GHANA COUNTRY REPORT ON ENERGY

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MINISTRY OF POWER
GHANA

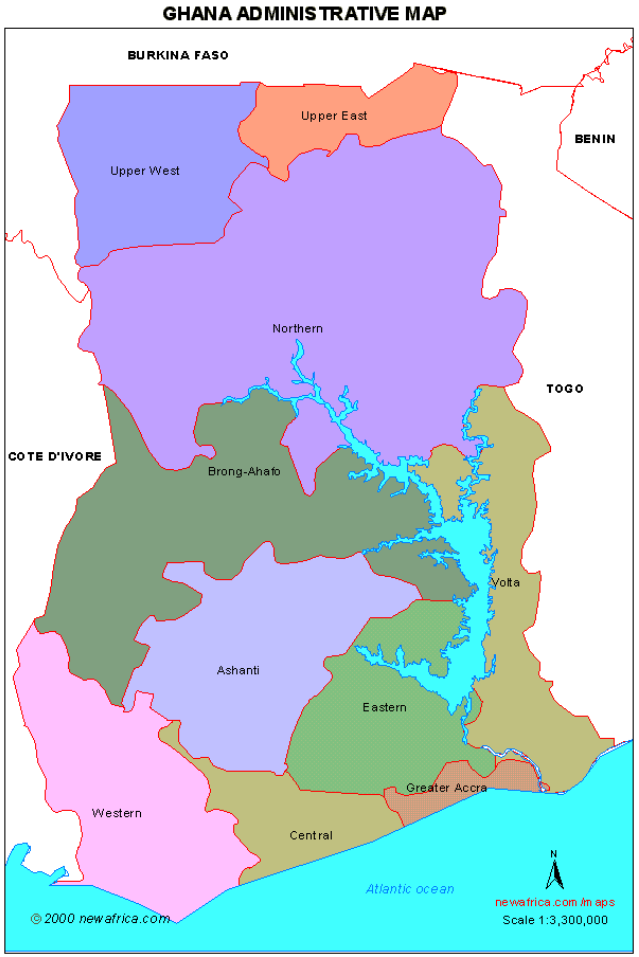
ENERGY POLICY COURSE - JICA

GHANA STATISTICS

- Ghana is a west Africa country bounded by Burkina Faso on the North, on the East by Togo and the West by Cote d' Ivoire and on the south of the Atlantic Ocean. Ghana which was formerly Gold Coast was a British colony. Ghana Means "Warrior King". Ghana's capital city is Accra.

Population:	25.9 million
Population growth Rate:	2.1% Annual change
Regions:	10
Land Area:	238, 535 km square
Coast line:	560 km square
Water :	11,000 km square
GDP:	$38.61 bn
unemployment rate:	5.2%

ADMINISTRATIVE MAP AND THE FLAG OF GHANA



ACCRA CITY

MINISTRY OF POWER

Mandate

The Ministry of Power by Executive decision(November 2014) and in line with Sections 11 and 13 of the Civil Service Law (PNDCL 327) is mandated to initiate and formulate policies to ensure the effective and efficient generation and supply of power, as well as coordinate and evaluate the efficiency and effectiveness of the performance of the sector.

MINISTRY OF POWER

Vision

- Global top-notch Ministry with reliable, sustainable, export-oriented power to the Nation

Mission

- Ministry of Power exist to ensure effective and efficient generation and supply of reliable, sustainable, export-oriented power for Ghanaians, through the initiation, formulation, co-ordination, monitoring and evaluation of innovative policies and programmes for the sector. We are committed to being resourceful, innovative, industrious, competitive, client-centered, gender sensitive and disciplined, in the delivery of our policies, programmes and services.

POWER SECTOR AGENCIES

AGENCY	RESPONSIBILITIES
POWER SUB-SECTOR: •Volta River Authority (VRA) •Bui Power Authority (BPA) •Ghana Grid Company (GRIDCO) •Electricity Company of Ghana (ECG) •Northern Electricity Development Company (NEDCo)	Power generation (Thermal, Hydro & RE) •Development of Bui Hydro Dam •Power Transmission •Power distribution in Southern Ghana •Power distribution in Northern Ghana
REGULATORY AGENCIES: •Public Utilities Regulatory • Electricity tariffs approval, monitoring quality Commission (PURC) of service and consumer protection •Energy Commission (EC) •Licensing of operators in the power sector, setting technical standards , sector planning & policy advice	Electricity tariffs approval, monitoring quality Commission (PURC) of service and consumer protection •Energy Commission (EC) •Licensing of operators in the power sector, setting technical standards , sector planning & policy advice

