



Federal Ministry
for Economic Affairs
and Energy



REAG
Renewable Energy
Association of Ghana



**MITTELSTAND
GLOBAL**
EXPORTINITIATIVE ENERGIE

REGULATORISCHE RAHMENBEDINGUNGEN DES AKTUELLEN STROMMARKTES IN GHANA

Regulatory Framework of Ghana's Electricity Sector

Enoch Yeboah AGYEPONG

Sustainable Development & Energy Consultant

26.02.2019, Berlin

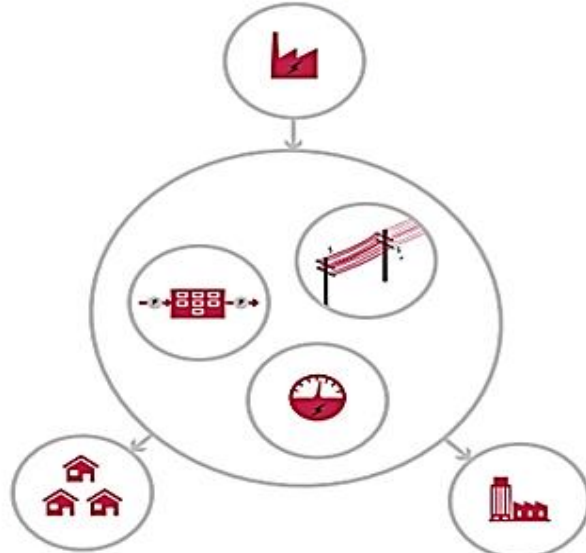


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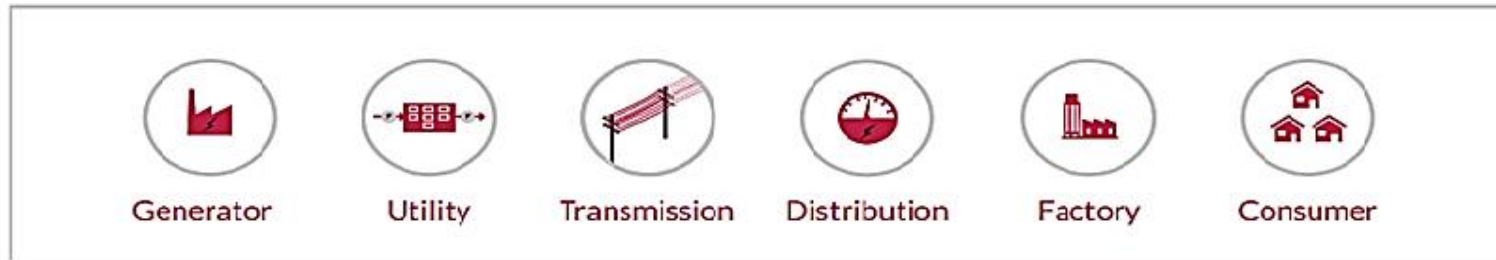
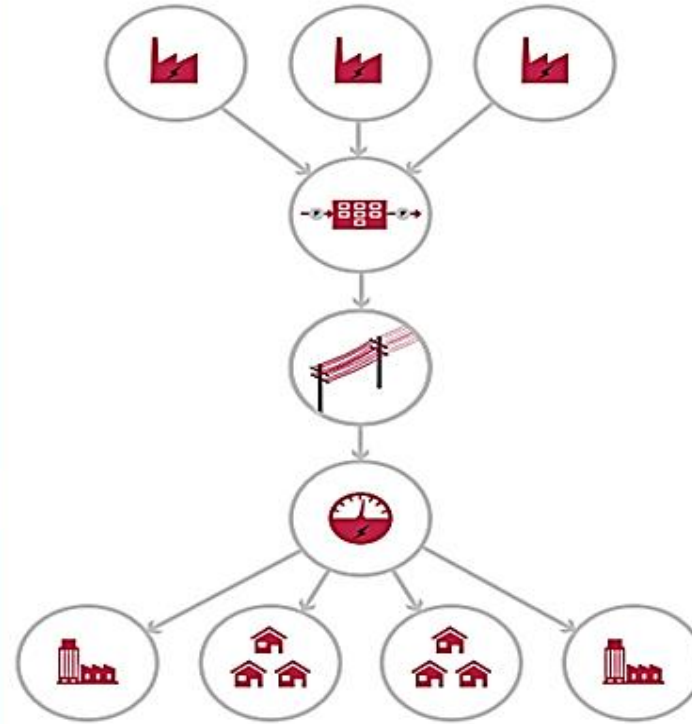
- Ghana Power System
- Electricity Sector Legislation
- RE & EE Commitments
- Prospects
- Final Remarks



Bundled Distribution + Transmission



Unbundled Distribution + Transmission



Ghana Power System

Source: http://cldp.doc.gov/sites/default/files/Understanding_Power_Purchase_Agreements.pdf

GHANA POWER SYSTEM – A CHRONOLOGY

- ❑ **1914** – Electricity supply in Ghana started (@ Sekondi, an isolated stand-alone power station and then extended to various towns.
- ❑ **1920s & 1930s** – small oil-powered plants (supplied Accra, Cape Coast, Koforidua, Kumasi, and Tamale)
- ❑ **1947** – Electricity Company of Ghana (ECG) (at that time, the Electricity Department) took over the responsibility of distribution of power in the entire country from the Public Works Department and the Railway Administration.
- ❑ **1949** – first high-voltage overhead sub-transmission line to be commissioned in the country was an 11 kV line between Accra and Nsawam.
- ❑ **1956** – Ghana's largest power plant just before independence was the Tema Power Station (TPS), commissioned [3 x 650 kW (i.e., 1.95 MW) generating set (gen-set)]

GHANA POWER SYSTEM – A CHRONOLOGY (continued)

- ❑ **1963** – first 161 kV transmission system build (moved Power from TPS to Accra)
- ❑ **1965** – 588 MW hydropower plant (4 units, connected to the 161-kV grid) completed (started 1961), operated by the Volta River Authority (VRA). ~75% power generated in Ghana consumed in Accra & Tema [primarily by Volta Aluminium Company (VALCo), in Tema]
- ❑ **mid 1960s** – TPS' capacity extended to 35.3 MW
- ❑ **1972** – additional hydropower units (2, total capacity of 324 MW) were constructed and commissioned. i.e. total hydropower capacity 912 MW. ECG decommissioned the isolated diesel power stations due to grid-based power supply from VRA. Transmission network was extended to various parts of the country.

GHANA POWER SYSTEM – A CHRONOLOGY (continued)

- ❑ **1977 – 1981** – The third phase of hydropower development in Ghana (a total capacity 160 MW, at Kpong, downstream of the Akosombo Dam on the Volta River). [Ghana’s total hydropower capacity: 1072 MW]

- ❑ **1994** - Power Sector Reforms was initiated by the Government of Ghana - GoG (Key reasons: reduce the increasing pressure on the GoG to secure timely and adequate funding for investment in the power sector, which had started experiencing delays in the implementation of expansion plans. Independent Power Producers (IPPs) expected to bring private sector investment into the energy sector:- increasing the generation capacity to ensure the availability of reliable power supply. Until this time, investments in the sector had been made largely by VRA (a vertically integrated state-owned power generation monopoly) with support from the GoG, mainly through sovereign guarantees.

- ❑ **1997** - In furtherance of the Power Sector Reforms, the Public Utilities Regulatory Act, (Act 538) enacted to establish the Public Utilities Regulatory Commission

GHANA POWER SYSTEM – A CHRONOLOGY (continued)

(PURC), charged inter alia, is to regulate the provision of utility services in the electricity and water sectors.

- ❑ The Energy Commission (EC) was also established [Energy Commission Act, 1997 (Act 541)] to regulate and manage the development and utilisation of energy resources in Ghana as well as to provide the legal, regulatory, and supervisory framework for all providers of energy in the country.

- ❑ **1997** – The EC, under Section 2.2(c) of Act 541, is mandated to “prepare, review and update periodically indicative national plans to ensure that all reasonable demands for energy are met”. The Act also mandates the EC to grant licences for the construction and operation of all transmission, wholesale electricity supply, and distribution assets within the sector and to enforce performance standards (technical and operational rules of practice) of the utilities.

GHANA POWER SYSTEM – A CHRONOLOGY (continued)

First IPP (CMS Generation of Michigan, an American company) to execute a joint venture deal with VRA (90% CMS and 10% VRA) to operate in Ghana's power sector.

- ❑ **2000** – A special purpose vehicle, Takoradi International Company (TICo, now TAQA after CMS sold off its interest in the venture in 2007, to the Abu Dhabi National Energy Company) was founded to operate the first 220-MW simple cycle thermal power plant built at Aboadze, Takoradi

- ❑ **2007** – Hydropower development in the country continued (3 units, with total capacity of 400 MW, on the Black Volta at Bui, Commissioned in 2013) – [Ghana's total hydropower capacity: 1472 MW]

- ❑ **2010** – The second IPP (a 200-MW combined cycle power plant by Sunon Asogli, owned by the Shenzhen Group of China), came on line.

GHANA POWER SYSTEM – A CHRONOLOGY (continued)

