7 days	16 hours	35%	0	70%	70%	30%
Data centres	7 days	24 hours	60%	0	N/A	70%	60%
Laboratories	6 days	10 hours	70%	0	70%	70%	60%
Cold storage facilities	7 days	24 hours	60%	0	N/A	90%	60%

Source: Authors' own compilation, Clement K. Quansah (2025)

1.1 Categorisation of commercial buildings and market sizes

To assess solar market potential across the commercial building sector, buildings were categorised by type and further broken down into relevant sub-categories based on gross internal area or usage. For each category, the number of buildings and potential capacity for on-site and off-site solar PV systems were estimated, with off-site systems checked for legal eligibility under bulk customer rules.

TABLE 9. Summary of market potential

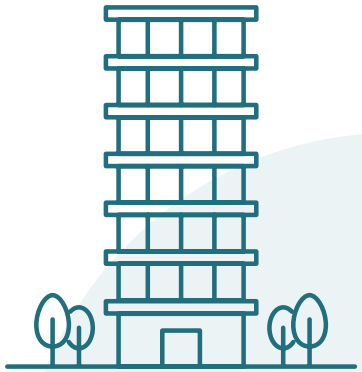
Category	Number of buildings	On-site system size (kWp)	Off-site system size (kWp)	Off-site system size (kWp) – legally permitted
Offices	59	11,632	32,027	3,670
Malls	32	22,669	22,918	0
Hotels	35	10,361	15,453	0
Condominiums	34	4,383	7,704	0
Data centres	8	4,288	5,315	0
Laboratories	2	1,020	1,157	0
Cold storage	9	2,416	2,416	0
Total	179	56,769	86,990	3,670

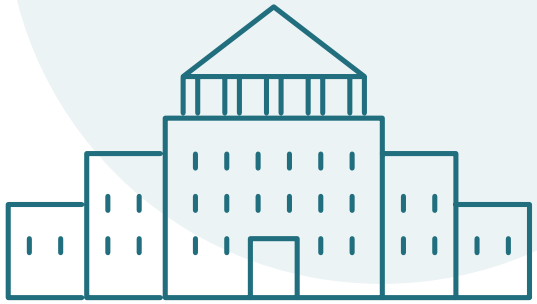
2.0.1 Office buildings

TABLE 10. Market potential for office buildings

Sub-category	Selection criteria (gross internal area, m²)	Number of buildings	On-site system size (kWp)	Off-site system size (kWp)	Off-site system size (kWp) – legally permitted
Small	(>1,500, <5,000 m²)	16	1,440	2,230	0
Medium	(>5,000, <15,000 m²)	32	7,067	17,240	0
Large	(>15,000 m²)	11	3,125	12,558	3,670
Total		59	11,632	32,027	3,670

Sources: Authors' own compilations, Clement K. Quansah (2025)

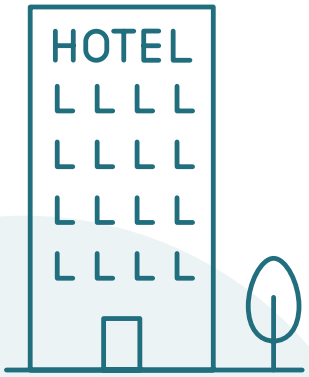




2.0.3 Malls

TABLE 11. Market potential for malls

Sub-category	Selection criteria (gross internal area, m²)	Number of buildings	On-site system size (kWp)	Off-site system size (kWp)	Off-site system size (kWp) – legally permitted
Small	(>1,800, <5,000 m²)	14	3,281	3,281	0
Medium	(>5,000, <10,000 m²)	7	3,493	3,493	0
Large	(>10,000 m²)	11	15,894	16,144	0
Total		32	22,669	22,918	0



2.0.2 Hotels

TABLE 12. Market potential for hotels

Sub-category	Selection criteria (no. of rooms)	Number of buildings	On-site system size (kWp)	Off-site system size (kWp)	Off-site system size (kWp) – legally permitted
Business hotel	>35 rooms	25	7,154	11,483	0
Resort	>35 rooms	10	3,207	3,969	0
Total		35	10,361	15,453	0

Sources: Authors' own compilations, Clement K. Quansah (2025)

2.0.5 Condominiums

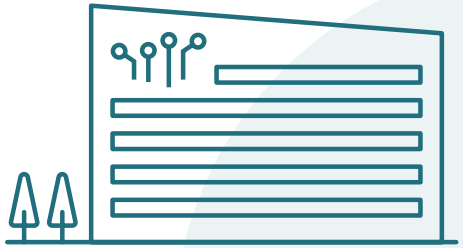
TABLE 13. Market potential for condominiums

Sub-category	Selection criteria (gross internal area, m²)	Number of buildings	On-site system size (kWp)	Off-site system size (kWp)	Off-site system size (kWp) – legally permitted
Small	(>2,500, <5,000 m²)	22	2,281	3,831	0
Medium	(>5,000, <10,000 m²)	8	983	2,256	0
Large	(>10,000 m²)	4	1,119	1,617	0
Total		**34**	**4,383**	**7,704**	**0**

2.0.4 Data centres

TABLE 14. Market potential for data centres

Sub-category	Selection criteria (gross internal area, m²)	Number of buildings	On-site system size (kWp)	Off-site system size (kWp)	Off-site system size (kWp) – legally permitted
Small	(>500, <1,000 m²)	2	265	399	0
Medium	(>1,000 m²)	6	4,024	4,916	0
Total		**8**	**4,288**	**5,315**	**0**

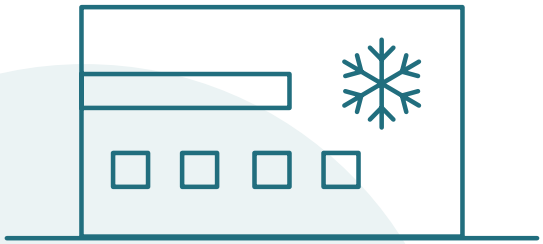


Sources: Authors' own compilations, Clement K. Quansah (2025)

2.0.7 Laboratories

TABLE 15. Market potential for laboratories

Sub-category	Selection criteria (gross internal area, m²)	Number of buildings	On-site system size (kWp)	Off-site system size (kWp)	Off-site system size (kWp) – legally permitted
Diagnostic/ medical lab	(>1,500 m²)	0	0	0	0
Research lab	(>1,500 m²)	2	1,020	1,157	0
Total		2	1,020	1,157	0



2.0.6 Cold storage facilities

TABLE 16. Market potential for cold storage facilities

Sub-category	Selection criteria (gross internal area, m²)	Number of buildings	On-site system size (kWp)	Off-site system size (kWp)	Off-site system size (kWp) – legally permitted
Medium	(>2500, <5,000 m²)	7	1,437	1,437	0
Large	(>5,000 m²)	2	979	979	0
Total		9	2,416	2,416	0

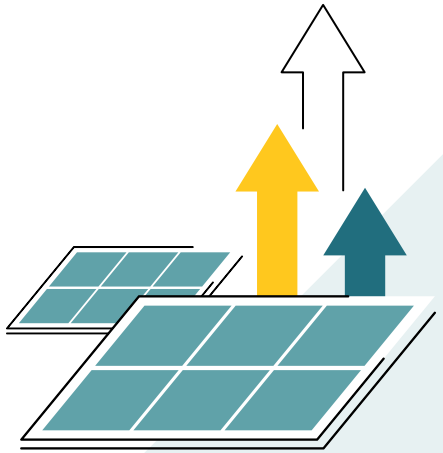
Sources: Authors' own compilations, Clement K. Quansah (2025)

1.1 Current PV adoption rates by commercial building category

This section presents the current level of solar PV adoption across the commercial building categories. The analysis compares the number of operational facilities with existing PV systems to the total number of buildings identified, providing insight into market penetration and highlighting segments with the greatest potential for further adoption.

