RENEWABLE ENERGY IN AFRICA:

An opportunity in a time of crisis

Ghana

State of electricity

Ghana's rate of electrification is high, at 84%, leaving 5 million people without access to electricity in 2016, according to REN21's 2018 report.[1] The country suffers frequent power outages and an inadequate power supply.[2] In 2017 the main buyer of electricity in Ghana, the Electricity Company of Ghana (ECG), had to be rescued through a concession won by Meralco, the Philippine electricity company and intended to turn around the poor finances of ECG and increase investment in the Ghanaian grid.

Oil and gas provides the majority of Ghana's electricity supply, accounting for a combined 68% of generation in 2017.[3] The remainder mostly comes from hydropower, at risk of low water levels, potentially compounded by climate change.

Renewable energy is largely confined to two utility-scale PV plants. There is an increasing number of (often solar) mini-grids being deployed in off-grid communities. Utility power investment stalled in 2017 and 2018 during a process of reassessment of independent power producer (IPP) power purchase agreements (PPA). These PPAs, signed after 2016 power shortages, were later assessed by government to be at high prices and lacking societal benefits. Ghana has some of the highest power prices in the region, due to an inefficient transmission system, with high losses, and a failure to effectively collect revenue. In March 2018, the government unveiled reduced electricity tariffs for industrial, commercial and residential users, up to 30% lower than the previous rates, and not reflective of the cost of generation and transmission, and so they are heavily subsidised.[4] The population with no electricity access are mostly communities living in remote locations, for example islands in Lake Volta and in isolated lakeside locations.[5]
Only 68.8% of the rural population and 96.8% of the urban population enjoy access to electricity. There are 4.5 million people without access to electricity.

Relevant energy policy for renewable energy

The Ghanaian Strategic National Energy Plan (SNEP) has set a target to increase the country's generation capacity more than twofold from 2.6 GW in 2012 to 5.5 GW by the year 2026.[6] The Renewable Energy Act (832) enacted in 2011 targets a 10% renewable energy share of generation by the year 2020. The Act introduced a renewable energy fund to incentivise development and set up a feed-in tariff for utility-scale grid interconnection. As part of the Act, in 2015, the government launched the Scaling up Renewable Energy Program (SREP) aiming to invest USD 230 million.

The government has a clean energy target of 500 MW, which was to have been commissioned by 2020.[4]

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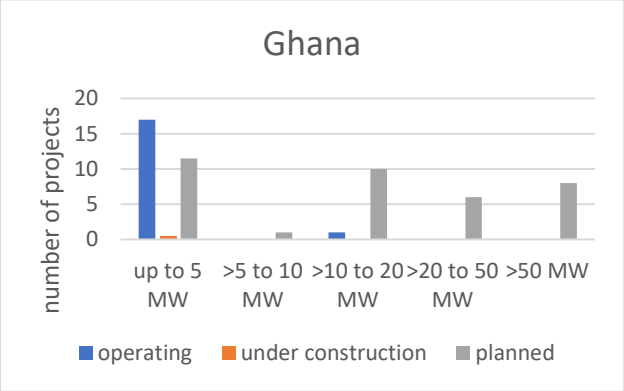
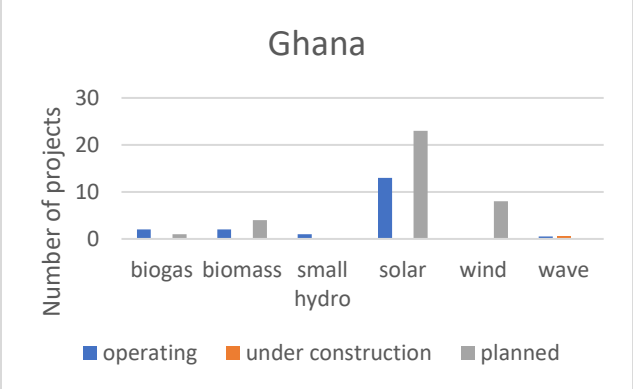
[1] http://www.ren21.net/wp-content/uploads/2017/06/17-8399_GSR_2017_Full_Report_0621_Opt.pdf
[2] https://www.solarplaza.com/channels/markets/11890/solar-facts-figures-africa/
[3] Ghana Energy Commission, 2010. 2018 Energy (Supply and Demand) Outlook for Ghana. Ghana Energy Commission, Accra, Ghana. Accessed at http://www. energycom. gov. gh/planning/data-center/energy-outlook-for-ghana
[4] http://global-climatescope.org/results/gh#power-market
[5] http://documents.worldbank.org/curated/en/576111512382257544/pdf/121824-ESM-GhanaESMAPGhanaTechnicalReportDECclean-PUBLIC.pdf
[6] https://www.iea.org/policiesandmeasures/pams/ghana/name-24513-en.php