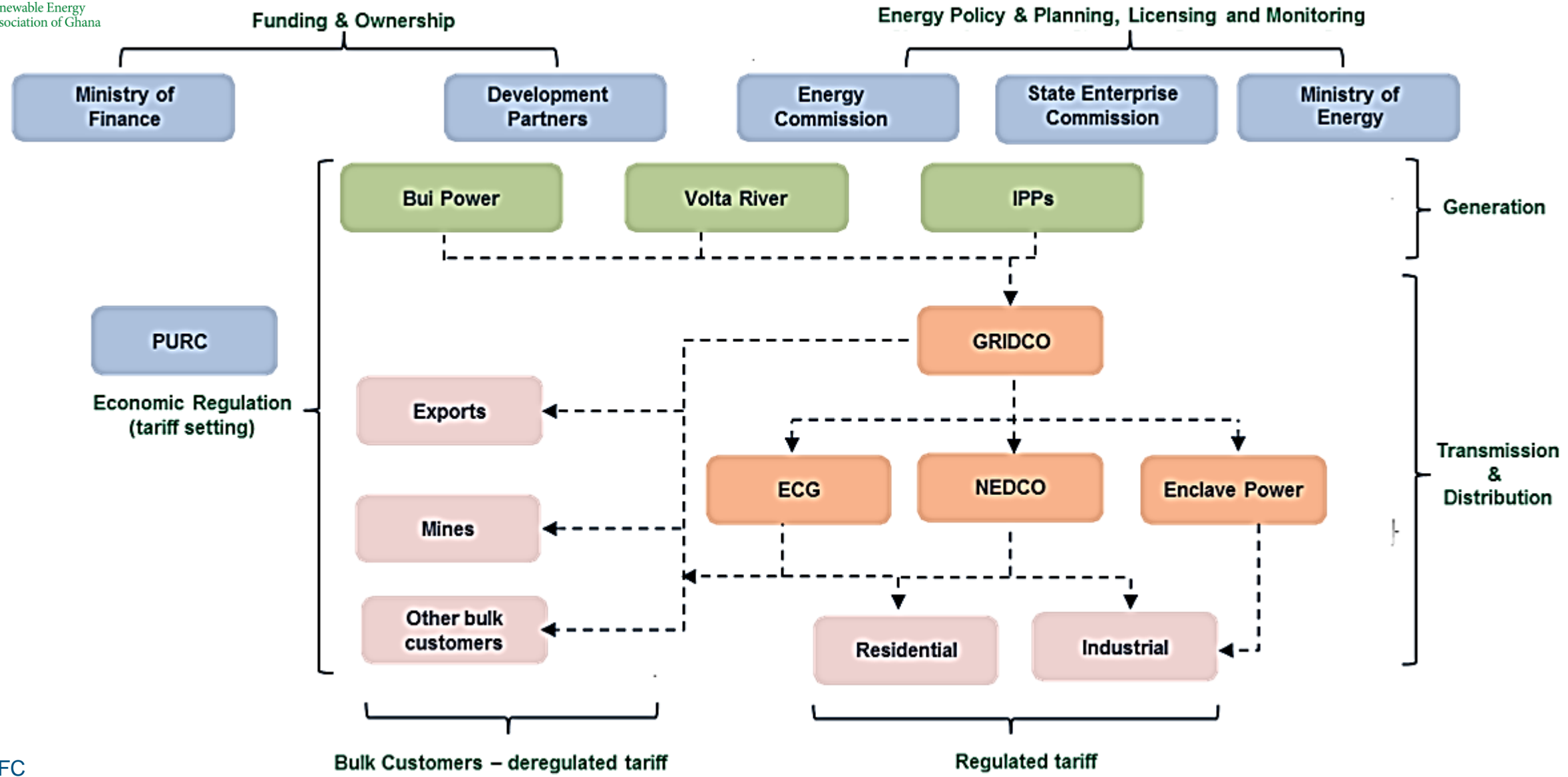
- ❑ **2011** – Renewable Energy (RE) Act 832 enacted. Regulation to provide for the development, management and utilisation of renewable energy sources for the production of heat and power in an efficient and environmentally sustainable manner and to attract investment in renewable energy sources.
- ❑ **2015** – TAQA plant (owned by the Abu Dhabi National Energy Company) has been expanded to a 330-MW combined cycle power plant with the addition of heat recovery steam generation (HRSG) and steam power generation plants.
- ❑ **2016** – Entry into Force (EIF) of the Power Compact. GoG & USG 5yr Economic Growth interventions and Sector Reforms by Millennium Development Authority (MiDA) & Millennium Challenge Cooperation (MCC). Portfolio include Financial and Operational Turn Around Projects for ECG and NEDCo; Regulatory Strengthening and improvement/transparency in Tariff/Rate Making Processes; Energy Efficiency and Demand Side Management (Standards and Labels, LIs, Test Centers, Audits and Retrofits) & Access (markets and economic enclaves).

GHANA POWER SYSTEM – A CHRONOLOGY (continued)

- ❑ **2017** – Ghana’s Power System consisted of a number of hydropower and thermal plants [owned by the VRA, Bui Power Authority (BPA), and six IPPs [TICo, Sunon Asogli, CENIT (a special purpose vehicle created to develop the IPP), AKSA, Karpowership and Ameri] with a total net dependable capacity of 3,971 MW as of December 2017, together with an embedded generation of 167.5 MW (Trojan at a total of 115 MW; BXC Solar at 20 MW; Navrongo Solar at 2.5 MW; and Genser (supplies power to the Chirano mines) at 30 MW)]

- ❑ **2017** – the country had three (3) additional IPPs under construction: Cenpower, Amandi, and Early Power (which are expected to bring in up to 700 MW of additional generation). PPAs are under negotiation.

- ❑ **2019** – Power Distribution Services (PDS) is expected – under the Power Compact, to invest in, manage and operate the Distribution Network as a Private Sector Participant under a 20yr Concession Arrangement with the GoG, in ECG’s service area.

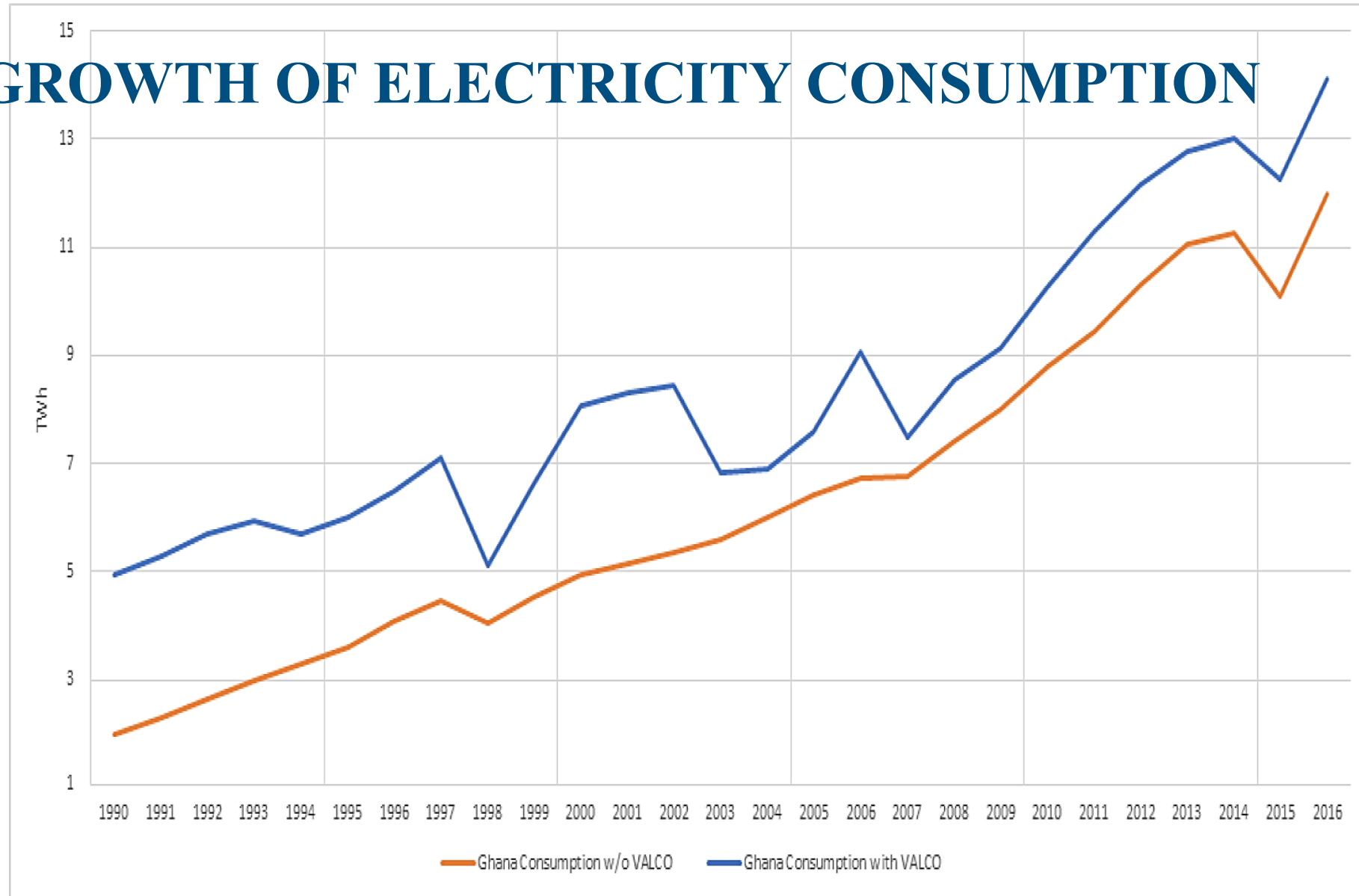


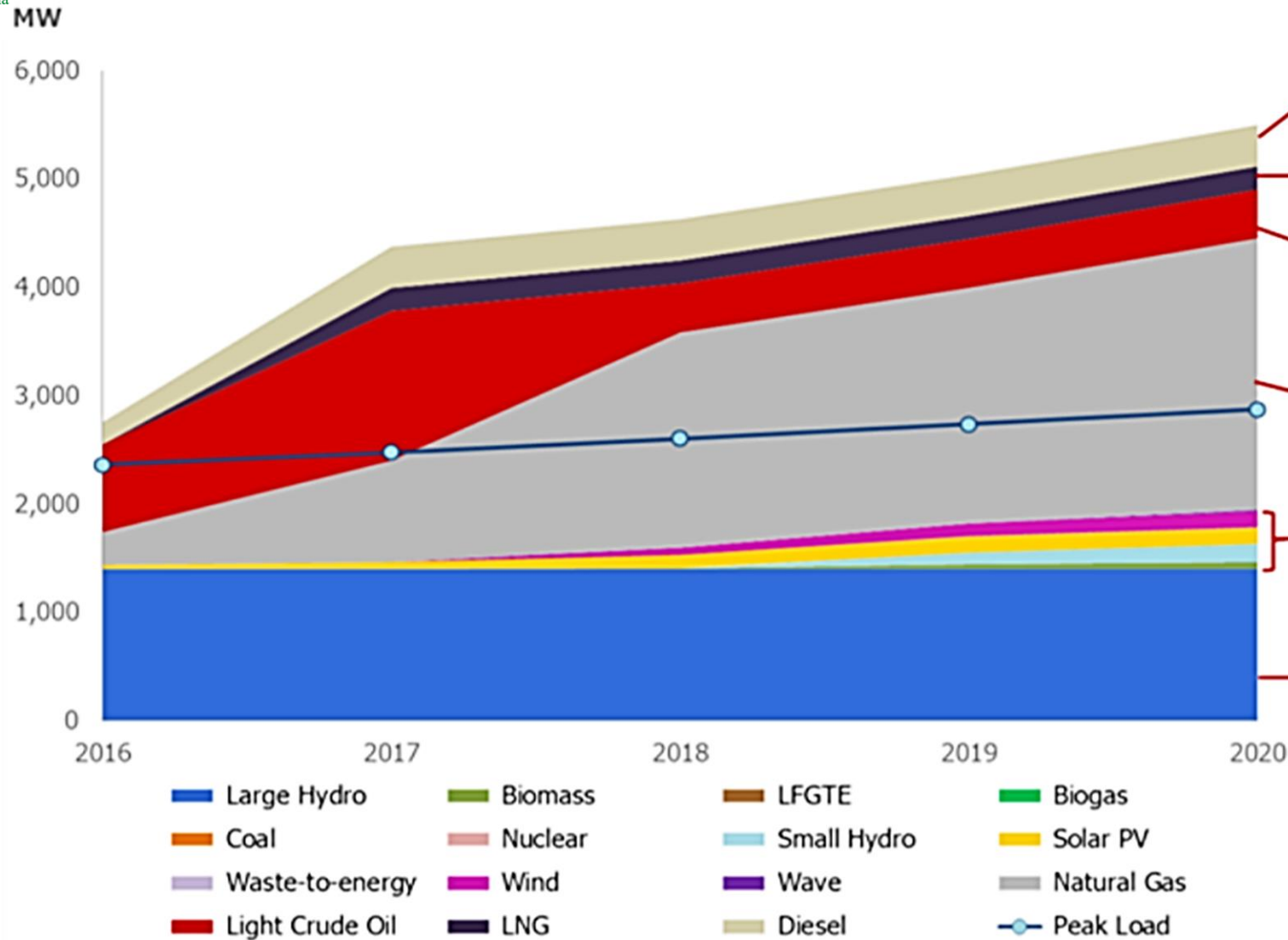
Source: IFC

HISTORICAL GROWTH OF ELECTRICITY CONSUMPTION IN GHANA

Graph showing consumption growth of electricity in Ghana (with and without VALCO) over the past 26 years.