TABLE 17. Current solar PV adoption rates

Category	Total buildings	Buildings with solar PV	Adoption rate
Offices	59	7	12%
Malls	32	3	9%
Hotels	35	3	9%
Condominiums	34	0	0%
Data centres	8	5	63%
Laboratories	2	1	50%
Cold storage	9	3	33%



1.2 Prioritisation matrix

The prioritisation matrix ranks commercial building types based on their potential for solar PV, using factors such as system size, adoption rates and location to show where the best opportunities exist.

TABLE 18. Prioritisation matrix for solar PV market engagement

Category	On-site system size (kWp)	Off-site system size (kWp)	Off-site system size (kWp) – legally permitted	Adoption rate	Alignment	Priority
Malls	22,669	22,918	0	9%	High (large rooftops, urban areas)	1
Offices	11,632	32,027	3,670	12%	High (concentrated in Accra)	2
Hotels	10,361	15,453	0	9%	Medium (scattered locations)	3
Condominiums	4,383	7,704	0	0%	Medium to low (small-scale rooftops)	4
Cold storage	2,416	2,416	0	33%	Low (smaller niche segment)	5
Data centres	4,288	5,315	0	63%	Low (high adoption already)	6
Laboratories	1,020	1,157	0	50%	Low (limited market size)	7

Sources: Authors' own compilations, Clement K. Quansah (2025)

PRIORITISATION CRITERIA

- Larger system size = greater market potential
- Lower adoption rate = more room for growth
- Alignment indicates strategic fit based on location, size and project scalability

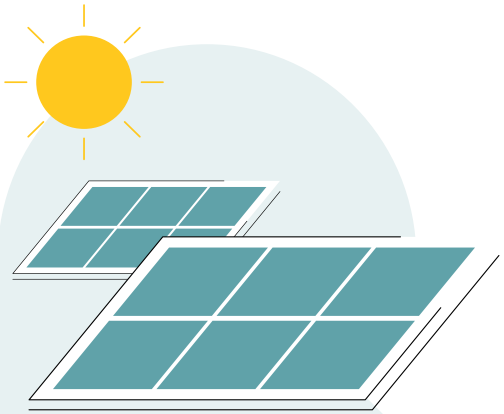
3

Analysis of business cases

With malls, office buildings and hotels identified as the most promising building categories, a reference building was selected from each category and a full pre-feasibility analysis, based on measured data, was prepared to assess and compare technical and financial viability for solar PV solutions in present market conditions.

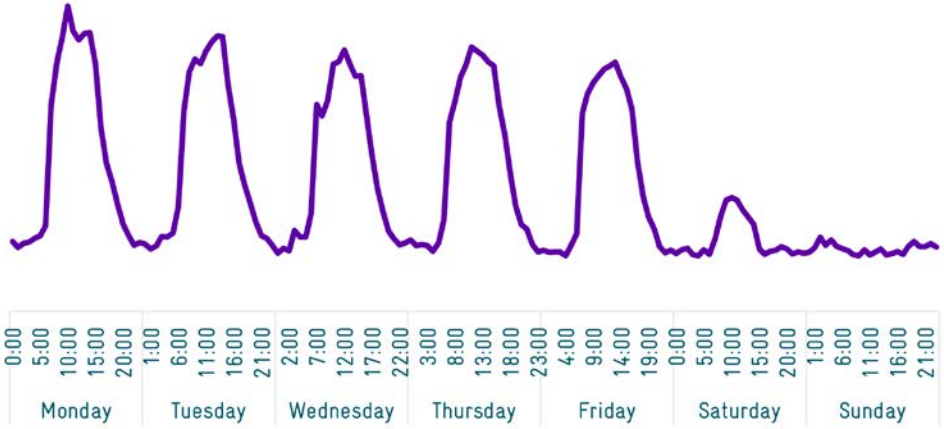
1.1 Operational patterns and suitability for solar PV systems

Differences in energy demand, operating hours and peak periods influence the economics and optimal size of embedded PV generation systems, as depicted in the load profiles.



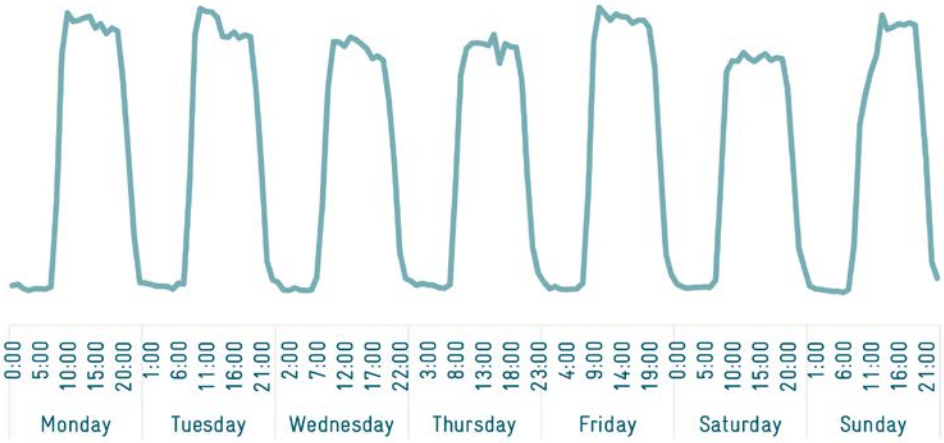
3.0.2 Office building

FIGURE 2. Load profile – office building



3.0.1 Shopping mall

FIGURE 3. Load profile – mall



Sources: Authors' own compilations, GIZ (2025)