The Ministries, Departments and Agencies (MDA) Solar Rooftop Programme aims to install 200 MW of rooftop solar capacity. [7,8] Net metering policy development has stalled, reportedly around questions raised by the Electricity Company of Ghana (ECG).[9] Ghana has a unified national tariff (UNT), so remote rural connections must be heavily subsidised. The graphs below show the scale or ambition of renewable energy, particularly solar and wind projects, being planned.





Distribution of renewable energy projects in Ghana by technology and scale, by stage of development ('operating', 'under construction', or 'planned'). Source: Authors' estimates from African Energy Live database, September 2019. [5]

Potential and ambition

It is considered unlikely that the 500 MW 2020 target (see above) will be realised before 2030 following the reassessment of PPAs, mainly because of the lead time needed for such large-scale implementation. This is at odds with a recent market analysis that 360 MW of PV installation is 'highly possible' over the next five years.[10] Energy security may motivate increased ambition in the light of low water levels in hydropower dams and uncertainty about gas supply costs.

Renewable energy projects

The majority of investment in renewable energy in Ghana has come from foreign sources, with the largest solar project (20 MW) being financed by Chinese investors.

The African Development Bank is currently assessing opportunities to invest in renewables in Ghana and a number of domestic funds are looking to back renewables. The status of the large Nzema Power Station (155 MW) that was originally due to come online in 2015 is uncertain and it is possible that construction has not started.

CASE STUDY: Solar Power in Ghana – The 20 MW Meinenergy PV Plant in Gomoa Onyadze

While the growth in renewables in Ghana is insignificant in global terms, some progress has been achieved. In 2013, only 3 MW came from renewable sources, however, just two years later 43 MW was being generated. Of this, 20 MW is provided by the Meinenergy plant.

[7] https://www.transparency-partnership.net/sites/default/files/u2612/1-the_national_rooftop_solar_programme_ghana_appiah_25.04.17.pdf
[8] https://worldmeetsinghana.com/10-investment-opportunities-in-ghanas-2018-budget/
[9] https://www.solarplaza.com/channels/markets/11890/solar-facts-figures-africa/, https://www.myjoyonline.com/business/2018/june-12th/suspension-of-solar-net-metering-policy-disappointing-agsi.php
[10] https://sun-connect-news.org/fileadmin/DATEIEN/Dateien/New/Intersolar-Solarize-Africa-Market-Report_2019.pdf

The Meinenergy plant is privately owned and provides energy directly to the Ghanaian national grid via the Electricity Company of Ghana (ECG). The plant, which cost Chinese company Beijing Xiaocheng Company (BXC) USD 30 million and was built between 2014 and 2017, is located in the Gomoa Mpota area in Ghana's Central Region. It feeds energy into an ECG sub-station, and provides electricity to four major towns: Winneba, Apam, Swedru and Kasoa.

Residents who receive electricity from the plant note that power is now far more reliable for their homes and businesses. They state that reliable electricity has enabled them to grow their businesses, start new ones, and has resulted in local economic growth.

At a glance:
Construction Company: Beijing Xiaocheng Company (China)
Operated/owner: Meinergy Ghana Ltd
Technology: Solar PV
Size of plant: 20MV
Cost of plant: USD 30 million
Finance: Private
Community Ownership Share: 0%
Operational Date: 2017

The plant occupies 120 acres of land, the release of which was negotiated between the chief and the company. While the chief held three meetings with local community members about the plant, it appears that these meetings were more to tell local people what was happening, than to seek their consent. The loss of the 120 acres of land has caused considerable hardship for many community members who rely on the land for their livelihoods. Over 50 farmers and their families have been negatively impacted as they received no compensation for lost land. For example, Mrs X, a 60-year-old farmer with six children, lost five acres and is now struggling to provide for her family.