[From 2007 to 2013, the growth rate for domestic demand was about 10%; however, this high growth rate was affected by supply challenges that hit the sector from 2013 to 2016. A key issue, therefore, is how the demand will grow in the future.]





Diesel / 383 MW
266 MW (existing) 176 MW (2017)

LNG / 212 MW (2017)

Light Crude Oil / 500 MW
Progressive commissioning/
decommissioning

Natural Gas / 2507 MW
808 MW (existing) Rest
progressive commissioning

RE / 545 MW
25 MW (existing)

Large Hydro / 1404 MW
all (existing)

Source: Castalia for GZ & GoG (2015)

T:

In Ghana, generating units are evacuated

- ❑ through a transmission network with a total length of approximately 5200 km
- ❑ with voltage levels spanning
 - 69 kV (213 km),
 - 161 kV (4950 km),
 - 225 kV (73 km), and
 - 330 kV (374 km)
- ❑ terminating at 68 bulk supply substations (BSPs).

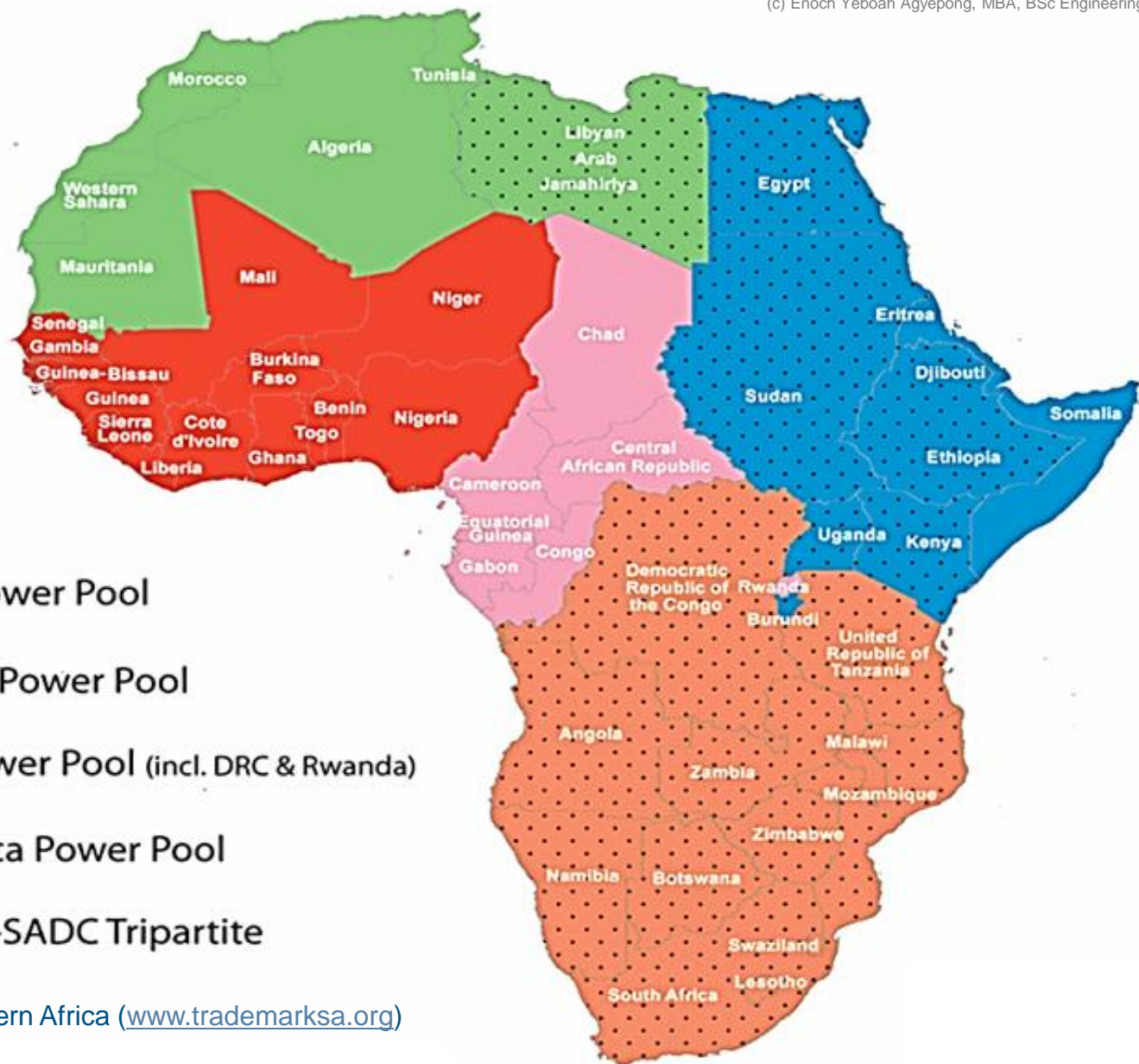
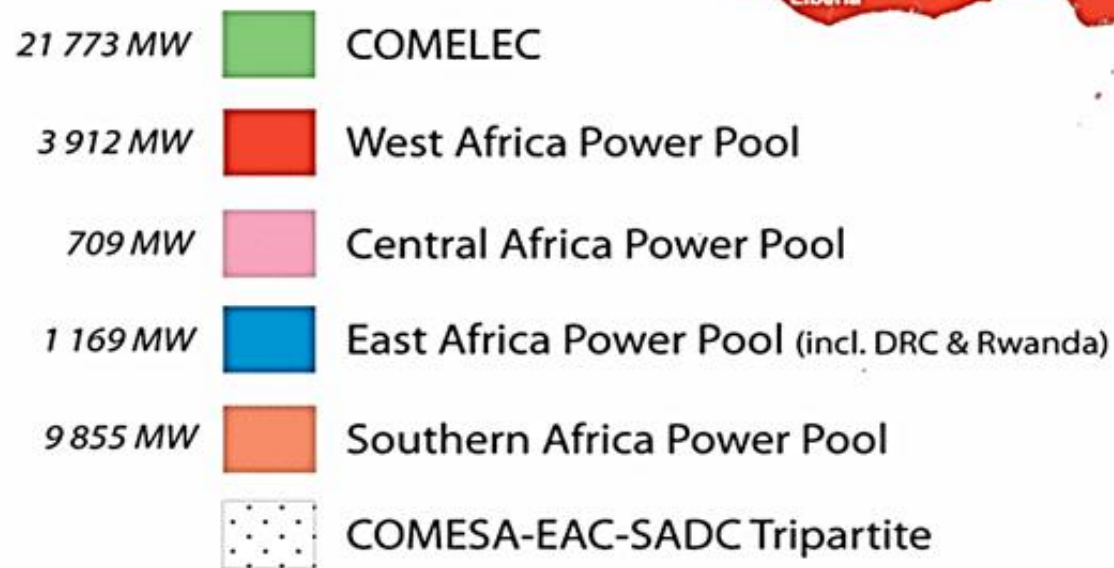
The total transformer capacity as of 2016 is approximately 5000 MVA.

The national grid is interconnected with those of three (3) neighbouring countries, Togo/Bénin (CEB), Cote d'Ivoire (CIE), and Burkina Faso (Sonabel)

WEST AFRICA POWER POOL (WAPP)



AFRICAN POWER POOL



Source: Southern Africa Power Pool (www.sapp.co.zw) ; Map by TradeMark Southern Africa (www.trademarksa.org)

D:

Ghana's distribution companies & others

[% of the total electricity consumed annually]

❑ Electricity Company of Ghana (ECG)	[71%]
❑ Northern Electricity Distribution Company (NEDCo)	[9%]
❑ Enclave Power Company (EPC)	[1%]
❑ Other bulk customers	[19%]

(some industrial customers, mining companies, hotels, etc.)

- ECG operates, approximately, 20,000 km of 33 kV lines | 20,469 km of 11 kV lines | and 68,018 km of 415 V of distribution lines.
- NEDCo, on the other hand, operates 12,682 km of medium-voltage and 16,490 km of low-voltage network.
- According to the Ghana Energy Development and Access Project (GEDAP) electricity access in the Ghana (as of the December 2017) – estimated at a national average of 84.15%.

Electricity Sector Legislation



Federal Ministry
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AHK

Delegation der Deutschen Wirtschaft
in Ghana
Delegation of German Industry and
Commerce in Ghana

giz

Deutsche Gesellschaft
für Internationale
Zusammenarbeit (GIZ) GmbH



renac
renewables academy

GHANA ELECTRICITY SECTOR – KEY LEGISLATIONS

Summary of Objectives, Purpose/ Scope

Electricity Transmission (Technical, Operational, and Standards of Performance) Rules, 2008 (LI 1934)

These rules define NITS and establish the requirements, procedures, practices, and standards that govern the development, operation, maintenance, and use of the high-voltage NITS.

These rules shall apply to the Electricity Transmission Utility (ETU) and persons connected to the transmission system including:

- (a) Wholesale electricity suppliers licensed by the Commission,
- (b) Electricity distribution utilities licensed by the Commission, and
- (c) Bulk customers of electricity duly authorised by the Commission.

The Electricity Transmission Utility (ETU), as the independent operator of the transmission system, is not a grid participant.

GHANA ELECTRICITY SECTOR – KEY LEGISLATIONS

Summary of Objectives, Purpose/ Scope

Electricity Transmission (Technical, Operational, and Standards of Performance) Rules, 2008 (LI 1934) (continued)

A grid participant is a person who has a valid connection agreement (CA) with the ETU to:

- (a) Construct, own, and connect a facility to the transmission system infrastructure;
- (b) Inject, wheel, or off-take power for its own use or for retail;
- (c) Provide ancillary services; or
- (d) Exchange power either with the electricity networks of neighbouring countries or within the West African Power Pool.

GHANA ELECTRICITY SECTOR – KEY LEGISLATIONS

Summary of Objectives, Purpose/ Scope

Electricity Supply and Distribution (Standards of Performance) (LI 1935)

The regulations apply to electricity supply and distribution utilities licensed by the Commission. These regulations define the “electricity supply and distribution utility” as a person licensed under the Act to distribute and sell electricity without discrimination to consumers in an area or zone designated by the Commission.

The regulations also provide performance benchmarks for electricity supply and distribution in conformity with the provisions of Electricity Supply and Distribution (Technical and Operational) Rules, 2005 (LI 1816).

GHANA ELECTRICITY SECTOR – KEY LEGISLATIONS

Summary of Objectives, Purpose/ Scope

Electricity Regulations (LI 1937)

These regulations provide guidance to the planning, expansion, safety criteria, reliability and cost-effectiveness of the NITS, regulate the WEM, the technical operations of the ETU; define the minimum standards and procedures for the construction and maintenance of facilities and installations; the protection of electrical installations and services; life, property and the general safety of the public in respect of electricity services; define the minimum reserve margins to satisfy demand and the development and implementation of programmes for the conservation of electricity.

