

A Simplified Guide to
**Renewable
energy** 

Investment for
SMEs in Ghana



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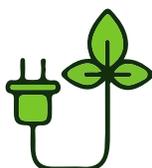
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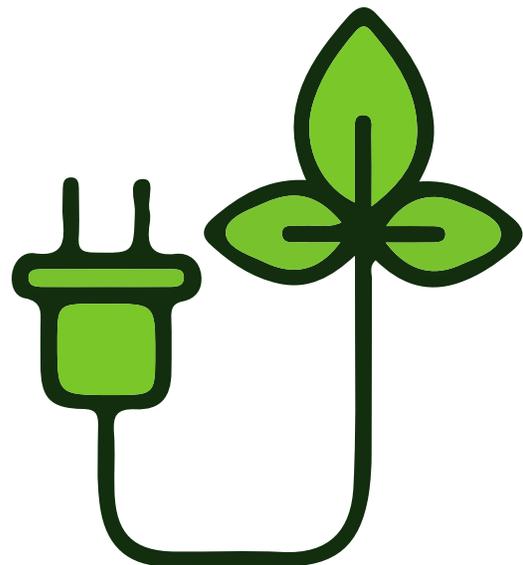
1.0 Introduction

Most businesses depend on reliable and affordable power for their operations. The reducing costs associated with adopting renewable energy technologies and the opportunities it presents in terms of reliable power supply and cost savings are some business case incentives for investment. Despite the economic and environmental advantages of renewable energy, often there is a lack of readily available information on how to adopt these technologies in practice.

This guide is aimed at providing relevant information to businesses, particularly small and medium-sized enterprises (SMEs) as well as the general public on the merits of adopting renewable energy, the means of sourcing the technology and options available for financing such investments.

2.0 What is renewable energy?

Renewable Energy (RE) is a form of energy from natural sources that are constantly replenished by nature and/or human activities. The major sources of renewable energy are **hydropower**, **biomass**, **geothermal**, **wind** and **solar**.



HYDRO-POWER

Hydropower harnesses energy from falling or flowing water. Hydroelectricity can be generated in a few ways, though the main principle is to force water through a turbine. Large-scale sites do this with a system of pumps, dams, and reservoirs, while small-scale plants rely on diverting the natural flow of a river.



BIO-MASS

Bio-mass is a term for organic fuel, which can be burned to produce electricity, or fermented through anaerobic digestion to produce green gas (also known as biogas and biomethane). Biomass is made from two types of organic materials – purposely-grown crops like sugarcane or wood, and waste products from farming and food. Huge amounts of biomethane can also be harvested from engineered landfill sites as well as constructed biodigesters which uses solid organic and fecal waste as feedstock.



GEO-THERMAL

Geothermal energy is heat that derived from deep layers of the earth. Water and/or steam carry the geothermal energy to the Earth's surface and the energy is converted into electricity by forcing the steam or water through specialized turbines.



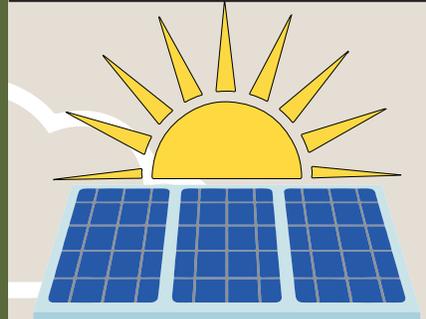
WIND POWER

Wind power generation harnesses the power of the wind to create electricity. The wind forces the propellers to turn around a motor to produce electricity.



SOLAR POWER

Solar power uses sunlight to generate electricity. Solar energy can be converted directly to electricity through solar panels (also called photovoltaic cells or PV cells), or indirectly using concentrated solar power technologies.