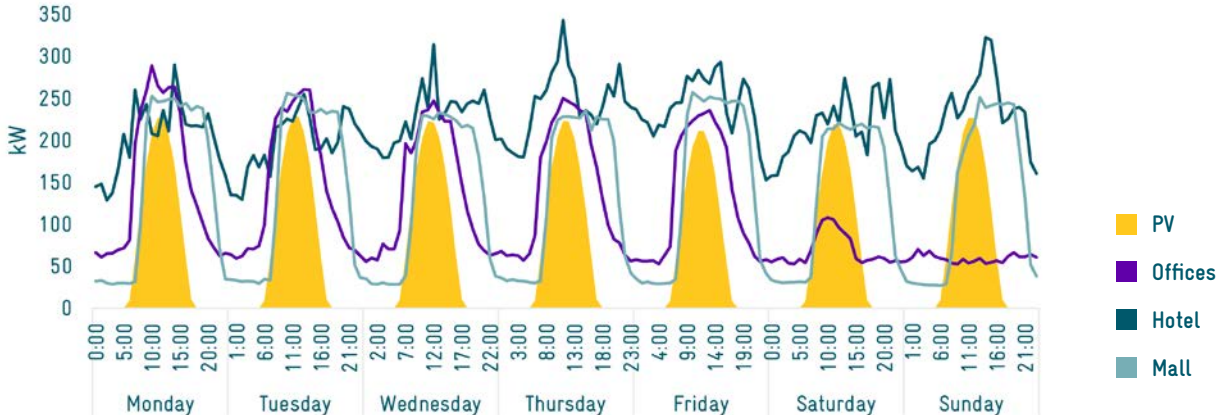
3.0.4 Hotel

FIGURE 4. Load profile – hotel

Source: Authors' own compilation, GIZ (2025)

3.0.3 Comparison of commercial building suitability for solar PV

FIGURE 5. Load profiles of commercial buildings and typical PV generation



Source: Authors' own compilation, GIZ (2025) and solar data from (Pfenninger & Staffell, 2016).

1.1 Financial analysis

This section presents the financial assessment of solar PV systems for selected commercial buildings. Aurora Solar was used to simulate solar PV design, HOMER for system optimisation and PV sizing to achieve the highest NPV and lowest levelised cost of electricity (LCOE), and a sophisticated cash-flow model for economic evaluation. Key financial indicators, including NPV, IRR, LCOE and payback period, were calculated to assess the profitability of PV investments under current market conditions. The results provide insights into the economic viability of different system sizes and configurations for office buildings, shopping malls and hotels. As USD is the prevailing investment currency in Ghana's property market, the modelling has been conducted on a dollar basis.

TABLE 19. Techno-economic analysis of solar PV applications in commercial buildings

Case	Unit	Medium-sized office building	Medium-sized shopping mall	Medium-sized hotel
Annual consumption	MWh	806	1,239	1,182
PV capacity	kWp	180	544	240
PV annual production	MWh	228	702	297
Curtailed PV energy	%	13	11	0
Self-consumption ratio	%	25	51	23
WACC	%	15	15	15
Total investment	Thousands USD	138	417	184
LCOE (base case)	USD/kWh	0.26	0.26	0.26
LCOE (PV)	USD/kWh	0.09	0.09	0.09
Payback period	Years	3.64	3.59	3.52
NPV	Thousands USD	87	280	125
Project IRR	%	27	27	28

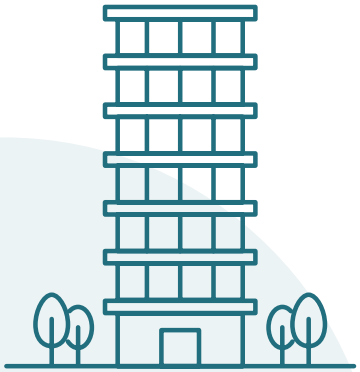
Source: Authors' own compilation, GIZ (2025)

1.1 Sensitivity analysis

Sensitivity analyses were carried out considering four financial and technical parameters across five scenarios:

- Scenario 1 – base case with net metering;
- Scenario 2 – PV investment cost increased by 20%;
- Scenario 3 – electricity priced at the higher low voltage (LV) rate;
- Scenario 4 – cost of debt decreased by 30%;
- and Scenario 5 – cost of debt increased by 30%.

These variations were used to assess how changes in key economic parameters could influence the profitability of PV system investments in commercial buildings.



3.0.5 Office building

TABLE 20. Sensitivity analysis of PV system performance in office building

Sensitivity parameters	Unit	Proposed case	Net metering	CAPEX +20%	LV tariff	Cost of debt –30%	Cost of debt +30%
Cost of debt	%	12	12	12	12	8.4	15.6
PV CAPEX	Thousands USD	138	138	166	138	138	138
Surplus PV electricity		Curtailed	Net-metered	Curtailed	Curtailed	Curtailed	Curtailed
Cost of electricity (including levies)	USD/kWh	0.20	0.20	0.20	0.24	0.20	0.20
WACC	%	15	15	15	15	14	16
Self-consumption ratio	%	25	26	25	25	25	25
LCOE PV	USD/kWh	0.09	0.08	0.10	0.09	0.08	0.10
Project IRR	%	27	28	23	33	27	27
NPV	Thousands USD	87	98	68	132	93	80

Source: Authors' own compilation based on pre-feasibility study conducted by GIZ

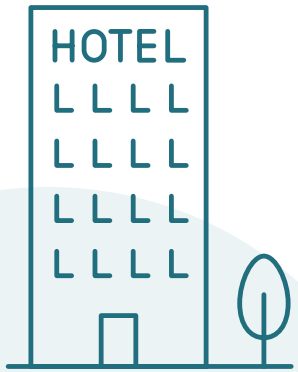
3.0.6 Mall

TABLE 21. Sensitivity analysis of PV system performance in mall

Sensitivity parameters	Unit	Proposed case	Net metering	CAPEX +20%	LV tariff	Cost of debt –30%	Cost of debt +30%
Cost of debt	%	12	12	12	12	8.4	15.6
PV CAPEX	Thousands USD	417	417	501	417	417	417
Surplus PV electricity		Curtailed	Net-metered	Curtailed	Curtailed	Curtailed	Curtailed
Cost of electricity (including levies)	USD/kWh	0.20	0.20	0.20	0.24	0.20	0.20
WACC	%	15	15	15	15	14	16
Self-consumption ratio	%	51	53	51	51	51	51
LCOE PV	USD/kWh	0.08	0.08	0.10	0.09	0.08	0.10
Project IRR	%	27	29	23	33	27	27
NPV	Thousands USD	299	311	222	422	300	259

Source: Authors' own compilation, GIZ (2025)

The analysis indicates that PV investments in commercial buildings remain financially strong across different scenarios. Net metering helps office buildings and malls manage curtailed energy, while higher CAPEX reduces returns, but projects remain viable. Changes in the cost of debt have only minor effects on NPVs, and project IRRs remain largely stable. In contrast, higher electricity prices have the largest impact, boosting both IRRs and NPVs, confirming the robustness of the business case for PV adoption.



3.0.7 Hotel

TABLE 22. Sensitivity analysis of PV system performance in hotel

Sensitivity parameters	Unit	Proposed case	Net metering	CAPEX +20%	LV tariff	Cost of debt –30%	Cost of debt +30%
Cost of debt	%	12	12	12	12	8.4	15.6
PV CAPEX	Thousands USD	184	184	222	184	184	184
Surplus PV electricity		Curtailed	Net-metered	Curtailed	Curtailed	Curtailed	Curtailed
Cost of electricity (including levies)	USD/kWh	0.20	0.20	0.20	0.24	0.20	0.20
WACC	%	15	15	15	15	14	16
Self-consumption ratio	%	23	23	23	23	23	23
LCOE PV	USD/kWh	0.09	0.09	0.10	0.09	0.08	0.10
Project IRR	%	28	28	23	34	28	28
NPV	Thousands USD	125	125	100	189	134	116

Source: Authors' own compilation, GIZ (2025)

4

Market outlook

This chapter explores the key factors shaping the growth of Ghana's commercial building solar PV market. It outlines the main drivers encouraging adoption, the barriers slowing uptake and emerging trends influencing how projects are financed and deployed. It also provides an outlook for each building category and offers practical recommendations for investors, policy-makers and development partners to accelerate market development.