GHANA ELECTRICITY SECTOR – KEY LEGISLATIONS

Summary of Objectives, Purpose/ Scope

Electricity Supply and Distribution (Technical and Operational) Rules, 2005 (LI 1816)

These rules provide technical and operational guidance for services in the standard voltage range of 230 V – 34.5 kV.

The guidance is provided under five main technical and operational areas of:

- § Supply and Metering of Electricity (Rules 1 – 7)
- § Quality of Supply of Electricity (Rules 8 – 14)
- § Electricity Interruption (Rules 15 – 19)
- § Electricity Billing (Rules 20 – 22)
- § Bill Payment (Rules 23 – 44)

GHANA ELECTRICITY SECTOR – KEY LEGISLATIONS

Summary of Objectives, Purpose/ Scope

National Electricity Grid Code of Ghana, 2009

The purpose and scope of the National Electricity Grid Code is to ensure the coordinated operation of the high-voltage NITS within Ghana, for the provision of fair, transparent, non-discriminatory, safe, reliable, secure, and cost-efficient delivery of electrical energy. It establishes the requirements, procedures, practices, and standards that govern the development, operation, maintenance, and use of the high-voltage transmission system in Ghana.

The Grid Code describes the responsibilities and obligations associated with all the functions involved in the supply, transmission, and delivery of bulk electric power and energy over the NITS, including the functions of the ETU, a NITS asset owner, a wholesale supplier, a distribution company, and a bulk customer.

GHANA ELECTRICITY SECTOR – KEY LEGISLATIONS

Summary of Objectives, Purpose/ Scope

Renewable Energy Act 832

The purpose for this regulation is to provide for the development, management and utilisation of renewable energy sources for the production of heat and power in an efficient and environmentally sustainable manner and to attract investment in renewable energy sources.

GHANA ELECTRICITY SECTOR – KEY LEGISLATIONS

Summary of Objectives, Purpose/ Scope

Public Utilities Regulatory Commission Act 538

This Act provides for the establishment of a PURC to regulate and oversee the provision of utility services by public utilities to consumers and to provide for related matters.

The functions of the PURC include, among others:

- § Develop guidelines on rates chargeable for provision of utility services;
- § Examine and approve rates chargeable for provision of utility services;
- § Protect the interest of consumers and providers of utility services;
- § Monitor standards of performance for provision of services, and conduct investigations on quality of service; and
- § Promote fair competition among public utilities

GHANA ELECTRICITY SECTOR – KEY LEGISLATIONS

Summary of Objectives, Purpose/ Scope

Energy Commission Act 541

This Act establishes an Energy Commission and defines its functions relating to the regulation, management, development and utilisation of energy resources in Ghana. The primary objective of the Energy Commission is to regulate and manage the utilisation of energy resources in Ghana and coordinate policies in relation to them. The functions of the Energy Commission include, among others:

- § Recommend national policies for the development and utilisation of indigenous energy resources;
- § Advise the minister on national policies for the efficient, economical, and safe supply of electricity, natural gas, and petroleum products having due regard to the national economy;
- § Prepare, review, and update periodically indicative national plans to ensure that all reasonable demands for energy are met;

GHANA ELECTRICITY SECTOR – KEY LEGISLATIONS

Summary of Objectives, Purpose/ Scope

Energy Commission Act 541 (*continued*)

§ Secure a comprehensive data base for national decision-making on the extent of development and utilisation of energy resources available to the nation;

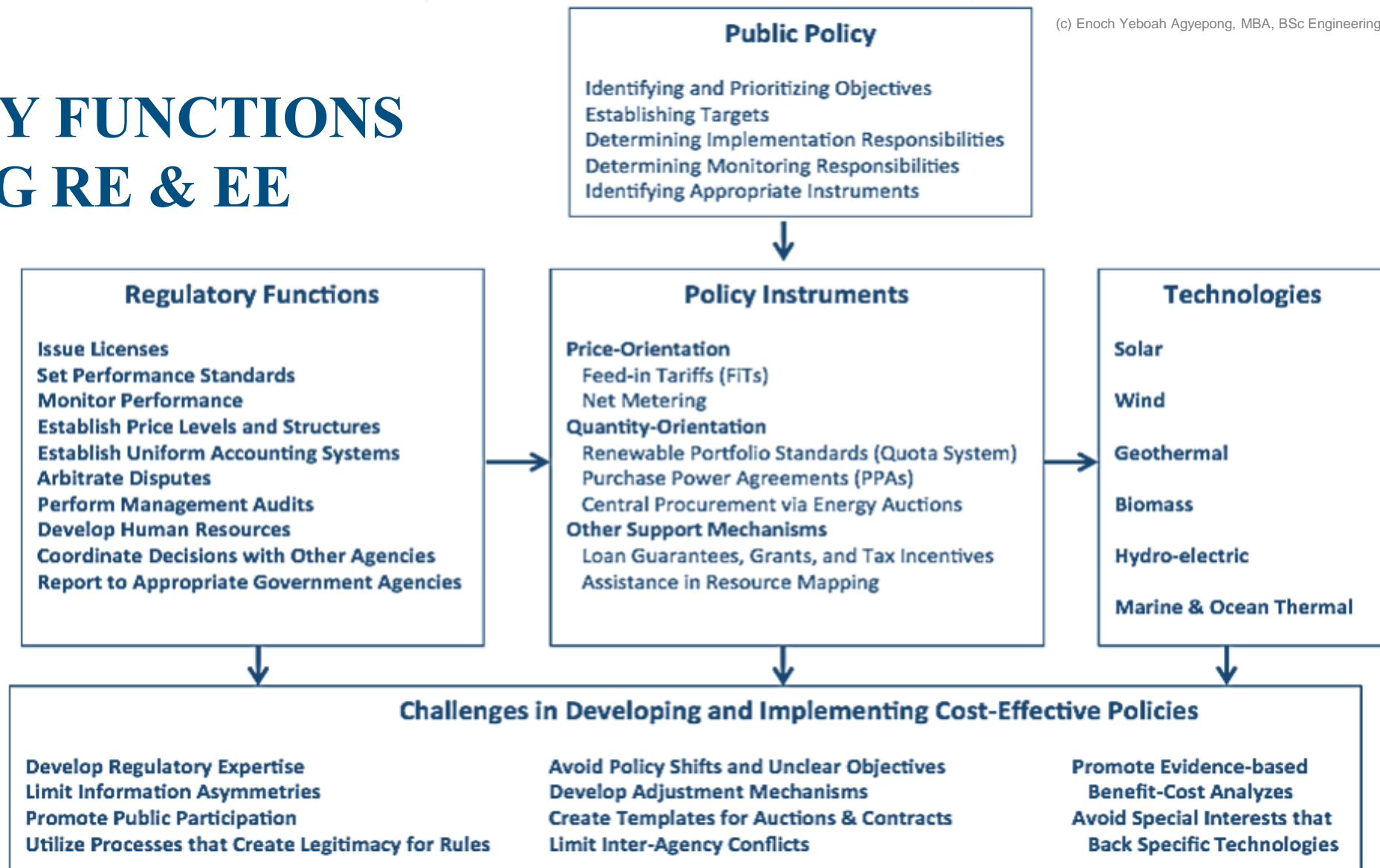
§ Receive and assess applications, and grant licenses to public utilities for the transmission, wholesale supply, distribution, and sale of electricity and natural gas;

§ Establish and enforce, in consultation with PURC, standards of performance for public utilities engaged in the transmission, wholesale supply, distribution and sale of electricity and natural gas;

§ Receive and assess applications, and grant licenses for the refining, storage, bulk transportation, marketing and sale of petroleum products; and

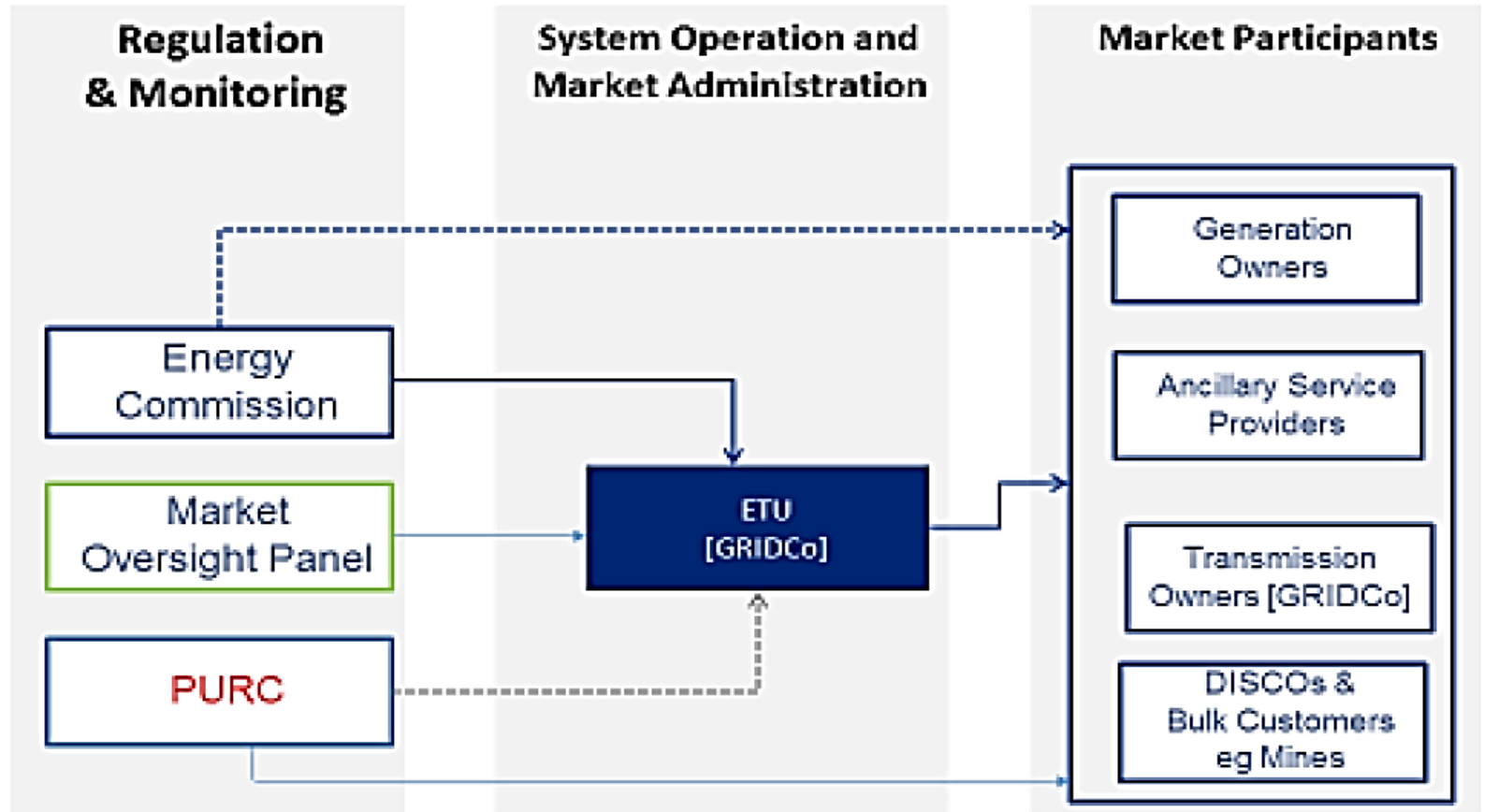
§ Promote competition in the supply, marketing and sale of petroleum products.