3.0

Choosing a Renewable Energy Source

Globally, solar has become a popular and cheap source for generating power among the various renewable energy sources. This can be attributed to a reduction in the initial cost required for purchasing and installation of the systems as well as improvements in equipment efficiency. According to the International Renewable Energy Agency (IRENA), the prices of solar PVs have reduced by about 80% since 2009 and further projects a 59% cost reduction by 2025.¹

In Ghana, there is an added advantage of all year sunshine. The monthly average solar irradiation is between 4.49 and 5.66 kWh/m²/day, with sunshine duration of between 1,800 and 3,000 hours per annum. This solar potential is significantly higher compared to Japan's solar irradiation of 2.94 to 4.27 kWh/m²/day³ and sunshine duration of 1870 hours per annum.² Yet, Japan has the third highest cumulative solar photovoltaic capacity globally as of 2020.⁴

Solar technology options have also increased over the years. These options include solar PVs which convert energy from sunlight directly to electricity and concentrated solar power (CSP) which concentrates solar power to drive turbines to create electricity. While solar PVs would require a separate storage unit such as batteries, CSPs store energy in the form of heat for use during the day or night and do not require any secondary storage. Generally, the initial costs for CSPs are higher than that of Solar PVs.

Beyond this, one of the key decisions that needs to be made when considering a solar panel system for business is the type of inverter to install. Inverters convert direct current (DC) electricity generated by your solar panels into usable alternating current (AC) electricity. The three main inverter options available for residential and commercial solar installations are string inverters, microinverters and power optimizer systems. Historically string inverters are the most installed worldwide.⁵ Microinverters and power optimizers allow you to monitor the power production of each individual panel. Microinverters and power optimizer systems are also typically more expensive than string inverters.

¹ IRENA (2016). The Power to Change: Solar and Wind Cost Reduction Potential to 2025. International Renewable Energy Agency, Abu Dhabi.

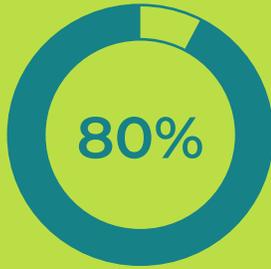
² Embassy of The Kingdom of The Netherlands. (2016). Business Opportunities for Renewable Energy in Ghana. Retrieved from: <https://bit.ly/2Q3gf2S>

³ Global Solar Atlas. Retrieved from: <https://bit.ly/2OuzUZm>

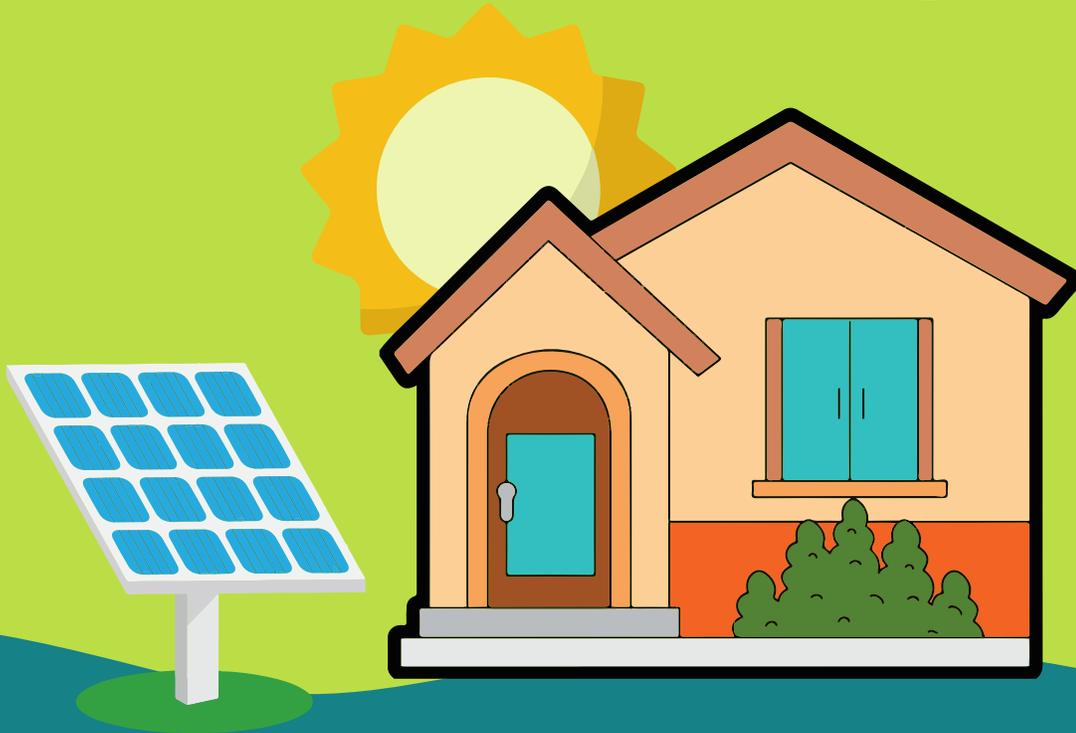
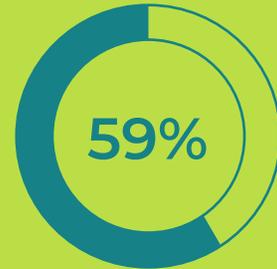
⁴ IRENA Country Rankings (2020). Solar Installed Capacity. Retrieved from: <https://bit.ly/3FPQUo6>

