



On-going Initiatives to Accelerate Sustainable Uptake of Renewable Energy

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Presentation Outline

Introduction

Key Themes of the Renewable Energy Law

Context and Vision

On-going Initiatives

Challenges

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Introduction

- RE Resources & Potential in Ghana
- Regulatory and Institutional Framework

What constitutes RE?

- **The Renewable Energy (RE) Act of Ghana defines RE as non depleting energy sources including:**
 - *Wind*
 - *Solar*
 - *Hydro*
 - *Biomass*
 - *Bio-fuel*
 - *Landfill gas*
 - *Sewage gas*
 - *Geothermal*
 - *Ocean; and*
 - *Any other energy sources designated in writing by the Minister*

Renewable Energy Potential



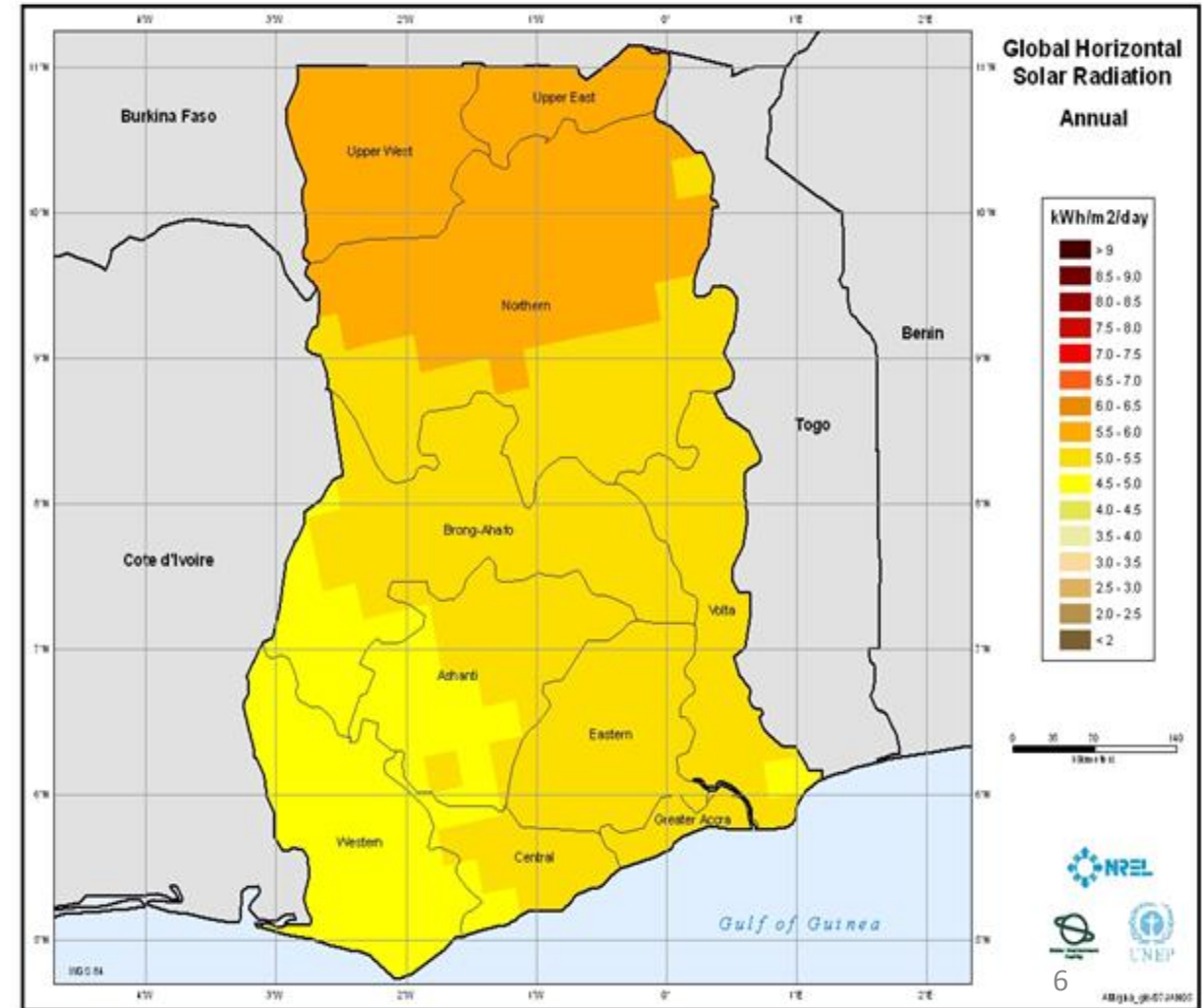