REGULATORY FUNCTIONS INFLUENCING RE & EE

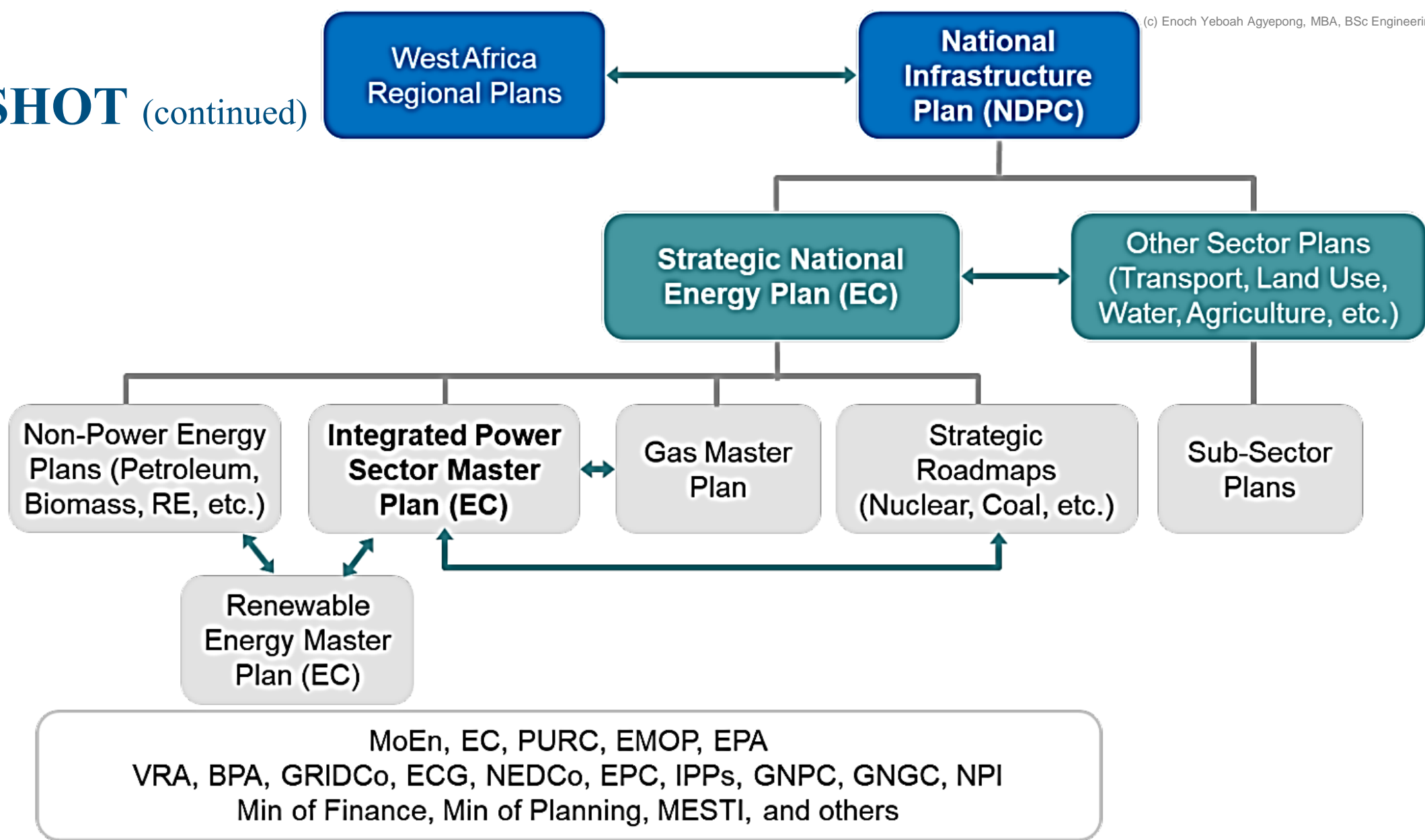


Source: Sanford Berg, Regulatory Functions Affecting Renewable Energy in Developing Countries, the Electricity Journal, 2013

SNAPSHOT



SNAPSHOT (continued)



NATIONAL ENERGY POLICY

The policy is defined by the Ministry of Energy (MoEn), with advice and counsel from the Energy Commission (EC), which acts in both a policy formulation and regulatory role. Current energy policy is guided largely by the National Energy Policy of 2010, and provides the following:

- ❑ An overview of existing objectives and priorities, problems, & measures to address the problems;
- ❑ Calls for encouraging RE in the national energy mix through pricing and fiscal incentives;
- ❑ Recommends using waste to energy to generate low-cost electricity, as well as sustainable waste management;
- ❑ Outlines GoG's attempt to encourage energy efficiency, including fiscal incentives, awareness creation, institutional and human resource capacity development, and financial intermediation; and
- ❑ Mainstreams gender concerns in the energy sector with a particular focus on improving cook stoves.

NATIONAL ENERGY POLICY (continued)

The Government intends that the Policy guide its efforts in achieving its objectives to:

- ❑ Secure long term fuel supplies;
- ❑ Reduce technical and commercial losses;
- ❑ Achieve universal access to modern energy by 2020;
- ❑ Improve the overall management, regulatory environment, and operation of the energy sector;
- ❑ Ensure cost recovery tariffs for energy supply and delivery;
- ❑ Encourage private sector participation in the sector through a Wholesale Electricity Market;
- ❑ Diversify the national energy mix by promoting renewable energy sources, nuclear and coal; and
- ❑ Achieve its vision of Ghana becoming a net electricity exporter by 2015.

NATIONAL ENERGY POLICY (continued)

In pursuit of its policy objectives, the Government has developed a number of strategies and plans, the most significant of which are:

- ❑ The Energy Sector Strategy and Development Plan (2010);
- ❑ The National Electrification Scheme;
- ❑ The Self-Help Electrification Project;

In addition, the Government has signed on or agreed to international initiatives such as the ECOWAS Renewable Energy Policy and the Sustainable Energy for All (SE4All) program. In the same vein, the Government also passed its own Renewable Energy Act in 2011.

EXCEPTS OF REACT PROVISIONS

Provides the fiscal incentives and regulatory framework to encourage private sector investment.

Key Provisions includes:

- **Feed-in-Tariff Scheme** under which electricity generated from renewable energy sources would be offered a guaranteed price.
- **Purchase Obligation (*Opportunity)** under which power distribution utilities and bulk electricity consumers would be obliged to purchase a certain percentage of their energy required from electricity generated from renewable energy sources
- **Net Metering** (distributed generation) under which RE generated on site may be delivered to the local utility to offset the cost of electricity provided by the utility

EXCEPTS OF RE ACT PROVISIONS (continued)

- ❑ **Off-grid Electrification** – promote Mini-grid and stand-alone RE systems for remote off-grid locations;
- ❑ **Woodfuels** – Promote efficient production and utilization of woodfuel use for cooking;
- ❑ **Renewable Energy Fund** to provide incentives for the promotion, development and utilization of renewable energy resources;
- ❑ **Establishment of Renewable Energy Authority** to own, implement and manage renewable energy assets on behalf of the State (particularly for off grid electrification);
- ❑ **Licensing regime** for commercial RE service providers;
- ❑ **RE Business Fund** to promote public private partnerships.

RENEWABLE ENERGY POLICY STRATEGY

- ❑ Increase the contribution of RE source (including hydro, solar, biomass and wind) by 10% for grid, mini grid and off-grid applications; by 2020.
- ❑ Reduce share of combustible renewables (woodfuel) in total energy mix to levels below 50%
- ❑ Use of clean cooking fuel alternatives e.g. LPG and efficient woodfuel cookstoves.

RENEWABLE ENERGY POLICY STRATEGY (continued)

Potential Renewable Energy Projects	Target	Required Investment US\$ million
Development of utility type wind farms	50-150 MW	300-550
Development of grid-connected solar parks	N.A.	400-700
Solar lantern promotion	2 million units	150-200
Medium – small hydro	150-300 MW	450-900
Modern biomass /waste to energy	20-50 MW	60-150
Development of mini-grid	30-42 units	21 - 38.5
Off-grid renewable energy project	30,000 units	10-25
Sustainable energy for cooking	2.0 million units	10-50
TOTAL Investments		1.4 - 2.6 billion

Source: Ministry of Power, Ghana, 2015

GH – INDC

Ghana's intended nationally determined contribution
(INDC) and accompanying explanatory note



RE & EE Commitment



Federal Ministry
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in Ghana
Delegation of German Industry and
Commerce in Ghana



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renac
renewables academy

GHANA'S INTEGRATED POWER SYSTEM MASTER PLAN (IPSMP)

IPSMP is to develop “a resilient power system to reliably meet Ghana’s growing power demand in a cost-effective manner that supports the country’s sustainable development”.

The specific objectives that define the course to realising this vision are:

- ❑ Achieve cost-competitiveness in power generation and delivery;
- ❑ Reliably meet local demand and exports in a timely manner;
- ❑ Increase resilience of the power system;
- ❑ Ensure positive economic impacts through job creation and GDP growth;
- ❑ Meet Ghana’s local environmental and climate change commitments;
- ❑ Promote and implement sustained energy efficiency and demand-side management (DSM) programmes; and
- ❑ Support secondary objectives beyond current universal access goals (e.g., productive uses of electricity, household-level connection, mini-grids).

GHANA ELECTRICITY SECTOR – KEY LEGISLATIONS

Energy efficiency measures could reduce power demand by nearly 7% in 2030, purely due to customers making economic decisions to save money by deploying energy efficient lighting, air-conditioners, and industrial motors. Increased efficiency reduces consumer costs and engenders a more productive economy.

Continue to promote energy efficiency uptake to save consumer costs in the street lighting, commercial, industrial, and residential sectors through consumer awareness, access to low-cost finance, and implementation and enforcement of standards and building codes.