⁵ Energy Sage (2020). String inverters vs. power optimizers vs. microinverters. Retrieved from: <https://bit.ly/3dL31AI>

Prices of Solar PVs reduced in 2009 by



Projected to reduce further in 2025 to



Ghana's Advantage of all-year sunshine

Monthly solar irradiation is between

4.49 - 5.66 kWh/m² per day



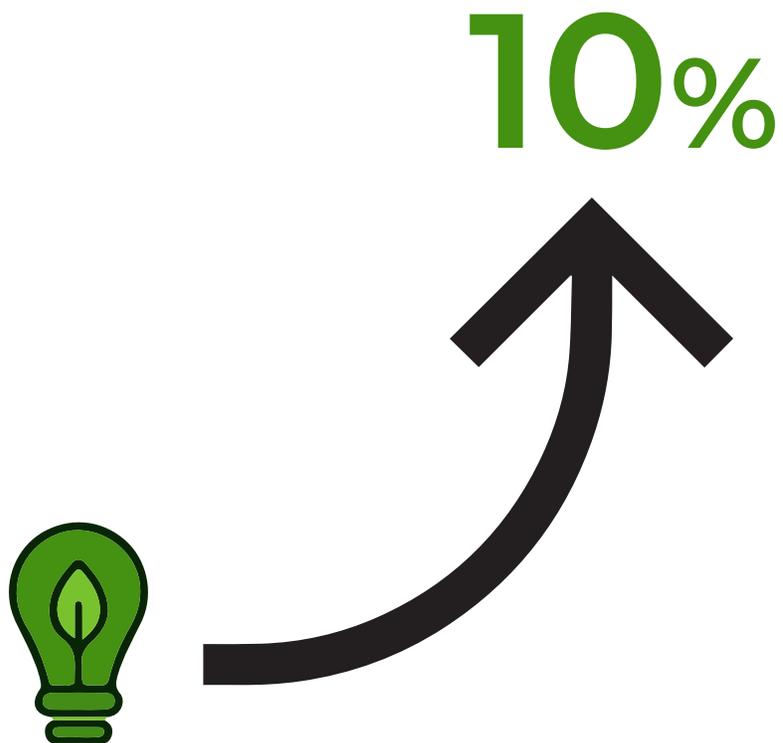
Sunshine duration

1,800 and 3,000 hours

4.0 Renewable Energy Regulation in Ghana

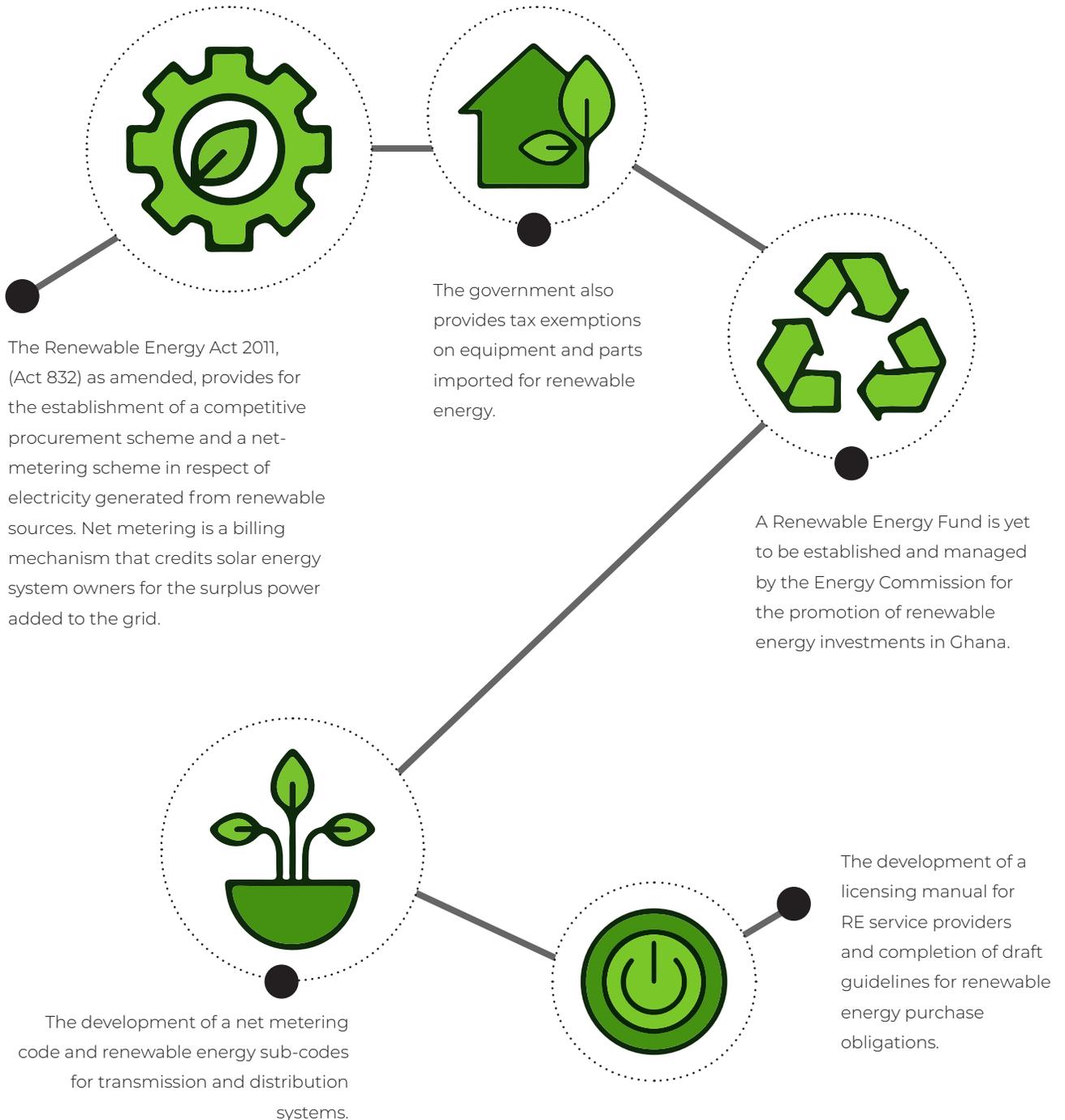
The renewable energy sector in Ghana is regulated by the Renewable Energy Act 2011, (Act 832) which was amended in 2020. There are also several policies that indicate the government's focus and plans for the sector. These policies include the Ghana Renewable Energy Master Plan (2019); National Energy Policy (2020); Scaling-Up Renewable Energy Program in Ghana (SREP) (2015); Strategic National Energy Plan (2006-2020); and the Energy Sector Strategy and Development Plan. The Renewable Energy Act has a target of increasing renewable energy penetration by at least 10% of by 2020. However, this deadline has been extended to 2030.