TABLE 23. Approved electricity tariffs for non-residential and SLT customers

Tariff category	Value (GHS/kWh)	Value (EUR/kWh)
Non-residential (0–300 kWh)	1.63	0.11
Non-residential (301+ kWh)	2.02	0.14
SLT LV	2.43	0.17
SLT MV/HV	1.94	0.13

Source: 2025 Third Quarter Natural Gas, Electricity & Water Tariff Decision (PURC, 2025)

1.1 Market drivers

The following factors are catalysing interest and investment in solar PV across Ghana's commercial building sector:

- **High tariffs and daytime loads:** Ghana's commercial and industrial users face some of the region's highest electricity tariffs, and since offices, malls and hotels operate primarily during daylight hours, they are well suited for on-site solar self-consumption.

  As shown in Table 23, nominal electricity prices (excluding varying levies) range from GHS 1.63/kWh for small non-residential consumers (0–300 kWh) to GHS 2.43/kWh for special load tariff (SLT) LV customers, with even large medium- and high-voltage (MV/HV) users paying GHS 1.94/kWh. At these tariff levels (equivalent to EUR 0.13–0.20/kWh), solar PV offers a competitive and predictable alternative.

- **Growing interest in environmental, social and governance (ESG) considerations and green real estate:** Developers are increasingly targeting solar integration to attract ESG-conscious tenants and secure green certifications – for example, Excellence in Design for Greater Efficiencies (EDGE) and Leadership in Energy and Environmental Design (LEED) – especially in offices and hotels. While the green commercial building market is still in its early stages, momentum is steadily growing. In Accra, a rising number of Grade-A office buildings and mixed-use developments have already secured EDGE certification, with several more currently under assessment. Market studies indicate that by 2025, green-certified commercial floor space in Accra could exceed 20% of total supply, underscoring both developer commitment and the growing demand from tenants for sustainable, ESG-aligned real estate.

- **Regulatory enablement for captive use:** Rooftop solar installations for self-consumption, whether leased or owned, require only a basic licence. The developer must obtain an installation and maintenance licence, while the end user does not require any licensing. This simplified process allows for faster project implementation.

- **Falling PV system costs:** Global solar PV system costs continue to decline, with BloombergNEF (BloombergNEF, 2025) projecting a drop of up to 11% in clean power technology prices for 2025. This trend supports strong IRRs, making projects financially viable even without direct subsidies.

- **Availability of rooftop space and load match:** Malls and office buildings typically have favourable rooftop-to-demand ratios, enabling efficient solar sizing.

1.2 Barriers to solar PV uptake

Despite the technical context, several constraints continue to limit uptake:

- **Financing constraints:** Many property owners, particularly small and medium-sized enterprises, lack access to affordable capital for solar investments. Local credit options for long-term, GHS-denominated financing remain scarce. Additionally, banks lack human resources to evaluate renewable energy projects.
- **Regulatory complexity for PPAs and resale:** PPAs require a wholesale electricity supply licence and are restricted to bulk customers (≥6 GWh/year). This excludes most malls, hotels and condominiums.
- **Split incentives in multi-tenant buildings:** In shared-use buildings where landlords bear the investment cost while tenants enjoy the savings, legal resale is restricted, and compliant billing (non-kWh, non-profit) requires complex allocation models.
- **Off-site PV constraints:** Only ~4 MWp of the total 87 MWp of off-site potential meets bulk customer requirements, and all of it is concentrated in large office buildings. Most commercial segments are legally ineligible.
- **Tenant consent and landlord approval:** Tenant-owned PV systems require landlord permission. In buildings with shared rooftops (e.g. condominiums), approval and cost allocation become even more complicated.

1.3 Trends shaping market growth

Several developments are reshaping how solar PV is financed, installed and managed in Ghana:

- **Shift towards lease model:** Noted rising interest in lease models, where developers finance and operate systems and clients pay fixed service fees, thereby avoiding high upfront costs.
- **Indexed pricing in contracts:** Contracts feature price-indexed clauses, with prices pegged to utility tariff rates or foreign exchange rates, reducing exposure to inflation and devaluation.
- **Smart metering and submetering workarounds:** In shared buildings, submetering allows landlords to allocate solar costs fairly by using flat service fees or floor area-based formulas without violating resale rules.
- **Green certifications and investor signalling:** Developers are leveraging solar as part of broader ESG strategies to attract investors, increase asset value and differentiate properties in competitive urban markets.
- **Bundling solar with storage:** Some developers now offer storage as part of lease options for clients that prioritise power supply reliability, albeit at a premium cost.
- **Pending implementation of net metering:** Net metering is expected to take effect by the end of 2025. This would allow the export of surplus energy, improving project financial viability.

1.4 Category outlook and prioritisation

Based on market size, adoption rates and legal feasibility, Table 24 summarises prospects by subsector.