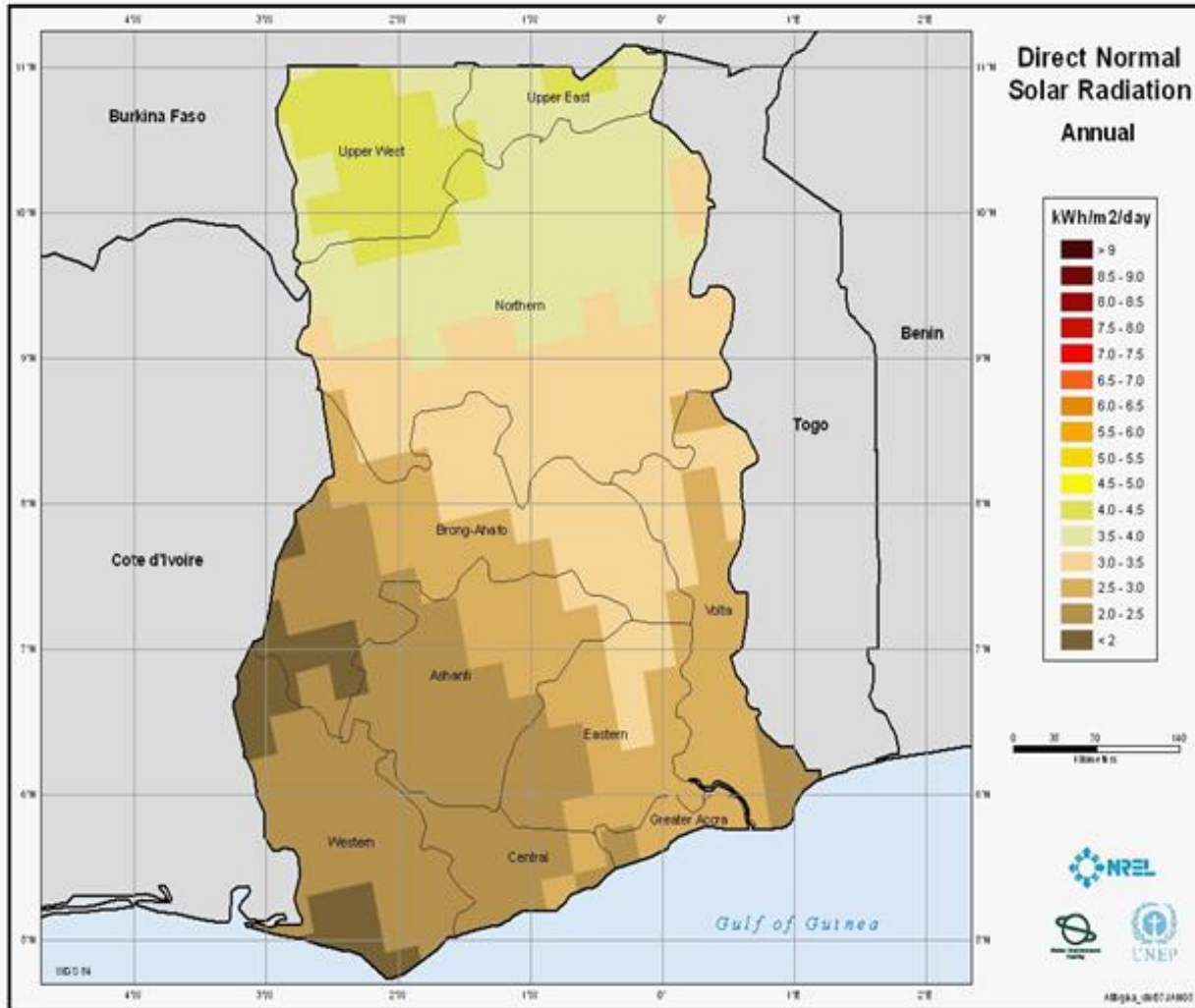
- Ghana has significant Renewable Energy resources which can be exploited to add to energy supply mix.
- For this presentation I will focus on solar and wind resources and potential in view of the high interest shown in the these two sources.
- **Solar Energy**
 - an annual sunshine duration of between 1,800 and 3,000 hours.
 - average annual solar irradiation in different parts of the country ranging from 4.4 kWh/m²/day to 5.6 kWh/m²/day.
 - Over 23MW of utility scale solar PV plants have already been installed in Ghana.
 - A large number of solar home systems have also been deployed.
- **Wind Energy**
 - Ghana has an estimated potential of 2,000MW.
 - EC has granted provisional licenses for the development of about 490 MW capacity of wind farms to be established along the coast.