The Bui Power Authority (BPA) is the government's designated entity for Renewable Energy and clean energy development in the country while the Energy Commission regulates the sector. The Energy Commission issues licenses for the importation, installation, operation, and maintenance of renewable energy technologies in Ghana. The Commission also issues licenses for embedded generation from renewable sources. While the Energy Commission regulates the technical issues of RE, the Public Utilities Regulatory Authority (PURC) handles the financial regulations, i.e., all issues about tariffs and financial agreements.



4.1

Incentives for Renewable Energy Investments



5.0

Advantages of renewable energy for SMEs

Two broad benefits drive the adoption of renewable energy: **Economic** and **environmental benefits**.

5.1

Economic Benefits

Economic benefits accrue from cost savings on power and credits for transferring surplus power to the grid.

5.1.1 Cost Savings

The continually decreasing cost of renewable energy technologies, particularly solar PV, increasingly presents an attractive alternative and cheaper source of power for businesses. Between 2010 and 2019, the investment cost of solar PVs had reduced by about 80 percent. Ghana's conventional tariff for the commercial consumer averages about GHP 80 (14 US cents) per kwh of electricity consumed.⁶ Investment in renewable energy technologies weans businesses off conventional electricity sources, providing some substantial cost savings in the long run through self-generation of electricity.

Usually, the Levelized Cost of Energy (LCOE), which is a measure of the lifetime cost of energy production for solar PVs, are significantly lower than that of conventional power generation. Generally, for an investment cost of about GHS 5700 (\$990) per kw for solar power systems, the levelized cost of solar investment is about GHP 40 (7 US cents) per kwh. This is compared to that of conventional energy which is about GHP 98 (17 US cents) per kwh.⁷

⁶ ACEP's estimations based on PURC tariffs and the average cost of solar PV investments.

⁷ Ibid



Solar power investments

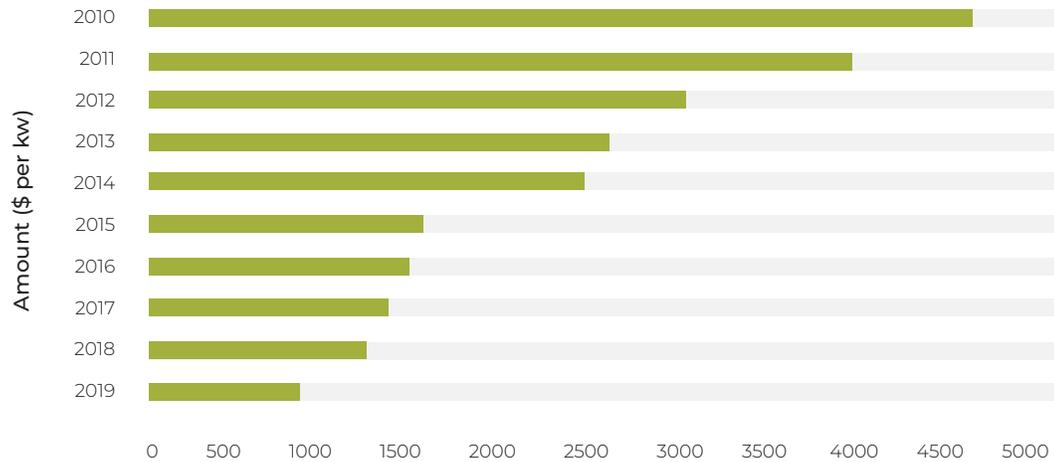
Investment of
GHS 5,700 (\$990) per kw

Levelised cost of

GHP 40 (7 US cents) per kw

Conventional energy

GHP 98 (17 US cents)