Farmers affected by the solar plant

The developer is also facing difficulties. It claims that the government has not paid them for the electricity it has supplied to the grid, plunging the company into debt.

Off-grid

Mini-grids are being considered as a long-term alternative to grid connection for the minority of the population not yet connected to the main grid. There is considerable evidence of mini-grid and off-grid expansion for residential and business users. Power4All estimates that more than 4,000 off-grid solar systems have been distributed in Ghana.[11]

A 2018 study found potential for agricultural waste gasification in the five Ghanaian agricultural communities under research. [12] Results show that the projected electricity demand of the communities compares favourably with the potential energy generation from available agricultural residues, but that, "… as with most biomass electricity analysis, it is not profitable from the perspective of an entrepreneur with 100% private funding; however, by applying a customer tariff equal to the current expenditure on

[11] https://www.powerforall.org/resources/fact-sheets
[12] Arranz-Piera, P., Kemausuor, F., Darkwah, L., Edjekumhene, I., Cortés, J. and Velo, E., 2018. Mini-grid electricity service based on local agricultural residues: Feasibility study in rural Ghana. Energy, 153, pp.443-454. Available at https://upcommons.upc.edu/handle/2117/118057?locale-attribute=en

electricity equivalent uses in the communities, a subsidy of about 35% on initial investment would enable a private entrepreneur an internal rate of return of 15%, whereas a 60% subsidy could enable an internal rate of return of 25%."[13]

A recent case study on the socio-economic impacts of a project implementing solar PV mini-grid electricity supply for rural island communities on the Volta Lake identified a range of experiences and insights. The study reported that the provision of electric light boosted selling activities and extended trading hours in the communities. Some community respondents in the study said that fishing communities would benefit from higher-capacity installations to support applications such as refrigerators for storage, which could help improve the economic conditions of the fishing communities. Community respondents were worried that government intervention in the form of subsidies would be necessary to sustain the electricity services, and thereby the benefits of the mini-grid systems. They identified a likely future issue about how they might recycle and dispose of systems components, such as batteries and PV cells after end-of-life.[14] In terms of benefits further up the value chain, an EnDev (an energy access partnership funded by six European countries) project providing energy access to agriculture and small-scale manufacturing reportedly brought about 1,000 small and medium-sized enterprises (SME) and 3,000 jobs.[15]

Some of the findings outlined in a 2012 report by PwC and the Kumasi Institute for Technology, Energy and Environment (KITE), "Socio-economic study for mini-grid electrification of island communities" include that dry cell battery use is common (85% of households in all communities), and that solar PV uptake is limited (5% of households). There was a majority perception (over 90% of households interviewed) that solar technology provided inferior energy services for the reason that home installations supplied only enough energy for lighting and charging mobile phones.[16]

Local market

Accra-based developer Strategic Power Solutions (SPS) has launched a new PV module manufacturing plant, following a 50 million USD investment, in a commercial hub just outside the country's capital. SPS is a subsidiary of Strategic Security Systems International (3SIL), an independent Ghanaian conglomerate specialising in the procurement of solar products. Ghana's first ever PV manufacturing plant will mainly produce crystalline PV modules at a rate of 30MW per year. Power for All reports that solar-powered internet cafes made out of shipping containers have been built in Ghana.[17]

One report assessed that the macroeconomic climate in Ghana is extremely favourable for foreign investors, taking into account Ghana's long-lasting economic and political stability. Ghana is considered to be a relatively good investment option in terms of political and economic stability, despite the national electricity utility's recent rescue from insolvency.

Visit the report webpage at https://350africa.org/renewable-energy-report.

[13] ibid.
[14] Boateng, E., 2016. The potential socio-economic and environmental impacts of solar PV mini-grid deployment on local communities: A case study of rural island communities on the Volta Lake, Ghana. Available at https://jyx.jyu.fi/bitstream/handle/123456789/49358/URN%3aNBN%3afi%3ajyu-201604182231.pdf?sequence=1&isAllowed=y.
[15] Renewable Energy Benefits: decentralized solutions in the agri-food chain. IRENA, 2016. p.24
[16] PwC and KITE (2012) in http://documents.worldbank.org/curated/en/576111512382257544/pdf/121824-ESM-GhanaESMAPGhanaTechnicalReportDECclean-PUBLIC.pdf
[17] https://www.powerforall.org/resources/fact-sheets