Renewable Energy Potentials



Annual Direct Normal Solar Radiation

Annual Global Horizontal Solar Radiation



Institutional Framework



- Serious institutional development of RE in Ghana started with the establishment of the Ministry of Petroleum and Power in the early 1980s.
- The National Energy Board (NEB) followed in 1983 through the NEB Law (P.N.D.C.L 62) which clearly articulated the development and utilisation of RE.
- The Energy Commission Act 1997, Act 541 passed in 1997 consolidated the institutional mandates for RE.
- The Renewable Energy Act, 2011, Act 832 enacted in 2011 has projected the importance of RE in the energy sector of Ghana and provided the platform to grow the sector significantly.

Institutional Framework



- After over three decades of institutional development we have just a few projects to account for our efforts.
- Policy and regulatory issues have limited the significant development of RE.
- Some of these issues have recently been addressed but more remain to be accomplished.
- There remain more policy and regulatory instruments that can be put in place to accelerate the development of RE in Ghana.

Institutional Roles in RE Industry

| Institution | Responsibilities |
|-------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Ministry of Power | <ul style="list-style-type: none"> ▪ General Policy Formulation (including regulatory policy of general nature through legislative instruments as specified in the Act, on the recommendation of EC) |
| Energy Commission | <ul style="list-style-type: none"> ▪ General Policy Advise to Minister on renewable energy matters |
| | <ul style="list-style-type: none"> ▪ Set targets for the development and utilisation of renewable energy sources |
| | <ul style="list-style-type: none"> ▪ Licesning of operatives in the RE industry |
| | <ul style="list-style-type: none"> ▪ Promote all aspect of renewable energy development including local manufacture, exemption from customs, levies and other duties, recommendation of financial incentives, training of local expertise |
| | <ul style="list-style-type: none"> ▪ Issue codes of practice and guidelines for development and utilisation as well as technical standards for the use of renewable energy sources |

Institutional Roles in RE Industry

| Institution | Responsibilities |
|----------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Public Utilities Regulatory Commission | <ul style="list-style-type: none"> ▪ Approval of FITs for electricity from utility scale solar PV companies ▪ Approve charges for grid connection ▪ Specify the percentage level of electricity to be purchased by the electricity distribution utility or bulk customers in consultation with the Energy Commission ▪ Approve rates chargeable for wheeling of electricity from renewable energy sources |
| Distribution Utilities | <ul style="list-style-type: none"> ▪ Off-takers of electricity from utility scale solar PV companies for sale to final consumers ▪ Distribution of electricity from utility scale solar PV |
| Bulk Customers | Off-takers of electricity from solar PV Producers for own use |
| Private Businesses | <ul style="list-style-type: none"> ▪ Importation, sale and maintenance of solar PV equipment ▪ Bulk Production and Sale of electricity from solar PV power plants |

- ✓ *Institutional roles and responsibilities are clearly defined by enacted laws.*
- ✓ *So let us allow the systems to work.*

RE Policy & Regulatory Framework



- In December 2011, the RE Law (Renewable Energy Act 2011, Act 863) was passed by the Parliament of the Republic of Ghana.
 - The RE Act gives expression to both the policy and regulatory framework for the development of RE in Ghana.
- ✓ *The RE Act, if implemented fully, will surely put RE on a high pedestal in Ghana's energy sector.*