Sector Policies And Plans

- National Energy Policy (2010)
- Strategic National Energy Plan (SNEP)
- GSGDA II

National Energy Policy- 2010

- **Background**
- Developed in 2010 to provide a concise outline of Government's policy direction to contribute to a better understanding of Ghana's energy policy framework

- **Objective**
- Decision-making platform for the effective management and development of Ghana's Energy Sector;
- Guide to key stakeholders and institutions in the energy sector highlighting the definition and implementation of key activities in respect of their mandates;
- Guide for coordinating the implementation and monitoring of energy sector policies; and
- Platform for dialogue on investment opportunities with Ghana's development partners and the private sector.

Policy Goals -1

- Ensure adequate, reliable and improved supply of electricity to meet national requirement and for export through consolidation: rehabilitation and expansion of electricity- generation, transmission and distribution infrastructure;
- Increase access to electricity from 66% to, at least, 80% by 2015;
- Secure sources of cost-effective and sustainable fuel supply for electricity generation;
- Increase financing for electricity supply infrastructure development from Government sources, Development Partners and the private sector;

Policy Goals-2

- Strengthen institutional and management capacity as well as regulatory regime for the smooth development and operation of the power sub-sector, and
- Achieve 10% contribution of modern renewables (excluding large hydro and wood fuels) in the electricity generation mix by 2020.
- Reduce the demand on woodfuels from 72% to 50% by 2020.
- Promote development and use of other biomass technologies including biogas, biofuels, gasification and waste-to-energy.

Policy Objectives-1

- Increase generation capacity to 5,000 MW by 2020:
- Achieve gas-based generation for, at least, 50% of thermal power plant production by 2015;
- Reduce LCO based generation by at least 50% by 2016
- Increase participation of IPPs in the Power Sector through transparent procurement;
- Improve and modernize electricity distribution infrastructure to reduce system losses from 25% to 18% by 2016;
- Develop a non-congested electricity transmission network by 2016, and
- Strengthen Regulatory Agencies to perform their functions effectively.
- Achieve universal access by extending electricity to all communities by 2020, and
- Increase access to, at least, 80% by 2016.
- Achieve economically efficient tariffs by 2016.