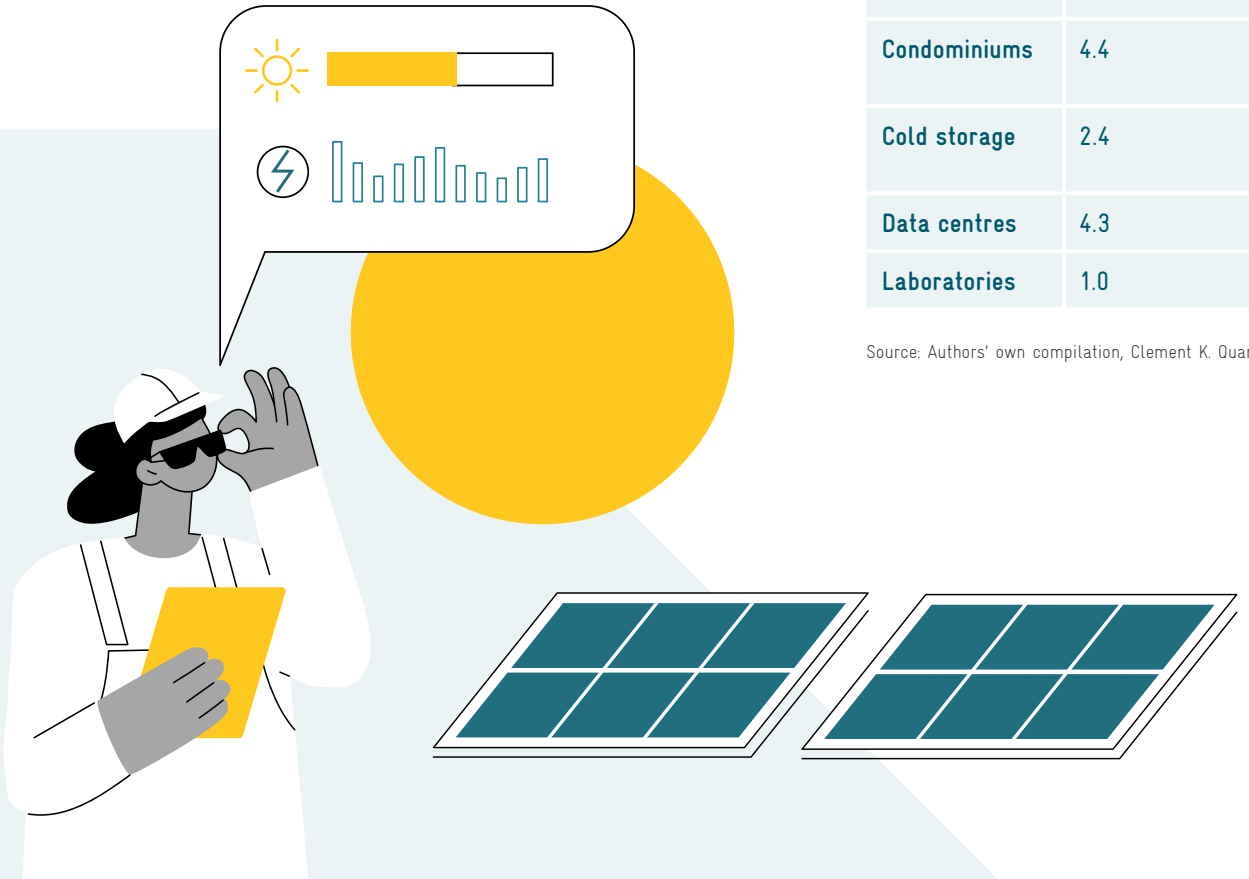


TABLE 24. Solar PV potential, adoption and outlook across commercial categories

Category	On-site potential (MWp)	Adoption rate	Legally eligible for off-site PV?	Outlook (2025–2030)
Malls	22.7	9%	X	★★★★★ – High potential; resale limits require workaround models
Offices	11.6	12%	✓ (3.7 MWp in large offices)	★★★★★– Strong fit for lease models
Hotels	10.4	9%	X	★★★ – seasonal loads; constrained system design
Condominiums	4.4	0%	X	★★★ – Governance and roof access issues
Cold storage	2.4	33%	X	★★ – Niche potential; adoption already moderate
Data centres	4.3	63%	X	★★ – Market nearing saturation
Laboratories	1.0	50%	X	★ – Small segment

Source: Authors' own compilation, Clement K. Quansah (2025)

1.1 Recommendations

To scale solar PV in Ghana's commercial building sector, the following measures are recommended.

FOR INVESTORS AND MARKET ENTRANTS

German developers entering Ghana's market should consider the following strategies:

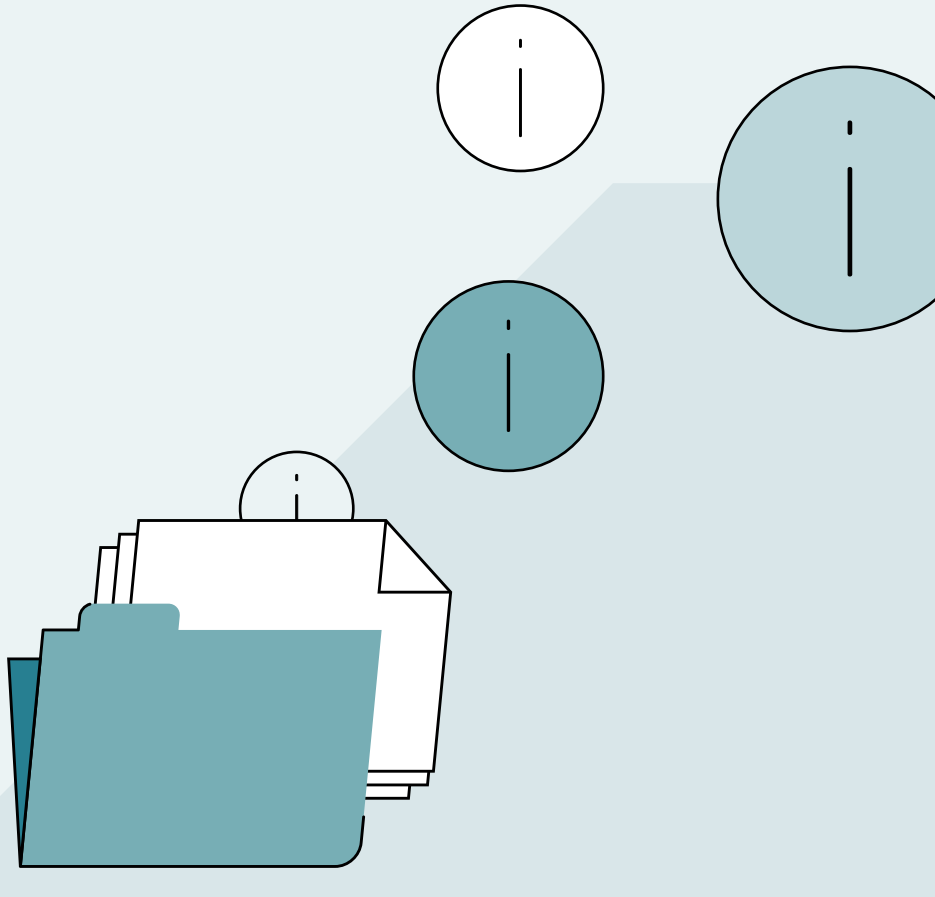
- **Offer financing-linked solutions:** Pure EPC offerings are unlikely to succeed. Competitive positioning will increasingly require bundling EPC with financing packages (e.g. leasing, buyer's credits or PPAs).
- **Pursue one-stop energy solutions:** There is growing demand for holistic offers that combine solar PV with energy efficiency upgrades, energy performance contracting or energy service company models. These solutions improve client bankability while addressing reliability and sustainability concerns.
- **Leverage local partnerships:** Collaboration with Ghanaian banks, property managers and real estate developers will be key to navigating regulatory processes and building client trust.
- **Target niche segments:** Beyond Grade-A office buildings and hotels, opportunities exist in shopping malls where energy reliability and ESG positioning are becoming critical.