RE promotion policy landscape in Ghana

| IMPLEMENTATION OF MOST POPULAR RE PROMOTION POLICIES IN GHANA | | |
|---------------------------------------------------------------|---------------------------------------------------------------|--------|
| | RE Promotion Policy Type | Status |
| 1 | Feed-in Tariff | ✓ |
| 2 | Renewable Portfolio Standard/quota, REPO | ✓ |
| 3 | Capital subsidies, grants, rebates | ✓ |
| 4 | Investment or other tax credits | X |
| 5 | Sales tax, energy tax, or VAT reduction | ✓ |
| 6 | Tradeable RE certificates | X |
| 7 | Energy production payments or tax credits | X |
| 8 | Net metering | ✓ |
| 9 | Public investments, loans or financing, renewable energy fund | ✓ |
| 10 | Public competitive bidding | ✓ |
| 11 | Mandates for RE Systems in buildings, etc | X |

✓ *Ghana is implementing 7 out of the 11 most popular RE promotion policies world wide*

Key Themes of the Renewable Energy (RE) Act



- Feed-in Tariffs.
- Renewable Energy Purchase Obligation (REPO).
- “Open Access” to Transmission and Distribution Systems.
- Renewable Energy Fund (REF).

Key Themes of The RE ACT



▪ Feed-in Tariffs (FiTs)

- On 28th August 2013, PURC gazetted the first Feed-in Tariffs (FiTs) effective from 1st September 2013
- Effective 1st October 2014, the FiTs was reviewed to include incentives for wind and solar PV systems with Grid stability/storage systems
- ✓ *By this FiTs schedule, RE producers have an assured price over a long term period for the electricity produced*



Key Themes of The RE ACT

▪ Renewable Energy Purchase Obligation (REPO)

- A percentage of total electricity demand of Discos and Bulk electricity customers is required to be purchased from renewable energy sources.

- Renewable Energy Purchase Obligation (REPO) will be finalized and issued by the end of the year.

- Factors being considered in setting the REPO:
 - electricity generating technology;
 - financial health of the Disco or Bulk Customer; and
 - resultant cost implication on the end user.

✓ *REPO will ensure a guaranteed market for all electricity generated from RE sources*



Key Themes of RE ACT

▪ “Open Access” to Transmission and Distribution Systems

- Operators of transmission and distribution systems are required to enter into a Connection Agreement with a generator of electricity from RE sources.

- Two codes have been developed as guidelines to give effect to requisite Connection Agreements:
 - RE Distribution Sub-Code
 - RE Transmission Sub-Code

- ✓ *The Codes guarantee “open access” to the transmission and distribution systems for RE electricity without discrimination*

Key Themes of RE ACT



▪ Renewable Energy Fund

- To provide financial support for the promotion, development, sustainable management and utilisation of RE.
- The fund will be applied for financial incentives, capital subsidies, equity participation, research into renewable energy, assist programmes to adopt international best practices, infrastructure and capacity building

On-going RE Initiatives



- Friendly Licensing-regime.
- Net Metering regime.
- National 200,000 Rooftop Solar PV Programme.

On-going RE Initiatives



▪ Licensing Regime

- The Commission has put in place a friendly licensing regime for persons wanting to engage in the production, transportation, storage, distribution, importation, installation and maintenance activity in the renewable energy industry.

- The licensing regime has the objective of building a contestable market however with strong regulatory safeguards for consumers.

- Types of licences that are normally granted:
 - Wholesale Electricity Generation and Supply license;
 - Importation license; and
 - Installation and Maintenance license.

✓ *A licence is normally granted in less than one month.*

On-going RE Initiatives



▪ Net-Metering

- Net metering will enable a customer-generator to export excess electricity that he produces into the grid and to receive a credit for it.
- A Net Metering Code has been developed.
- The Net Metering Scheme is currently being piloted.
- ✓ *In 2016, the net metering scheme will be rolled out nationwide and will allow a maximum of 500 kWh per customer to be exported into the distribution system*

On-going RE Initiatives



▪ National Solar PV Rooftop Programme

- The Commission in collaboration with PURC is implementing a National Rooftop Solar PV Programme to deploy up to 200,000 solar PV systems in the residential, public, commercial and industrial sectors.
- The programme will provide some amount of capital subsidy for prospective beneficiaries.
- Financial support from Commercial banks to prospective beneficiaries also are being considered by participating banks.
- The programme gives an opportunity to private sector businesses in the solar PV market to use the scheme to enter the electricity retail market.
- The Programme will increase energy security and contribute towards achieving Ghana's RE targets.
- The programme will reduce:
 - National electricity peak load by 200MW
 - CO₂ emission by 175 kton annually