Date Source: IRENA Database

5.1.2. Credits for Transferring Surplus Power to the Grid

The Renewable Energy Act, 2011 (Act 832), as amended, provides the opportunity to transfer surplus electricity produced by self-generated renewable energy sources to the national grid in exchange for credit. This is done through a competitive procurement scheme and a net-metering scheme which ensures that excess power produced from renewable energy is not lost to the business. This process is regulated by the Public Utilities Regulatory Commission (PURC), the commercial regulator of the power sector.

5.1.3. Stable and Reliable Power Supply

Beyond the cost of power, a major consideration for power is stability. Renewable energy sources provide stable and reliable power for business operations and save the cost of power disruptions. Recent development in RE technologies have made it possible for energy to be stored in batteries for use during periods of unavailability of sunlight or wind or any other RE source. These technological advancements have made RE technologies relatively stable compared to conventional energy sources.

5.2 Environmental Benefits

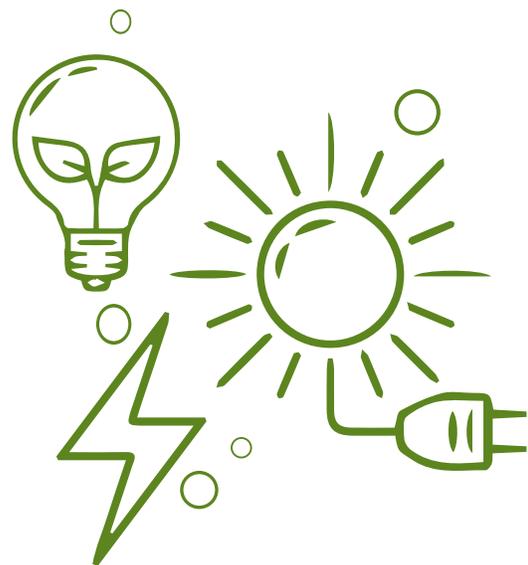
The environmental benefit from adopting renewable energy comes from the contribution to environmental sustainability.

5.2.1 Contribution to Climate Action and Environmental Sustainability

Conventional power sources are usually generated from fossil fuels which emit large amounts of CO₂ into the atmosphere. Renewable energy technologies present a cleaner option, not relying on fossil fuel, but rather natural sources. A transition away from fossil fuels significantly contributes towards reducing carbon emissions and reducing climate change.

5.2.2 Green Corporate Image

Increasingly, consumers are making more conscious purchasing choices based on a product's environmental impact. Transitioning to renewable energy has the potential to enhance the sustainable image of a firm. Businesses that make conscious efforts towards the consumption of clean energy and energy efficiency demonstrate a high level of corporate citizenship. With an increase in overall corporate environmental and social responsibility, businesses can reap the benefits of a stronger corporate image, improve public perception and investment attraction.



6.0 Financing Options for Renewable Energy Investments

The main challenge identified with the adoption of renewable energy technology by small and medium scale enterprises (SMEs), is the high initial cost of investing in renewable energy technology such as solar, and its maintenance costs. About 80 percent of the SMEs surveyed by the Africa Centre for Energy Policy (ACEP) identified high initial costs as being the foremost demotivating factor to their adoption of renewable energy. However, there are several options available for small businesses to surmount the initial cost hurdles for investing in renewable energy. These include supplier credit schemes, bank credits or loans.

6.1. Supplier Credit Schemes

Renewable energy technology suppliers can provide credit schemes for businesses. Businesses interested in investing in renewable energy should speak with suppliers as they may already have their own finance options in place or be able to recommend alternative sources of finance. These could be in the form of lease arrangements or power purchase agreements.