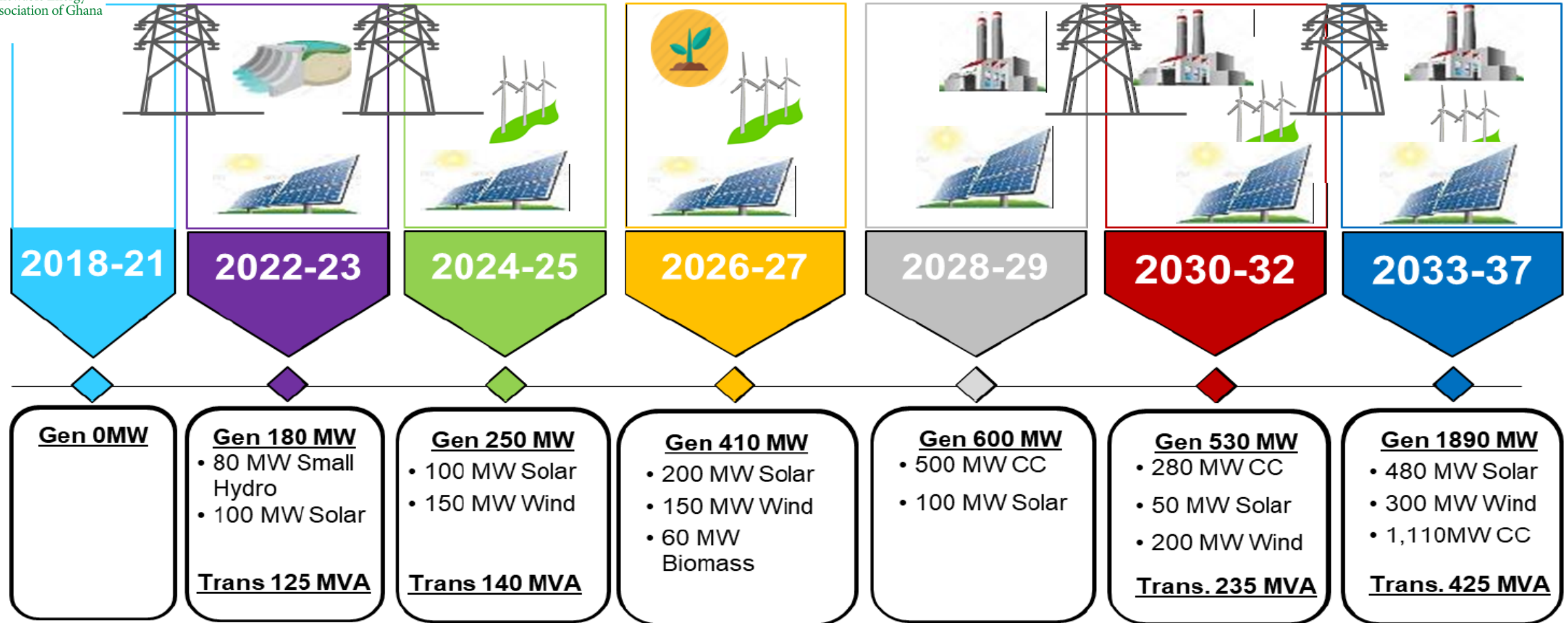
Assess demand growth, taking into consideration the impact of Energy Efficiency (EE) and Demand Side Management (DSM), for the next IPSMP update (in 2019) to determine the specific timing for new conventional power plants.



Prospects

Source: <http://www.upwindayitepa.com/ghana-wind-energy/news/messages/GWD-2016.php>

Global Wind Day 2016/ 1 drawing from more than 1000 students from 20 schools invited to submit their drawings on the topic "Wind Energy for Ghana"

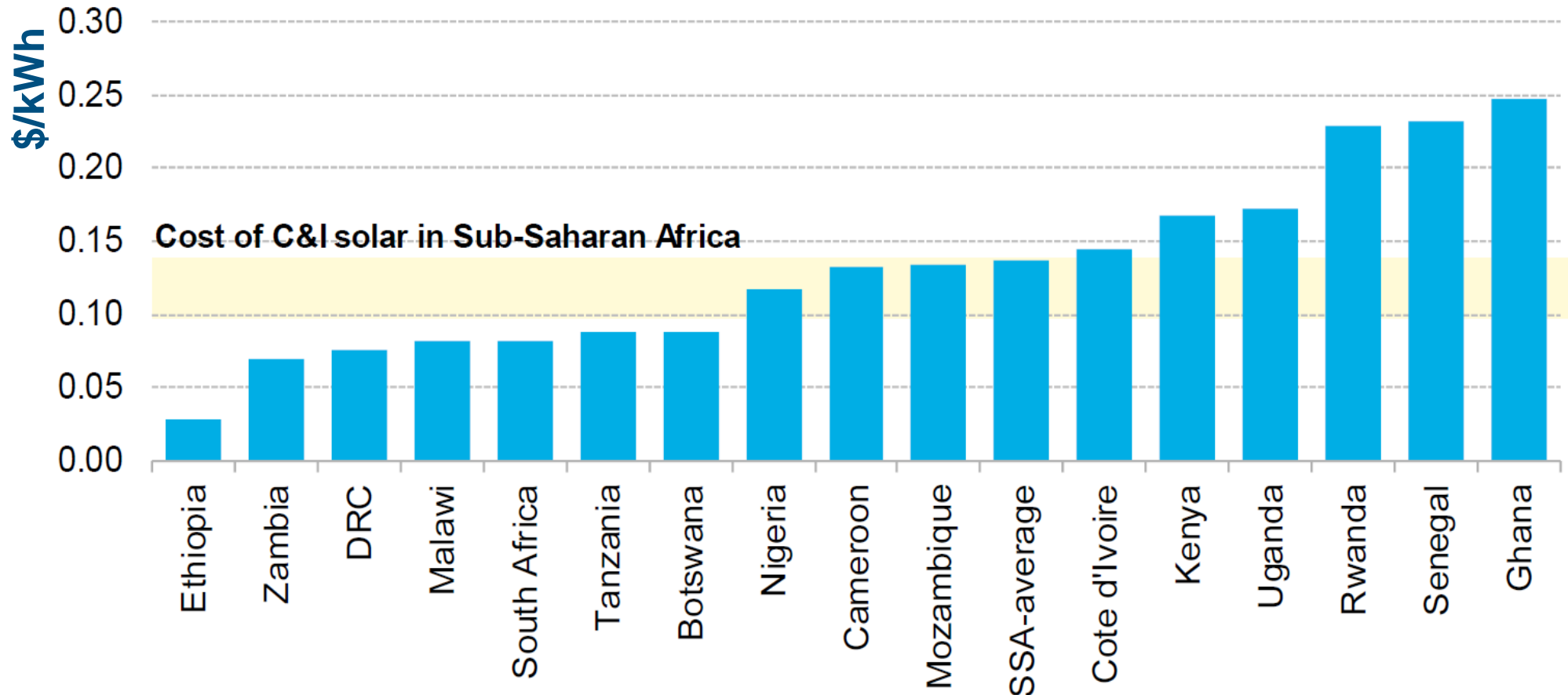


Assumptions: No renewable energy targets; 90% of Sankofa (Take-or-Pay) and 100% of Jubilee & TEN production must be consumed;
Weighted Avg. Annual Gas Cost for Power: \$8.1/MMBtu (2018); \$8.3/MMBtu (2020); \$8.5/MMBtu (2025); \$9.0/MMBtu (2030); \$9.8/MMBtu (2035)
Reference Annualized Costs (2016\$): Solar 2022: 8.9 USc/kWh; Solar 2026: 8.5 USc/kWh; Solar 2030: 8.0 USc/kWh; Solar 2035: 7.5 USc/kWh
 Wind 2024: 9.1 USc/kWh; Wind 2026: 8.7 USc/kWh; Win 2035: 8.2 USc/kWh; Small Hydro: 17.5 USc/kWh; Biomass: 14.7 USc/kWh; CC 2028: 8.6 USc/kWh

Source: ICF, Energy Commission [Least Regrets Generation and Transmission (Reference Case Demand)]

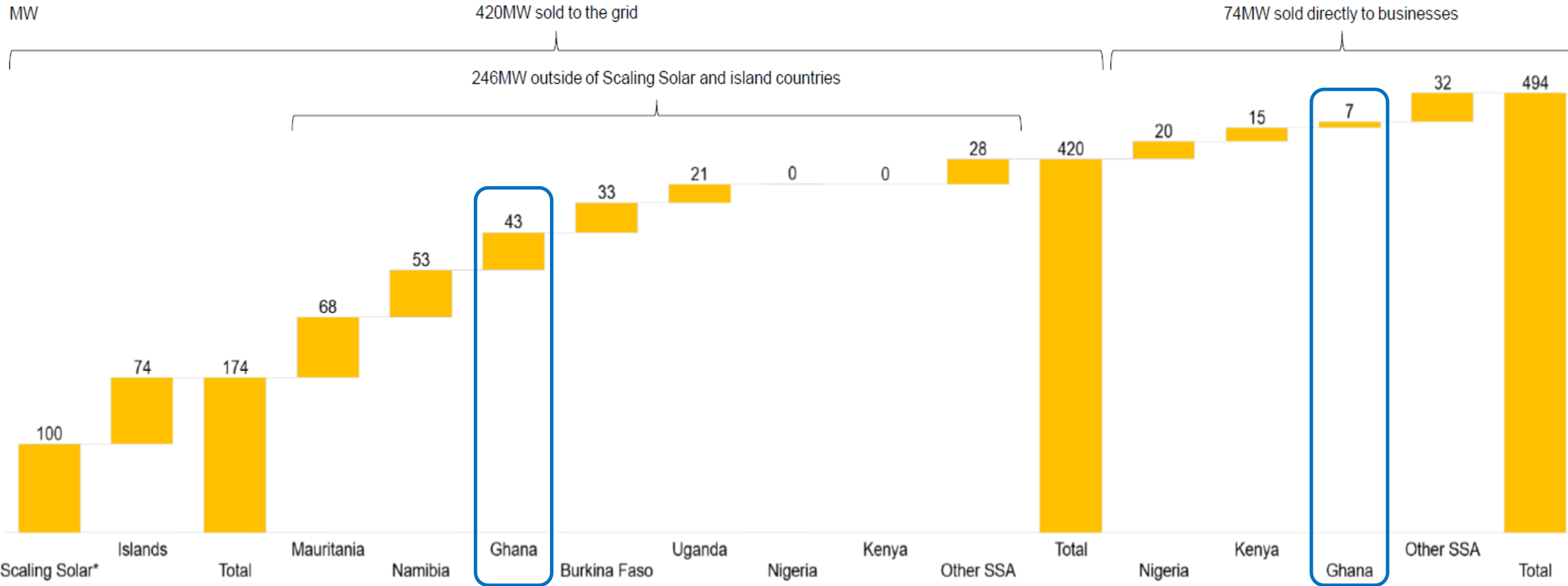
COMMERCIAL GRIDS AND COST RANGE OF C&I SOLAR IN SUB-SAHARAN AFRICA

Cost of C&I solar can be lower than grid electricity in some countries.



Source: BloombergNEF, Climatescope, World Bank. Note: Tariffs for Ghana are as of April 2018. The range of C&I solar cost estimates for Kenya, Ghana and Nigeria.