FOR POLICY-MAKERS AND DEVELOPMENT PARTNERS

Policy-makers and development partners should consider the following strategies:

- **Standardise solar lease templates:** The Energy Commission, in collaboration with solar industry associations, should coordinate the development of standardised lease and service agreement templates that comply with resale restrictions and support cost recovery in multi-tenant buildings. Templates should be aligned with licensing frameworks and utility tariff structures.
- **Relax bulk customer thresholds:** The Ministry of Energy and the Energy Commission should review and amend existing licensing thresholds (specifically the 6 GWh/year minimum for bulk customer status) to expand eligibility for PPAs and off-site PV use. This would unlock large-scale deployment in malls and hotels currently disqualified by demand ceilings.
- **Accelerate net metering implementation:** The Energy Commission, with implementation support from utility providers and development partners, should fast-track rollout of the Small Renewable Energy Programme (SREP), including deployment of net meters, activation of the application portal and public dissemination of eligibility guidelines and timelines.
- **Establish targeted credit facilities:** Development finance institutions should design concessional loan schemes or risk-sharing facilities tailored to the solar PV sector, addressing inter alia small and medium-sized commercial buildings. Ghana's SUNREF programme attempted this approach but achieved limited uptake, with stakeholders pointing to low awareness, insufficient alignment with market needs and a lack of tailored financing structures. Lessons learned should guide new initiatives. KfW has a green credit programme in the pipeline that should address these gaps.
- **Strengthen local bank capacities:** A major barrier is the limited ability of domestic financial institutions to evaluate renewable energy and energy efficiency projects. Training programmes for credit officers, potentially embedded in concessional loan schemes, are needed to build dedicated renewable energy/energy efficiency units and improve risk assessment capacity. Expanding participation beyond just a few international partner banks would broaden outreach.
- **Expand capacity building and outreach:** The Energy Commission, in partnership with solar developers associations, property management groups and real estate chambers, should jointly design and deliver tailored training programmes and awareness campaigns for landlords, tenants and facility managers. Topics should include solar financing models, non-kWh billing methods, maintenance and regulatory compliance.
- **Facilitate rooftop access protocols in condominiums:** Housing regulatory bodies and condominium associations should jointly develop and promote model rooftop governance frameworks for multi-unit buildings. These should address consent protocols, shared access rights, system ownership and fair allocation of solar benefits in compliance with resale laws.

Annexes



Annex 1 Estimated market size for office buildings

S/N	Name	Location	Gross internal area (m^2)	Sub-category	Monthly energy consumption	System size (on-site)	System size (off-site)	System size (legally permitted)	Solar available
1	Atlantic Tower	Accra	13,500	Medium	109,238	420	718	0	NO
2	The Octagon	Accra	75,000	Large	558,125	630	3,670	3,670	NO
3	Ecobank Head Office	Accra	27,000	Large	217,800	498	1,432	0	NO
4	Fifth Avenue Corporate Office	Accra	5,070	Medium	82,795	459	544	0	NO
5	SCB Towers	Accra	12,049	Medium	97,700	331	642	0	NO
6	Stanbic Heights	Accra	20,145	Large	162,167	399	1,066	0	NO
7	Silver Star Tower	Accra	9,290	Medium	82,913	377	545	0	NO
8	Absa Head Office	Accra	7,000	Medium	67,900	375	446	0	NO
9	335 Place	Accra	26,000	Large	208,216	343	1,369	0	NO
10	One Airport Square	Accra	17,000	Large	138,408	299	910	0	NO
11	IPMC Office Building	Accra	17,500	Large	142,188	252	935	0	NO
12	Accra Financial Centre	Accra	14,080	Medium	118,859	248	782	0	NO
13	City Galleria	Accra	7,600	Medium	76,000	241	500	0	NO
14	PwC Tower	Accra	13,000	Large	105,733	229	695	0	NO
15	The Capital Place	Accra	5,172	Medium	46,548	225	306	0	NO
16	19 Kofi Annan Street	Accra	1,200	Small	14,340	94	94	0	YES
17	Emerald House	Accra	8,230	Medium	71,944	217	473	0	NO
18	Anysia Building	Accra	10,000	Medium	94,750	208	623	0	NO
19	Skyview Tower	Accra	14,000	Medium	110,833	190	729	0	NO

S/N	Name	Location	Gross internal area (m^2)	Sub-category	Monthly energy consumption	System size (on-site)	System size (off-site)	System size (legally permitted)	Solar available
20	Advantage Place	Accra	15,581	Large	122,830	185	808	0	NO
21	Cannon House	Accra	5,600	Medium	49,943	176	328	0	NO
22	Heritage Tower	Accra	16,000	Large	134,000	158	881	0	NO
23	Huawei Building	Accra	7,500	Medium	61,250	158	403	0	NO
24	The Elizabeth	Accra	5,000	Medium	51,667	158	340	0	NO
25	The Grand Oyeeman	Accra	7,000	Medium	62,125	158	408	0	NO
26	Zenith Bank Head Office	Accra	10,000	Medium	84,500	158	556	0	NO
27	Opeibea House	Accra	5,000	Medium	51,500	133	339	0	YES
28	SU Tower	Accra	12,000	Medium	105,300	136	692	0	NO
29	CalBank Head Office	Accra	15,200	Large	120,333	132	791	0	YES
30	Ridge Towers	Accra	14,300	Medium	115,711	132	761	0	NO
31	GT Bank Head Office	Accra	10,000	Medium	91,333	121	601	0	NO
32	Telecel Ghana Headquarters	Accra	5000	Medium	47583	111	313	0	NO
33	Impact Hub Accra	Accra	1,700	Small	16,391	108	108	0	NO
34	Maame Saah Towers	Kumasi	2,500	Small	25,958	99	171	0	NO
35	GCB Head Office	Accra	10,000	Medium	87,667	208	576	0	YES
36	P-Cular Heights	Accra	3,000	Small	34,450	95	227	0	NO
37	Stanbic Takoradi Office Building	Takoradi	7,000	Medium	61,568	67	405	0	NO
38	British Council	Accra	1,200	Small	14,260	65	94	0	NO
39	Adoma House	Accra	800	Small	10,087	63	66	0	NO
40	The Executive	Accra	1,200	Small	14,500	48	95	0	NO
41	MTN Head Office	Accra	12,000	Medium	104300	158	686	0	YES

S/N	Name	Location	Gross internal area (m^2)	Sub-category	Monthly energy consumption	System size (on-site)	System size (off-site)	System size (legally permitted)	Solar available
42	Dufie Towers	Kumasi	1,000	Small	13,492	40	89	0	NO
43	Platinum Towers	Accra	1,800	Small	21,135	30	139	0	NO
44	World Trade Center Accra	Accra	13,600	Medium	109,253	67	718	0	NO
45	Premier Towers	Accra	9,100	Medium	7,668	50	50	0	NO
46	Export Trade House (EDAIF Building)	Accra	15,000	Medium	121,000	128	796	0	NO
47	Société Générale Head Office	Accra	6,000	Medium	51,300	218	337	0	YES
48	International Finance Corporation (IFC) Ghana Office	Accra	6,800	Medium	61,143	273	402	0	NO
49	Nester Square	Accra	10,000	Medium	81,417	227	535	0	NO
50	Republic Bank Head Office	Accra	3,900	Small	35,230	178	232	0	NO
51	Total House	Accra	6,300	Medium	54,128	105	356	0	NO
52	UN Offices	Accra	2,600	Small	23,985	158	158	0	NO
53	The Vivo Place	Accra	4,800	Small	42,840	65	282	0	NO
54	US Embassy Office Complex	Accra	15,000	Medium	124,625	667	819	0	NO
55	Canadian High Commission	Accra	2,300	Small	21,256	140	140	0	NO
56	German Embassy	Accra	800	Small	8,787	43	58	0	NO
57	Dutch Embassy	Accra	1,400	Small	13,988	92	92	0	YES
58	Aviation House	Accra	3,000	Small	28,400	123	187	0	NO
59	Platinum Place	Accra	9,350	Medium	77,449	166	509	0	NO
	Total		583,167			11,632	32,027	3,670	