Challenges



- The Context/Vision
- Financial
- Environmental
- Technological
- Institutional

Challenges - Context and Vision



- Exploiting our RE resources to the fullest to ensure security and sustainability in the supply of energy to all Ghanaians.
- Meeting the target of achieving at least 10% of RE in the national primary energy mix by 2020.
- Increasing utility scale solar PV power supply from the current level of 23MW to about 200MW by 2020.
- Installation of rooftop solar PV systems for homes, small businesses and institutions.

✓ *In achieving this Vision we will be faced with a number of challenges*



Challenges and Way Forward

▪ Financial Challenge

- Cost of RE technologies have been reducing over the years, however, they are still relatively expensive compared to some conventional technologies.
- The FiTs does not provide the right price signals.
- Duration of FiTs in Power Purchase Agreements – 10 years vrs 20 years.
- The Renewable Energy Fund is yet to be resourced.

▪ Mitigation Initiatives

- The FiTs must provide the right price signal for RE solutions.
- Tax exemption is granted on the importation of complete renewable energy systems into the country.
- Wholesale electricity generation and supply licenses will be issued through bidding process. The winning bid will be guaranteed a Power Purchase Agreement (PPA), a Connection Agreement (CA) and a Sovereign Guarantee from the Government.

✓ *In 2016, the Energy Commission will publish an Expression of Interest (Eoi) for the development of a 20 MW solar PV power through international competitive bidding (ICB).*

Challenges and Way Forward



▪ Environmental Challenge

➤ Competing land Use

- Utility scale solar farm require large area of land to produce electricity on a commercial scale. Eg. VRA's 2.5MW solar at Navrongo is situated on a 11.7 acre of land.

▪ Mitigation Initiatives

- Land intended to be used for large scale solar power projects shall be marginal lands not intended for agriculture.



Challenges and Way Forward

▪ Environmental Challenge

➤ Waste Disposal

- Solar photovoltaic panels and batteries contain hazardous materials that could be released when a panel or battery is damaged or disposed of improperly.

▪ Mitigation Initiatives

- Existing battery recycling plants in the country must be assisted to recycle these batteries.

Challenges and Way Forward



▪ Technological Challenges

➤ Intermittency in energy supply

- The intermittent of solar or wind power plants increases the amount of energy needed to balance demand and supply in the national interconnected transmission system.

➤ Cost-effectiveness of storage systems

- Current storage systems (batteries) are expensive constituting over 40% of the cost of solar PV systems.

▪ Mitigation Initiatives

➤ Grid connected variable renewable power plants (VRPP) must be equipped with storage as a means of ensuring grid stability as may be necessary

- Since 1st October 2014, the FiTs schedule has been modified to include differential tariffs (incentives) for wind and solar PV systems that incorporate Grid stability/storage systems.

Challenges and Way Forward



▪ Institutional Challenges

- Inability of institutions to stick to their prescribed responsibilities as defined in the RE Act
 - This will lead to conflicting policy information to the public which will result in a slow down of efforts.
 - Duplication of efforts and waste of resources.

▪ Mitigation Initiatives

- Better understanding of roles and responsibilities as provided for in the RE Act.
- Increased collaboration between institutions required.

✓ *ONCE AGAIN LET THE SYSTEMS WORK AS PRESCRIBED BY THE RE ACT.*



Conclusions

- In general, well-designed and effective policy and regulatory frameworks have significantly impacted on the up-take of Renewable Energy.
- The passage of RE Act, the enactment of relevant Legislative Instruments (LIs) and implementation of proposed policy mechanisms and on-going programmes will accelerate the up-take of Renewable Energy.
- The institutional roles are clearly defined and that should facilitate the processes as long as every institution sticks to its mandate and avoids duplication of efforts. It is however critical that the institutions collaborate in the implementation of their respective mandates.



Conclusions

- With growing solar and wind market, we can expect further consolidation resulting in more competitive prices of renewable energy.
- There are already good systems in place. Let us allow them to work without duplication of efforts.
- The Commission will therefore urge the private sector and the public at large to take advantage of this emerging industry.



Thank you