SREP - PROJECT

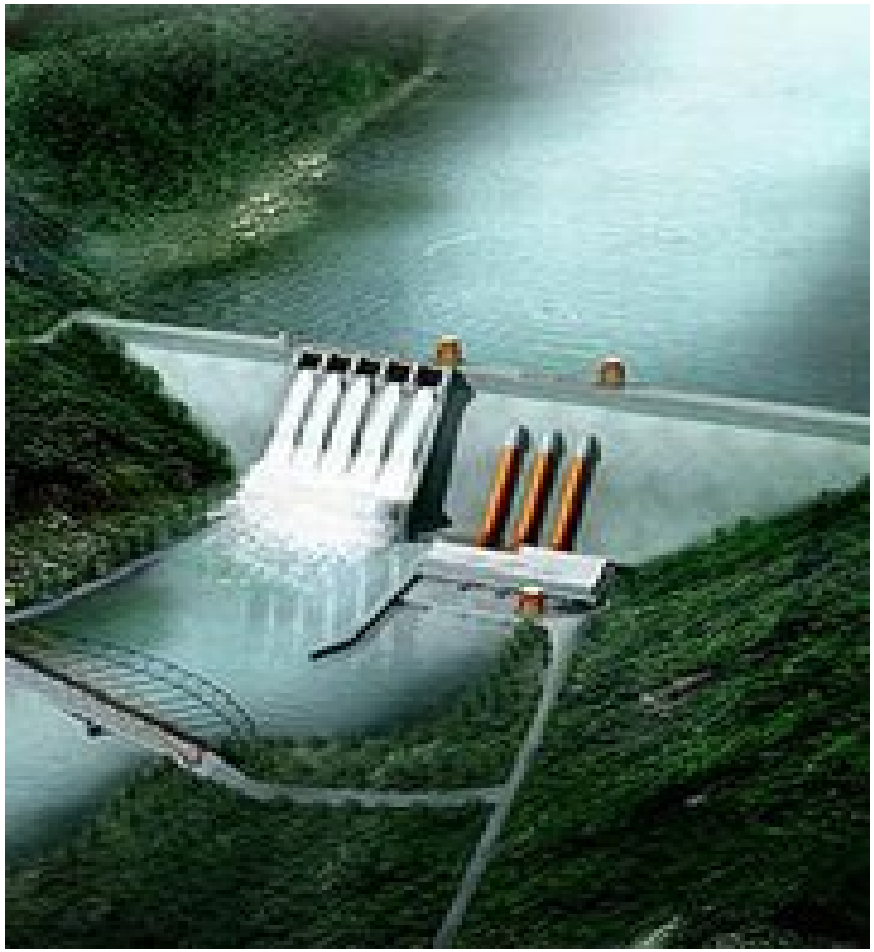
THE SCALABLE RENEWABLE ENERGY PROJECT

GHANA SECURED FUNDS OF $40M FOR FOUR KEY PROJECT UNDER THE SREP

- Mini grids and stand alone solar PV system
- Solar PV based net metering with storage
- Utility scale solar PV/wind power generation and
- Technical assistance project

THE AKOSOMBO DAM

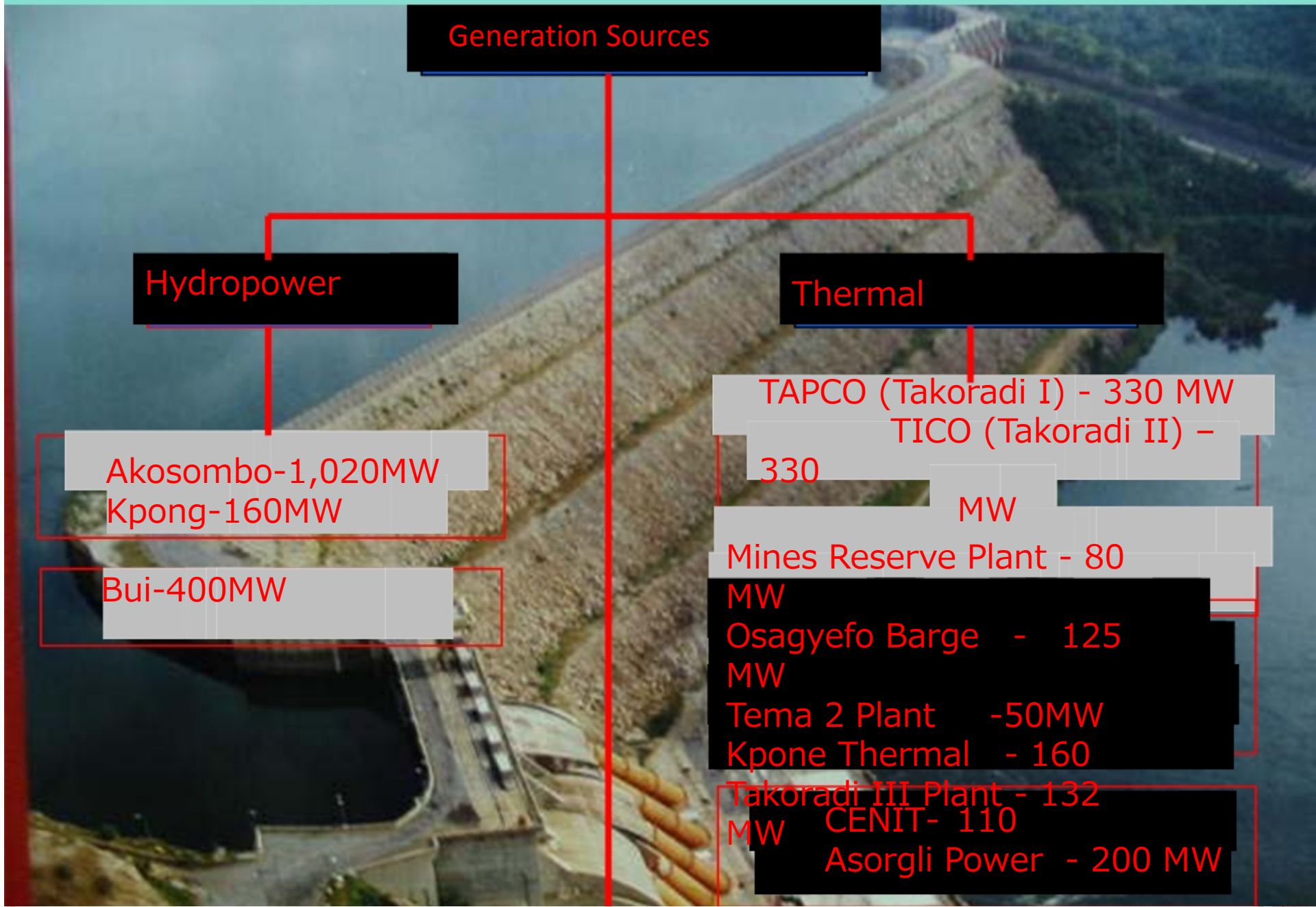
THE BUI DAM



- SUPPLIES 400 MW TO THE MIDDLE BELT AND NORTHERN PART OF GHANA NAMELY:

- SAWLA
- TECHIMAN
- KINTAMPO
- SUNYANI

ELECTRICITY SUPPLY INFRASTRUCTURE



GENERATION CAPACITY

Plants	Installed Capacity	Effective Capacity MW	Type	Fuel
Akosombo Hydro Station	1,020	1,001	Hydro	Water
Kpong Hydro Station	160	120	Hydro	Water
Bui Hydro Dam	400	133	Hydro	Water
Takoradi Power Company (Tapco TI)	330	350	Thermal	LCO/Gas
Takoradi Int. Co. (Tico TII)	220	220	Thermal	LCO/Gas
Takoradi Thermal Plant	132	132	Thermal	LCO/Gas
Tema Thermal Plant	50	50	Thermal	DFO/Gas

GENERATION CAPACITY CONT.

Plants	Installed Capacity	Effective Capacity MW	Type	Fuel
Mines Reserve Plant (MRP)	80	80	Thermal	DFO
Sunon Asogli	200	200	Thermal	Gas
CENIT	110	110	Thermal	LCO/Gas
Navrongo Solar Farm	2	2	Renewable	Solar
Total	2,814	2,942		

NATIONAL ELECTRIFICATION SCHEME

- A National Electrification Planning Study (NEPS) was done with a grant from Canadian Government;
- The Study was carried out by Acres International of Canada for the establishment of the National Electrification Master Plan;
- Study considered alternative sources of providing power to communities i.e. solar, wind, biomass, small hydro etc.
- Implementation of National Electrification Programme :
- Six 5-year phases spanning the 30 years of implementation.

IMPLEMENTATION STRATEGY OF NES

- Phasing of the NES:
- The first phase covered the connection of all District Capitals and all towns/villages en-route to the District Capitals;
- To ensure efficient Government business
- Provide electricity for local industry, commercial activities and domestic use
- The subsequent phases of the electrification of communities was based on most economically viable projects.

RATIONALE FOR THE SHEP

- Accelerate grid connection for communities which felt their proposed projects on the programme of implementation were too far into the future;

- Reduce overall cost on Government; Introduce community ownership.

CRITERIA FOR JOINING THE SHEP

- Community must be within 20km of an existing 11kV/33kV network;
- Interested Communities must apply to be included in the programme;
- Community must be willing and able to procure and
  erect all the Low Voltage distribution poles required
  for the works;
- A minimum of one-third of houses in the
- community should be wired and ready to be
- serviced as soon as electricity supply is connected to
- the communities.

Issues Facing Rural Electrification & RE Utilization in Ghana

- •High cost of energy delivery from RE incl. solar, wind, biomass-based RET
- •The negative effect of subsidies on grid power
- •Ineffectiveness of tariff collection in remote and dispersed rural houses.

Policy Goals-Electricity sub sector

- Increase Renewable Energy in the Supply-mix to 10% by 2020
- Promote exploitation and use of mini-hydro, solar, biomass and wind

Strategies to achieve 10% contribution of Renewable Energy by 2020

- Provide the regulatory framework and fiscal incentives for the development and promotion of renewable energies by the private sector-Independent Power Producers (IPPs)

- Renewable Energy Bill which has the following main contents is currently in parliament for consideration and enactment into law.
  - Feed-in-Tariff
  - Obligatory purchase
  - Renewable Energy Fund

- Support renewable energy sector agencies to undertake detailed assessment of renewable energy resources with potential for electricity generation.

- Support for the research, development and demonstration of economic viable renewable energy technological options for grid connected, mini-grid and off-grid applications.

Required Investment in Renewable Energy Sub-sector (solar, biomass, mini-hydro and wind)

Targets to attain 10% RE by 2020

Energy Source	Exploitable Targets (MW)	Investment Requirement US$ (million)
Wind	200-300	250-400
Solar	20	100-150
Medium - small Hydro	150	200-300
Modern Biomass /waste to energy	90	90-150
Total	500 MW	640-900

FINANCING THE STRATEGY

- Private Sector Participation and Investment
- Public Private Partnership Arrangements
- Multilateral & Bilateral Sources from Development Partners
- Public Sector - Budget & Concessional Loan Facilities for “Special” Infrastructure Programmes (e.g Rural Electrification & Renewable Energy Programme)
- Internally Generated Funds from Energy Sector
- Companies - (VRA, ECG, TOR, etc) - Cost-Recovery Pricing
- Commercial Loan Facilities to Support Financially Viable
- Projects by Energy Sector Companies (TOR, VRA, ECG)
- Listing on Ghana Stock Market