Source: Authors' own compilation, Clement K. Quansah (2025), based on desktop research

Annex 2 Estimated market size for malls

S/N	Name	Location	Gross internal area (m^2)	Sub-category	Monthly energy consumption	System size (on-site)	System size (off-site)	System size (legally permitted)	Solar available
1	West Hills Mall	Accra	27,550	Large	452,968	2,978	2,978	0	NO
2	Accra Mall	Accra	20,900	Large	354,255	2,329	2,329	0	NO
3	Kumasi City Mall	Kumasi	19,950	Large	284,683	1,872	1,872	0	NO
4	Achimota Mall	Accra	15,485	Large	264,148	1,737	1,737	0	NO
5	Palace Mall Spintex	Accra	13,300	Large	219,118	1,441	1,441	0	NO
6	Garden City Mall	Kumasi	12,350	Large	200,585	1,319	1,319	0	NO
7	Takoradi Mall	Takoradi	11,400	Large	140,410	923	923	0	NO
8	A&C Mall	Accra	5,100	Medium	79,601	523	523	0	YES
9	China Mall Ashaiman	Accra	11,400	Large	133,475	878	878	0	NO
10	Melcom Mall Spintex	Accra	10,450	Large	175,299	1,153	1,153	0	YES
11	Orca Deco	Accra	10,545	Large	123,904	815	815	0	NO
12	China Mall Manet Main	Accra	9,500	Medium	111,704	734	734	0	NO
13	Atlantic Mall	Accra	5,985	Medium	99,950	657	657	0	NO
14	China Mall Spintex Annex	Accra	6,650	Medium	75,955	499	499	0	NO
15	Kitea	Accra	2,850	Small	33,434	220	220	0	YES
16	Melcom Mall Takoradi	Takoradi	7,400	Medium	71,842	472	472	0	NO
17	SIC Mall	Accra	12,000	Large	106,400	450	700	0	NO
18	Palace Mall Tema	Accra	4,750	Small	55,179	363	363	0	NO
19	SG Mall	Kumasi	2,850	Small	49,994	329	329	0	NO

S/N	Name	Location	Gross internal area (m^2)	Sub-category	Monthly energy consumption	System size (on-site)	System size (off-site)	System size (legally permitted)	Solar available
20	Marina Mall Airport City	Accra	5,250	Medium	49,816	328	328	0	NO
21	Legon City Mall	Accra	4,275	Small	45,600	300	300	0	NO
22	China Mall Kumasi	Kumasi	5,225	Medium	42,410	279	279	0	NO
23	China Mall Weija	Accra	3,230	Small	38,087	250	250	0	NO
24	Melcom Boundary Road	Accra	1,900	Small	35,166	231	231	0	NO
25	Oxford Street Mall	Accra	2,755	Small	32,968	217	217	0	NO
26	China Mall Amasaman	Accra	2,850	Small	32,063	211	211	0	NO
27	Junction Mall	Accra	1,425	Small	31,438	207	207	0	NO
28	Palace Home Decor	Accra	1,140	Small	18,744	123	123	0	NO
29	MaxMart 37	Accra	4,500	Small	42,638	280	280	0	NO
30	Koala Shopping Centre Osu	Accra	2,000	Small	25,733	169	169	0	NO
31	Marina Mall Spintex	Accra	3,180	Small	34,079	224	224	0	NO
32	Oyarifa Mall	Accra	1,800	Small	23,820	157	157	0	NO
	Total		249,945			22,669	22,918	0	

Source: Authors' own compilation, Clement K. Quansah (2025), based on desktop research and stakeholder engagement

Annex 3 Estimated market size for hotels

S/N	Name	Location	Number of rooms	Sub-category	Monthly energy consumption	System size (on-site)	System size (off-site)	System size (legally permitted)	Solar available
1	Mövenpick Ambassador Hotel	Accra	260	Business hotel	158,522	925	968	0	NO
2	Labadi Beach Hotel	Accra	164	Resort	98,728	603	603	0	NO
3	Lancaster Kumasi City	Kumasi	160	Business hotel	90,541	553	553	0	NO
4	Aqua Safari	Ada	151	Resort	84,588	516	516	0	NO
5	La Palm Royal Beach Hotel	Accra	152	Resort	83,511	510	510	0	NO
6	Kempinski Hotel Gold Coast	Accra	269	Business hotel	158,643	440	969	0	NO
7	Accra Marriott Hotel	Accra	208	Business hotel	121,940	425	745	0	NO
8	Tang Palace Hotel	Accra	112	Business hotel	68,639	419	419	0	NO
9	Accra City Hotel	Accra	196	Business hotel	106,320	385	649	0	NO
10	Best Western Plus Atlantic Hotel	Takoradi	200	Business hotel	113,177	340	691	0	NO
11	Alisa North Ridge	Accra	280	Business hotel	149,492	325	913	0	NO
12	Safari Valley Beach Resort	Okere, Eastern Region	53	Resort	30,311	185	185	0	YES
13	Alliance by Eagles	Takoradi	80	Business hotel	46,537	250	284	0	NO
14	Lancaster Accra	Accra	238	Business hotel	124,129	230	758	0	NO
15	Mensvic Grand Hotel	Accra	142	Business hotel	79,591	210	486	0	NO
16	Busua Beach Resort	Takoradi	62	Resort	28,718	175	175	0	NO
17	Best Western Premier Hotel	Accra	109	Business hotel	60,024	175	366	0	NO
18	The African Regent Hotel	Accra	109	Business hotel	60,370	160	369	0	NO

S/N	Name	Location	Number of rooms	Sub-category	Monthly energy consumption	System size (on-site)	System size (off-site)	System size (legally permitted)	Solar available
19	Coconut Grove Beach Resort	Elmina	50	Resort	23,933	146	146	0	NO
20	Airport View Hotel	Accra	101	Business hotel	44,386	120	271	0	NO
21	Peduase Valley Resort	Aburi	40	Resort	19,317	110	118	0	NO
22	Golden Bean	Kumasi	51	Business hotel	23,242	142	142	0	NO
23	Anita Hotel	Kumasi	102	Business hotel	46,974	287	287	0	NO
24	Ridge Royal Hotel	Cape Coast	79	Business hotel	38,341	234	234	0	NO
25	Hillcrest Hotel	Takoradi	55	Business hotel	28,365	69	173	0	NO
26	Raybow Hotel	Takoradi	77	Business hotel	37,330	228	228	0	YES
27	AH Hotel	Accra	75	Business hotel	36,000	110	220	0	NO
28	Best Western Plus	Accra	66	Resort	43,681	267	267	0	NO
29	Oak Plaza Hotel	Accra	81	Business hotel	38,599	165	236	0	NO
30	Fiesta Royale	Accra	100	Business hotel	65,138	398	398	0	NO
31	Palms by Eagles Airport City	Accra	160	Business hotel	55,993	240	342	0	NO
32	Royal Senchi Hotel and Resort	Akosombo	84	Resort	64,611	394	394	0	YES
33	Royal Nick Hotel	Accra	72	Business hotel	37,382	190	228	0	NO
34	Ibis Styles Accra Airport	Accra	200	Business hotel	91,093	135	556	0	NO
35	Volta Serene Hotel	Ho	300	Resort	172,710	300	1,055	0	NO
	Total		4,638			10,361	15,453	0	