6.1.1 Lease arrangements

The lease arrangement offers the opportunity for businesses to use renewable energy technologies without having to make an upfront investment, helping to overcome the barrier of high up-front costs. The supplier who offers the lease (i.e., the lessor) remains the owner of the asset during the lease period. However, several types of leasing options are possible, which differ in ownership and other economic, legal, and fiscal conditions.

There are two main types of leases: operational lease (or operating lease, usually treated as renting) and financial lease (or capital lease, usually treated as a loan). In the case of a financial lease, there is an ownership transfer option at the end of the lease period.



Credit Schemes & Leases are
available for Businesses

6.1.2 Power purchase agreements

The power purchase agreement provides the option for businesses to purchase power directly from an energy service company (ESCO). The company installs and maintains the system and charges a tariff, usually lower than power from the grid. The ESCO owns the renewable energy system over the tenure of the agreement.

6.2 Bank Loans and Credits

The financing of renewable investments (also known as green financing) in Ghana is still developing. However, a few financial institutions have begun offering dedicated green financing products to SMEs. Unlike traditional loans with short terms and high interest rates, these are specifically designed to fund renewable energy investments with relatively longer tenors and better interest rates.

Ecobank Ghana has been declared as the Nationally Designated Authority by the Green Climate Fund (GCF) – a fund established by the United Nations Framework Convention on Climate Change (UNFCCC) - to receive funding from the GCF. It has developed the Accelerating Solar Action Programme (ASAP) aimed at mobilizing concessionary finance to promote the use of solar PV systems in Ghana, with a clear focus on SMEs and households.

Cal Bank also received a grant as part of the Sustainable Use of Natural Resources and Energy Finance (SUNREF) programme, funded by the French Government, implemented by the Agence Française de Development - to provide green credit loans to finance small and medium enterprises in Ghana, for renewable energy and energy efficiency projects. The bank offers a maximum facility amount of up to US\$ 2 million to SME customers for renewable energy projects over a minimum tenure of three years.

Stanbic Bank has also developed sustainable finance solutions and services ranging from green and social bonds, sustainable project finance and loan market solutions to sustainable infrastructure funding, as well as broader strategic, sustainable advisory and support services. It is important to note that these green financing opportunities are expected to increase with the introduction of the Bank of Ghana's guidelines on Sustainable Banking Principles in 2019, which all commercial banks have committed to. The commitment to sustainable financing by the banks will accelerate the development of specialized products for renewable energy investment by individuals and businesses.



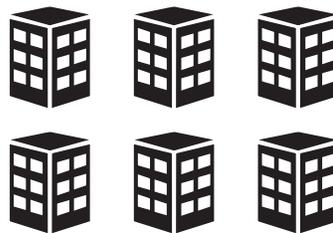
INCREASE OF GREEN FINANCING
OPPORTUNITIES

7.0

Where do I source the system?

The first step to investing in renewable energy is to speak to a renewable energy advisor who can assess a business's energy needs and recommend a suitable renewable energy technology. The AGI-Energy Service Centre currently provides such advisory services for the business community including SMEs in Ghana. You can find them here: <https://esc.agighana.org/#services>

After understanding the business's energy needs and the type of renewable energy technology required, contact a renewable service provider for quotes. In choosing a service provider, it is important to review and verify their certifications, licenses, track record and reputation in the market. The Energy Commission licenses renewable energy service providers and maintains a list of registered 34 companies that install and maintain renewable energy products and services to households and businesses including SMEs in Ghana at: <http://energycom.gov.gh/licensing/licensing-renewable-energy-sector/register-of-licenses>. The AGI-Energy Service Centre also maintains a continuously updated list of renewable energy service providers.



34 registered renewable
Energy Service providers

8.0

Are there operation and maintenance (O&M) costs for RE technologies?