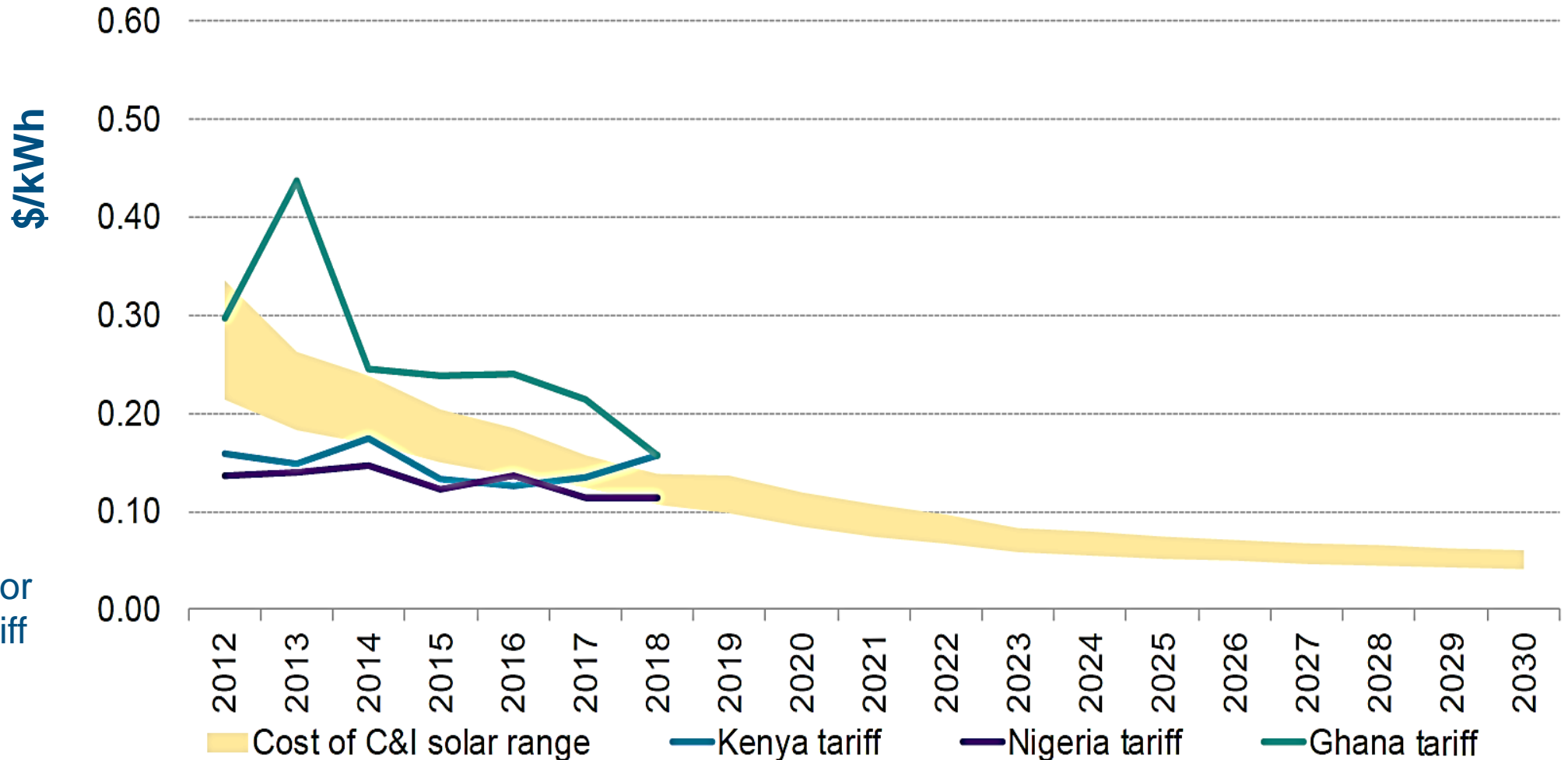
*UTILITY SCALE SOLAR POWER PLANTS



Source: BloombergNEF. Note: As of December 2018. Islands include Reunion, Mauritius and Cape Verde. Scaling Solar refers to a suite of World Bank Group services supporting solar power projects in Zambia, Senegal, Ethiopia and Madagascar.

SOLAR PV LCOE – COMMERCIAL

Solar allows customers to lock in a fixed or predictable tariff for years.



Source: Source: BloombergNEF. Note: PV LCOE range is a range of mid-scenario LCOE of Kenya, Nigeria and Ghana.

ENERGY PROJECTIONS – RESIDENTIAL SECTOR

❑ Electricity demand for the residential Sector is expected to exceed:

- 24,000 Gigawatt-hours for high economic growth, by 2020;
- The sectoral demand growth rate could be between 10 – 15 percent per annum if adequate electricity is made available.

❑ Government has indicated:

- Additional generation will come primarily from Independent Power Producers (IPPs);
- Investing in Renewable Energy is critical in order to provide access to some of the remote communities and make it more sustainable in the medium-long term;
- Focus shall include investments in off-grid solutions for decentralized access.

Source: Renewable Energy Act 2011

ENERGY PROJECTIONS – RESIDENTIAL SECTOR

❑ Energy Policy (2010):

- Includes the 10% target for the contribution of modern renewable energy to the country's energy sector by 2020 (adjusted to 2030*)

❑ Energy Sector Strategy & Development Plan (2012) articulates the vision of Ghana's energy sector:

- Ensure universal access to energy services and export of energy by 2016;
- The development and subsequent use of decentralized electricity generation sources (including renewables) for remote off-grid communities.

Note: * <https://www.ghanaweb.com/GhanaHomePage/business/Government-shifts-renewable-energy-target-10-percent-target-shifted-to-2030-544475>

C&I APPLICATIONS

- ❑ **According to the Energy Commission of Ghana, it is cost competitive to encourage mass deployment of solar electricity for commercial applications like:**
 - lighting in stores;
 - water pumping;
 - shaving off consumption in the commercial and services sector during peak hours;
 - as an energy conservation measure.

Source: *<https://www.ghanaweb.com/GhanaHomePage/business/Government-shifts-renewable-energy-target-10-percent-target-shifted-to-2030-544475>

OTHER STAKEHOLDERS / INCENTIVES

- ❑ Subsidies and tax Incentives
- ❑ Public Information
- ❑ Building Codes
- ❑ Appliance labeling and industry standards for products using electricity
- ❑ Training Programs for technical workers
- ❑ Demonstration projects (that can then be scaled up)
- ❑ Energy end-use efficiency in the public sector (for example, schools and hospitals, public lightning)
- ❑ Promotion of Energy Service Companies (ESCOs) that assist end-users in identifying, financing and implementing energy savings projects.

STRATEGIC PLANS FOR THE DEMAND SECTORS

❑ Residential Sector

The purpose for this regulation is to provide for the development, management and utilisation of renewable

- National goal is to achieve 100% universal electrification by 2020;
- Sixty (60) percent access is estimated for now; largely by grid.

❑ Residential Sector

The purpose for this Strategic Targets

- To achieve 15% penetration of rural electrification by decentralised renewable energy complementation by 2015; expanding to 30% by 2020;
- To reduce the average electricity intensity per urban household by 50% by 2020;
- Decentralised renewable energy penetration is less than 1% at present.

STRATEGIC PLANS FOR THE DEMAND SECTORS

❑ Commercial & Service Sectors

- The objective is to reduce the energy consumption in general and wood fuel consumption in particular, by introducing energy efficiency programmes and cleaner energy alternatives.

❑ Strategic Targets

- To reduce electricity consumption of military and police barracks, residential;
- Halls and hostels of public tertiary institutions by 50% by 2015;
- To achieve 1% penetration of solar energy in hotels, restaurants and institutional kitchens using solar water heaters by 2015 and 5% penetration by 2020.

RE:

- ❑ The policy emphasis on RE in GoG's desire to sustain energy supply through the promotion and development of its renewable energy resources lead to the enactment of the Renewable Energy Act (Act 832) in 2011, aims to support the use of renewable energy technologies to:
 - Increase generation of electricity,
 - Diversify supply of electricity,
 - Generate electricity in an environmentally sustainable manner.

- ❑ The Act includes specific measures to increase the use of RE in Ghana:
 - Licensing procedures for commercial activities in the RE industry,
 - Feed-in Tariff scheme for RE,
 - RE purchase obligation,

RE:

- ❑ The Act includes specific measures to increase the use of RE in Ghana.
 - A fund to provide financial resources for the promotion, development, and utilization of renewable energy resources,
 - Biofuel and wood fuel regulations.
 - A key objective of these measures is to create a more attractive environment for private sector investment in RE in Ghana.

- ❑ The Act, currently under review, places obligations on all distribution utilities to secure a proportion of their supply, determined by the PURC, from renewable energy sources. Consequently, the Electricity Distribution Code provides for the connection of renewable energy sources to the national grid and sale of renewable energy to the distribution utility and bulk customers. The Net Metering Code provides for metering and payment of compensation to persons who supply renewable electricity into the national grid through the distribution system.

EE:

- ❑ Ghana adopted an Energy Efficiency and Conservation Policy in 1985 to ensure the efficient and judicious use of energy resources through a combination of education, promotion, introduction and implementation of minimum energy performance standards and legislation. Significant progress has been made in developing and enforcing efficiency standards for basic electricity consuming appliances including lighting, refrigeration and air conditioning.
- ❑ In 2007 Ghana became the first African country to replace incandescent lamps with CFLs, on a countrywide scale, an effort that led to a reduction in demand of over 124MW. This effort is being strengthened with another mass injection of LED lamps. The refrigerator efficiency program seeks to transform the refrigerator market into an energy efficient appliance market through the introduction of appliance standards and labels and a ban on importation of used refrigeration and air conditioning appliances. Incandescent lamps and used refrigerators have been outlawed since 2008.

EE:

- ❑ The Energy Efficiency and Conservation program is not utility based, and is implemented by the Energy Commission in collaboration with the MoEn and other independent organisation and private companies. Energy Foundation and giz have recently focused on EE initiatives.

- ❑ Funding sources for the program include:
 - The Energy Fund;
 - Funds approved by Parliament;
 - Power Factor surcharge imposed, by the Electricity Supply and Distribution Regulations, 2005, LI 1815, on large electricity consumers whose power factors are low and collected by the distribution utility and paid into the Electricity Demand Management Fund; and
 - other international funds, including climate related funds.

STREET LIGHTING

- ❑ The infrastructure for street lighting is provided by government either directly or through the Metropolitan, Municipal and District Assemblies. The Distribution utility supplies electricity consumed in the street lights, for which it is paid. A street lighting levy equivalent to 5% of the cost of electricity consumed is charged. Forty percent (40%) of the amounts collected is paid into the Infrastructure Fund.
- ❑ The policy provides for the cost of electricity consumed to be paid to the distribution utility whilst the balance is paid to government/MDAs for the maintenance of the street lighting systems.
- ❑ Street Lighting Policy is currently under development.



Final Remarks

ABOUT REAG

Renewable Energy Association of Ghana (REAG) has a mission of serving as an organised platform for all matters relating to Renewable Energy (RE) & Energy Efficiency (EE).

Established by industry actors in mid 2015 to drive and achieve sustained impacts and effectively channel the Private Sector's contribution towards National Development.

- ❑ Raising the awareness and profile of Renewable Energy & Energy Efficiency.
- ❑ Improving and sustaining quality of information/design/installation/maintenance & service in the RE & EE industry.
- ❑ Administering a membership accreditation/certification programme and a code of ethics for best practices.
- ❑ Promoting the development of standards and compliance measures within the industry.
- ❑ Identifying and seeking funding opportunities for and in the interest of the Association and its members.

ABOUT REAG (continued)

- ❑ Arranging training/capacity building & professional development programmes.
- ❑ Ensuring effective communication within the membership of the Association to enhance synergies and satisfy mutual interests.
- ❑ Ensuring high level of service delivery, maintenance & support, quality and high standards in the entire RE & EE value chain.
- ❑ Serving as the official linkage between all stakeholders in the RE/EE sector and related groups and as an active advocate platform for Industry & Government for legislative, quality control & sustainability of the sector.
- ❑ Facilitating the development of RE & EE projects.
- ❑ Performing all other functions and obligations in best practices, with ethics, in integrity and proficiency as desired by all stakeholders of the Association.