Source: Authors' own compilation, Clement K. Quansah (2025), based on desktop research

Annex 4 Estimated market size for condominiums

S/N	Name	Location	Floor area (m^2)	Sub-category	Monthly energy consumption	System size (on-site)	System size (off-site)	System size (legally permitted)	Solar available
1	Accra Luxury Apartments @ The Gardens	Accra	18,000	Large	144,900	476	476	0	NO
2	Crystal Homes	Accra	12,000	Large	109,200	359	359	0	NO
3	Villagio Vista	Accra	12,000	Large	116,500	225	383	0	NO
4	Cantonments Gardens	Accra	4,400	Small	62,150	198	204	0	NO
5	Meridian Apartments	Accra	9,000	Medium	95,400	175	314	0	NO
6	Earl's Court	Accra	4,800	Small	65,600	173	216	0	NO
7	Taysec Residence	Accra	3,600	Small	58,770	170	193	0	NO
8	Elite Court by LLA	Accra	6,400	Medium	76,747	158	252	0	NO
9	Palm Court Apartments Ghana	Accra	3,200	Small	54,453	153	179	0	NO
10	Rivonia Gate Apartments	Accra	7,000	Medium	81,725	137	269	0	NO
11	Parker's Place	Accra	2,800	Small	51,847	127	170	0	NO
12	Cedar Court	Accra	3,600	Small	57,960	125	191	0	NO
13	Meridian Villas	Accra	2,600	Small	50,527	118	166	0	NO
14	Primrose Place	Accra	6,600	Medium	80,465	112	265	0	NO
15	Embassy Gardens	Accra	4,000	Small	61,600	108	203	0	NO
16	Earlwood Close (Goldkey Properties Ltd)	Accra	3,000	Small	54,075	108	178	0	NO
17	Hyatt II Apartments Ghana	Accra	8,000	Medium	91,733	108	302	0	NO
18	Nova by Devtraco	Accra	9,000	Medium	99,150	103	326	0	NO

S/N	Name	Location	Floor area (m^2)	Sub-category	Monthly energy consumption	System size (on-site)	System size (off-site)	System size (legally permitted)	Solar available
19	Ridge Condos	Kumasi	5,000	Medium	67,042	103	220	0	NO
20	Zollikon by Imperial Homes	Accra	3,000	Small	54,075	96	178	0	NO
21	Asafu Agyei's Place (Goldkey Properties Ltd)	Accra	3,600	Small	58,980	95	194	0	NO
22	Park Royale	Accra	3,000	Small	54,075	93	178	0	NO
23	The Gallery Luxury Suite 53	Accra	8,000	Medium	93,933	87	309	0	NO
24	Kai Villa	Accra	2,400	Small	50,100	87	165	0	NO
25	Libi Kraal	Accra	1,600	Small	43,813	82	144	0	NO
26	Palladio Apartments (Elm Developments Ltd)	Accra	2,100	Small	48,073	78	158	0	NO
27	Charlotte's Place (Elm Developments Ltd)	Accra	1,800	Small	46,020	75	151	0	NO
28	Gemini Court	Accra	1,800	Small	46,020	75	151	0	NO
29	Paradise Court by LLA	Accra	1,800	Small	46,020	70	151	0	NO
30	Brandford Charles Apartments	Accra	2,100	Small	48,073	68	158	0	NO
31	Emilean Residence	Accra	3,000	Small	55,975	60	184	0	NO
32	Knight Court by Mobus Property Ghana	Accra	2,400	Small	51,000	60	168	0	NO
33	Odi's Court	Accra	1,800	Small	46,020	60	151	0	NO
34	Mirage Residence	Accra	11,200	Large	121,147	58	398	0	NO
	Total		174,600			4,383	7,704	0	

Source: Authors' own compilation, Clement K. Quansah (2025), based on desktop research and stakeholder engagement

Annex 5 Estimated market size for data centres

S/N	Name	Location	Gross internal area (m^2)	Sub-category	Monthly energy consumption	System size (on-site)	System size (off-site)	System size (legally permitted)	Solar available
1	PAIX Accra	Accra	3,000	Medium	168,250	415	948	0	NO
2	Equinix AC1	Accra	1,000	Medium	57,058	322	322	0	NO
3	Onix Data Centre Ghana	Accra	3,800	Medium	213,307	1,202	1,202	0	YES
4	MTN Sakaman Data Centre	Accra	600	Small	35,430	200	200	0	YES
5	MTN South Legon Data Centre	Accra	3,300	Medium	185,213	685	1,044	0	YES
6	MTN Kaase Switch	Kumasi	3,200	Medium	48,516	273	273	0	YES
7	Internet Solutions Accra	Accra	600	Small	35,430	65	200	0	NO
8	National Data Centre (NITA)	Accra	4,800	Medium	199,880	1,127	1,127	0	YES
	Total		20,300			4,288	5,315		

Source: Authors' own compilation, Clement K. Quansah (2025), based on desktop research and stakeholder engagement

Annex 6 Estimated market size for laboratories

S/N	Name	Location	Floor area (m^2)	Sub-category	Monthly energy consumption	System size (on-site)	System size (off-site)	System size (legally permitted)	Solar available
1	Kumasi Centre for Collaborative Research	Kumasi	2,100	Research lab	62,677	275	412	0	NO
2	Noguchi Memorial Institute for Medical Research	Accra	7,000	Research lab	113,255	745	745	0	YES
	Total		9,100			1,020	1,157		

Source: Authors' own compilation, Clement K. Quansah (2025), based on desktop research

Annex 7 Estimated market size for cold storage facilities

S/N	Name	Location	Floor area (m^2)	Sub-category	Monthly energy consumption	System size (on-site)	System size (off-site)	System size (legally permitted)	Solar available
1	Pioneer Foods Company New Coldstore	Tema	8,400	Large	94,710	534	534	0	NO
2	Pioneer Foods Company Coldstore	Tema	7,000	Large	79,042	445	445	0	NO
3	Labianca Company Ltd	Tema	2,500	Medium	28,771	162	162	0	YES
4	Overseas Commerce Ghana Ltd	Tema	3,500	Medium	39,929	225	225	0	NO
5	Nyame Yie Cold Store	Takoradi	3,500	Medium	39,929	225	225	0	NO
6	Afko Fisheries	Tema	3,000	Medium	34,350	194	194	0	NO
7	Amisachi Ltd	Tema	2,500	Medium	28,711	162	162	0	NO
8	Fruit Terminal Company	Tema	4,300	Medium	48,877	275	275	0	YES
9	Adom Mbroso	Tema	3,000	Medium	34,350	194	194	0	YES
	Total		37,700			2,416	2,416		

Source: Authors' own compilation, Clement K. Quansah (2025), based on desktop research

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