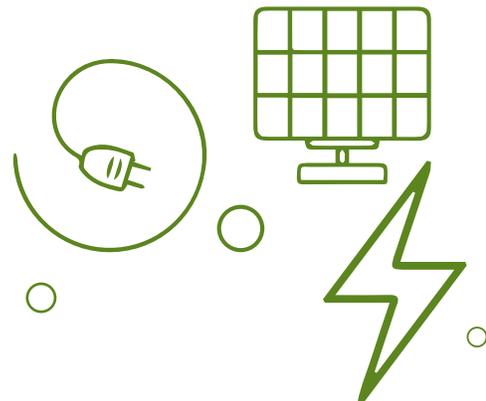
Like every technology, renewable energy systems require periodic maintenance to ensure efficiency, reduce costs of operation and improve availability of the systems. Failure to maintain renewable energy technologies may result in system failures which may warrant the removal of the entire system for replacement or repairs. Like the investment costs, operation and maintenance costs for renewable energy technologies have reduced significantly. These costs are substantially lower than periodic tariff payments under conventional energy technologies.

The warranty for most solar PVs is between 15 to 25 years which ordinarily covers total failure or leakages in the system but excludes any wear and tear over time. It is recommended to perform checks and cleaning on such renewable energy technology per the manufacturing instructions and recommendations from experts/the service providers to ensure maximum output and lifespan of the equipment.

Finally, it is recommended that SMEs engage the services of professional renewable energy operations and maintenance providers to ensure proper functioning and efficiency of the system. Based on the SME's preference, the company can outsource O&M services or internally recruit officers to be trained in the necessary skills.

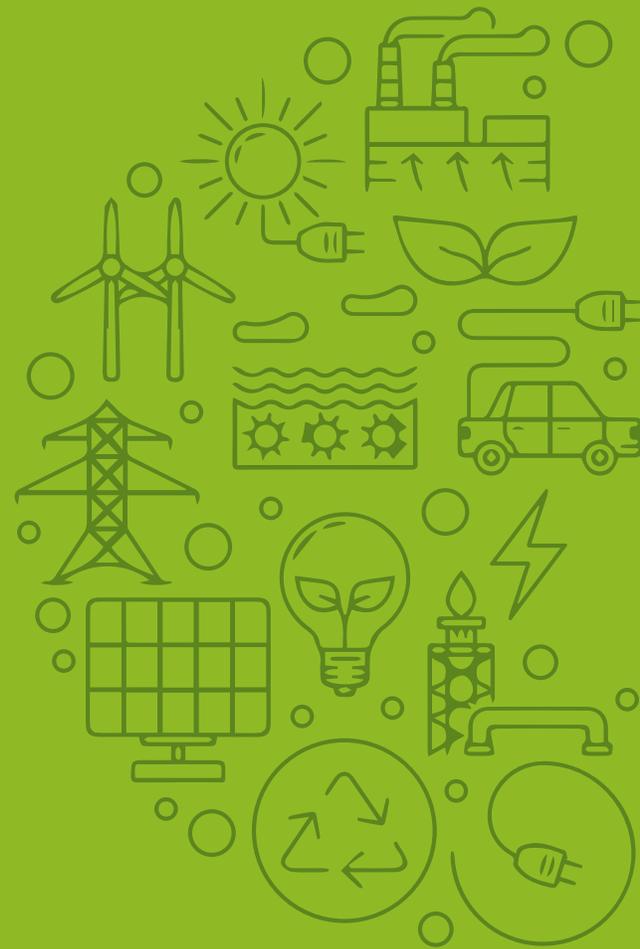
PV warranty

15 to **25** years



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- 4 IRENA (2016). The Power to Change: Solar and Wind Cost Reduction Potential to 2025. International Renewable Energy Agency, Abu Dhabi.
- 5 IRENA (2020). Renewable Power Generation Costs in 2019. International Renewable Energy Agency, Abu Dhabi.
- 6 IRENA Country Rankings (2020). Solar Installed Capacity. Retrieved from: <https://bit.ly/3fPQUo6>
- 7 Renewable Energy Act, 2011 (Act 832).





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