MY COUNTRY GHANA...

Generally:

- ❑ A conducive environment for business in the Renewable Energy (RE), albeit challenges that can be surmounted, and the need for harmonization of policies.
- ❑ An enabling policy environment
- ❑ Empirical information from experiences/investment during the load-shedding period, which has increased the awareness and possibilities for investments in RE.
- ❑ Climate Investment Funds/Financial instruments and commitments/actions from the SDGs is
- ❑ Opportunities for investment and trade relate to hardware and software; consultancy, advisory services, project development, import, manufacturing, distribution, sales. The market exists, is growing and there is plenty of scope for all.
- ❑ Is Ghana ready for business, ie: RE investments & trade? EE potentials? Yes!

MY COUNTRY GHANA...

Challenges:

There are some institutional and economic challenges in the RE & EE industry in Ghana.

- Although a license has been provided for one tidal and wave power company in 2013, there is still no Feed-in Tariff specifically for tidal and wave power to electricity;
- Higher request for Grid-Connection versus uptake of decentralized RE technologies (Education on competitive advantages, poor understanding of the advantages);
- No Policy for EE, *although there are some policy measures, eg. promotion of LED and CFLs lights, Standards & Labels, Energy Managers, ...;
- T&C of financing in Ghana, does not appear favourable for RE investments. Foreign Capital is free from such.
- ...

MY COUNTRY GHANA...

To Do / Must Do / Actions

- ❑ **Formulate and implement new policies and programmes** that support the deployment of EE and conservation measures (e.g., the use of light-emitting diode [LED] lamps, more efficient air conditioners, and fridges/deep freezers) to help decrease the growth rate of electricity demand, and keep carbon footprints down while helping businesses and homes to save money.
- ❑ Continue and enhance **collaboration between the various agencies** (e.g., GRA/Customs, the Energy Commission, and Ghana Standards Authority) that implement DSM measures to effectively enforce the ban/control of entry of substandard or non-energy efficient appliances at the country's points of entry.
- ❑ **Monitor IPP landscape...**
- ❑ **Regulatory Reforms...**

MY COUNTRY GHANA...

Pre-requisites for IPPs success

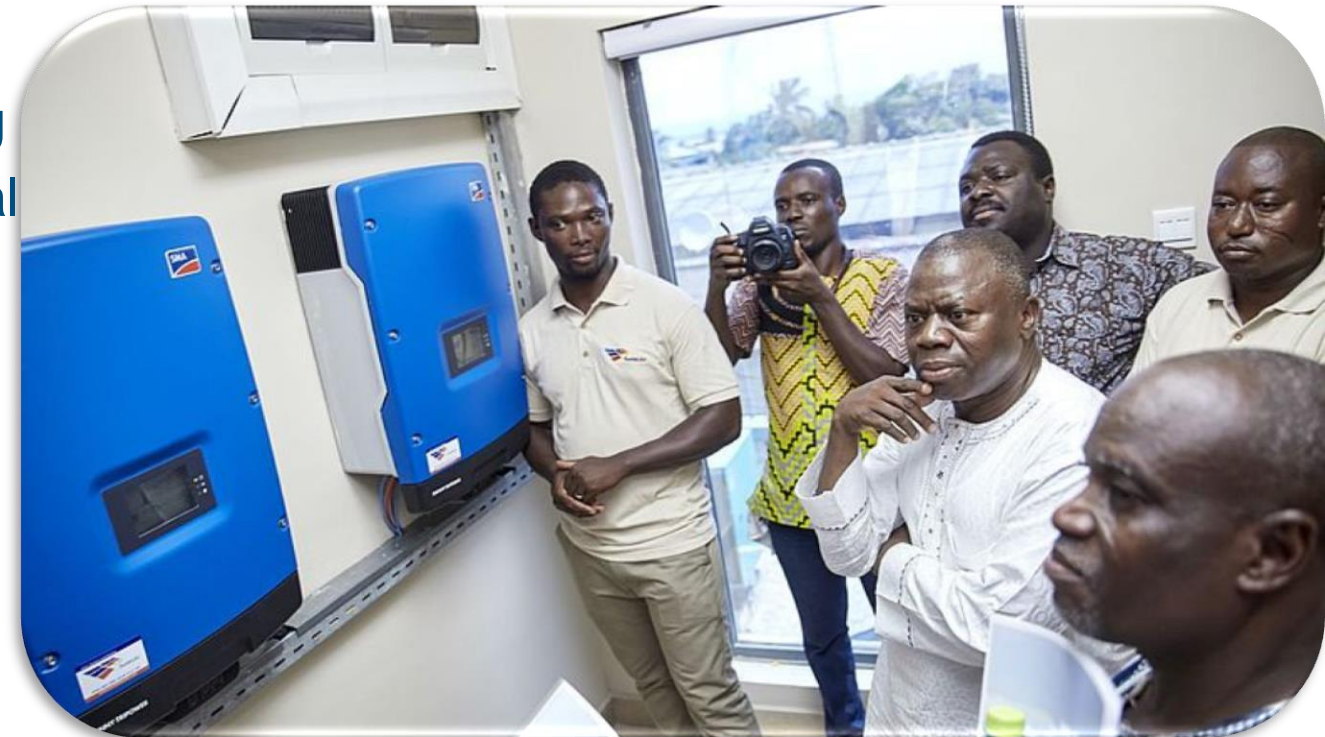
- Political commitment
- Transparency in award
- Involving local stakeholders at all stages
 - Design
 - Award
 - Implementation
- Independent regulator
- Government expertise
- Effective Project Appraisal and Selection

- Similar context for EE

MY COUNTRY GHANA...

Regulatory Reforms – work in progress

- ❑ Enforced import duty and VAT exemption
- ❑ Streamlining administration process including licensing
- ❑ Net metering
- ❑ Transparent and cost reflective tariff setting
- ❑ Stability and lack of transparency in general
- ❑ Clean energy priority at ports
- ❑ Easing local content rules
- ❑ Electricity retail market liberalization
- ❑ CBN intervention fund
- ❑ Tax reduction



DTC AGREEMENT BETWEEN GERMANY AND GHANA

This DTC agreement has been signed between [Germany](#) and [Ghana](#) on 12 Aug 2004.

The agreement does not contain paragraphs 4 and 5. It meets international standards.

It entered into force on 14 Dec 2007.

Agreement between the Federal Republic of Germany and the Republic of Ghana for the Avoidance of Double Taxation and the Prevention of Fiscal Evasion with Respect to Taxes on Income, on Capital and on Capital Gains (EIF: 14 Dec 2007)



Double Tax Treaties and Income Tax Act 2015 (Act 896)

JURISDICTION	TYPE OF EOI ARRANGEMENT	DATE SIGNED	DATE ENTERED INTO FORCE	MEETS STANDARD	CONTAINS PARAS 4 AND 5	
Barbados	DTC	22 Apr 2008	not yet in force	Yes	No	
Belgium	DTC	14 Jun 2005	17 Oct 2008	Yes	No	
Denmark	DTC	20 Mar 2014	3 Dec 2015	Unreviewed	Yes	
France	DTC	5 Apr 1993	1 Apr 1997	Yes	No	
Germany	DTC	12 Aug 2004	14 Dec 2007	Yes	No	



ADDITIONAL REFERENCES

RENEWABLE ENERGY POLICY REVIEW, IDENTIFICATION OF GAPS AND SOLUTIONS IN GHANA

- [http://www.energycom.gov.gh/files/Renewable%20Energy%20Policy%20and%20Regulatory%20Gap%20%20%20%20%20Analysis%20Final\(2015\).pdf](http://www.energycom.gov.gh/files/Renewable%20Energy%20Policy%20and%20Regulatory%20Gap%20%20%20%20%20Analysis%20Final(2015).pdf)
- <http://www.energycom.gov.gh/files/UNDP%20Renewable%20Energy.pdf>

IDENTIFICATION OF BARRIERS TO RENEWABLE ENERGY TECHNOLOGY TRANSFER TO GHANA

- http://www.energycom.gov.gh/files/Identification%20of%20barriers%20to%20Renewable%20energy%20technology%20transfer%20to%20Ghana_spread.pdf

SCALING-UP RENEWABLE ENERGY PROGRAMME IN GHANA (SREP): INVESTMENT PLAN

- https://www.climateinvestmentfunds.org/sites/default/files/meeting-documents/srep_ghana_investment_plan_27_04_2015.pdf
- https://www.climateinvestmentfunds.org/sites/default/files/AM%20SREP%20Ghana%20Scoping%20Mission_FINAL.pdf (Aide Memoire)

LINKING ENERGY POLICY TO GROWTH, PROSPECTS AND LIMITATIONS FOR RENEWABLE ENERGY (RE) TECHNOLOGIES, AS POTENTIAL SOLUTION FOR ENERGY: SPECIAL EMPHASIS ON BATTERIES

- <http://www.wacee.net/Home/Documents/Linking-Energy-Policy-to-Growth,Prospects-and-Limi.aspx>
- <https://www.dena.de/newsroom/meldungen/erneuerbare-energien-fuer-ghana-crowdfunding-erleichtert-den-einstieg/>



Embassy of Denmark in Ghana
January 24 at 11:58 AM · 🌐

- The Embassy of Denmark is going green! -

Throughout 2018 and the beginning of 2019, the Danish Embassy has been focussing on making the Embassy more green. 🌱 This initiative has been implemented by several sustainable solutions.

- We have changed all the ACs at the Embassy and replaced them with new, more energy efficient ACs. This reduce our energy used as well as the energy loss.
- We have put solar panels on our roof, which will produce 40-50 % of our energy use – and it is an excellent, sustainable way to cover our energy needs. ♻️
- We have changed the main electrical cables and replaced them with new cables, ensuring that less electricity is lost. ⚡
- We have replaced all light bulbs at the Embassy with LED bulbs. We are now only using a fifth of the energy we used before on light! 💡
- We are having sensors installed in all rooms that will make the ACs turn off after 10 minutes – and thus ensuring that the ACs won't stay turned on during the night.

We are proud and glad that these solutions have been made and we believe these are necessary actions to ensure that we continue to work in a sustainable environment.

Let's take more steps toward making the Earth a bit more green! 🌍



Germany to Close All 84 of Its Coal-Fired Power Plants, Will Rely Primarily on Renewable Energy

By Fin, Erik Kirschbaum and Los Angeles Times
29 January 2019 · 1 MIN READ

Organic Consumers Asso... 's article 6 4

[See more](#) ▶

Mit freundlichen Grüßen Welcome to Ghana... Medaase!



Enoch Yeboah Agyepong
Engineering | Sustainability | Organisational Development
m: +233 (0)244-981-590 | Skype: enoch-ya
a: # 9 DownHill St Kokomlemle | P. O. Box 13674, Accra, Ghana
e: eyagyepo@gmail.com

REGULATORISCHE RAHMENBEDINGUNGEN DES AKTUELLEN STROMMARKTES IN GHANA *„Regulatory Framework of Ghana’s Electricity Sector”*

A presentation at an Information Event on Energy Efficiency and Renewable Energy Industry in Ghana, in Berlin. © February, 2019
[Teilnehmerliste Informationsveranstaltung Ghana | Energieversorgung mit Erneuerbaren in Industrie]