INVESTMENT CLIMATE

- Political Stability
- Legal and Institutional Framework for Players in the Energy Sector
- The Rule of Law
- Free and Independent Press
- Transparency and Accountability
- Commitment to fight Corruption and Crime
  Vibrant Private Sector
- Strong Civil Society
- Attractive Incentives to All Investors (GIPC Act)

CHALLENGES AND STRATEGIES

Key Sector Challenges	Mitigation Strategy Employed
Inadequate funding for Rural Electrification Projects	Increased budgetary allocation for Rural Electrification Programme
Poor financial Health of Power Utilities	Implementation of cost reflective tariff for the utilities and increase the collection rate of utility bills
Inadequate power supply to meet growing demand and low investment in the sector	Promoted private sector participation in the provision of energy infrastructure
Increasing demand for electricity for household and industry	Promoted private sector participation in the power sector
Low Staff strength and inadequate office accommodation for staff	Arrangements made to increase staff strength and create office space for staff
Poor hydrology of Volta River	Reduced number of turbines in operation to prevent total depletion of reservoir
Non-adherence to mandatory inspection and routine maintenance plans causing loss of generating units through faults	Schedule for maintenance of generating equipment adhered
Non-payment of utility bills by some MDAs	Institutions with outstanding bills disconnected from electricity supply to ensure their timely payment of debt owed
Ageing equipment in the Power Sector (Generation, Transmission and Distribution)	Routine programme in place for the replacement of old and obsolete equipment
Absence of a reserve margin	Increased the existing generation capacity with the Emergency Power Projects to meet the demand
Insufficient GoG budgetary allocation/releases	Programmes and projects of Directorates and Units developed within the approved budget
Non availability of fuel for thermal plants	An emergency LNG Agreement signed to provide 120mmscf To settle outstanding debt with West African Gas Pipeline

CHALLENGES AND MITIGATION STRATEGY CONT'D

Power Distribution

Activity/Project	Challenges	Mitigation Strategy
Reduce system losses	Obsolete equipment High Commercial losses	Replacement of equipment Injection & Monitoring of prepayment metering
Extension of electricity to un-electrified communities; Self-Help Electrification Project (SHEP) Self-Help Electrification Project (SHEP 4) Turnkey Project	Performance of Contractors greatly impacts on the successful implementation of the project. Late submission of Customer Service data from utilities (ECG) thereby delaying completion of project and denying residents access to electricity. Right-of-way issues delaying progress	Monitor progress of work through regular site inspections. To involve top management to impress upon utilities (ECG) to submit Customer Service data on time. To get MMDAs to step to provide resolution on right-of-way issues

Challenges and Mitigation Strategy Cont'd

Renewable Energy

Activity/Project	Challenges	Mitigation Strategy
Community Lighting Project	1. Inability of customers to pay for the energy service (mobile phone charging, etc.) 2. Difficulty in accessing community during raining season	1. Ensure full compliance with the signed MOU 2. Conduct bulk of monitoring in the dry season
Basic Schools ICT Pilot Project	1. Low staff strength to conduct beneficiary assessment 2. Difficulty in accessing community during raining season	1. Engage a consultant to carry out the assessment 2. Conduct bulk of assessment in the dry season

Challenges and Mitigation Strategy Cont'd

Renewable Energy

Activity/Project	Challenges	Mitigation Strategy
Mini-grid electrification system project	1. Transportation of heavy materials and equipment from the various river banks to the islands, 2. Land related issues for the siting of power plants and right of way to string distribution lines	1. Quick arrangements with VLTC/VRA to transport all materials, equipment to islands on upstream of the Volta Lake 2. Secure land release agreement with the Nananum and educate communities on the need to cooperate and grant right of way as their contribution to project.

Challenges and Mitigation Strategy Cont'd

Renewable Energy

Activity/Project	Challenges	Mitigation Strategy
Scaling up Renewable Energy Program (SREP)	1. Raising leveraging finance by GoG and other stakeholders (private, DPs, MDBs, etc) 2. Capacity to implement project	1. Engage all potential funding stakeholders' right from program preparatory stage to ensure interventions are focused on priority areas 2. Leverage on GEDAP to create formidable team and SREP PIU for the implementation of program

Challenges and Mitigation Strategy Cont'd

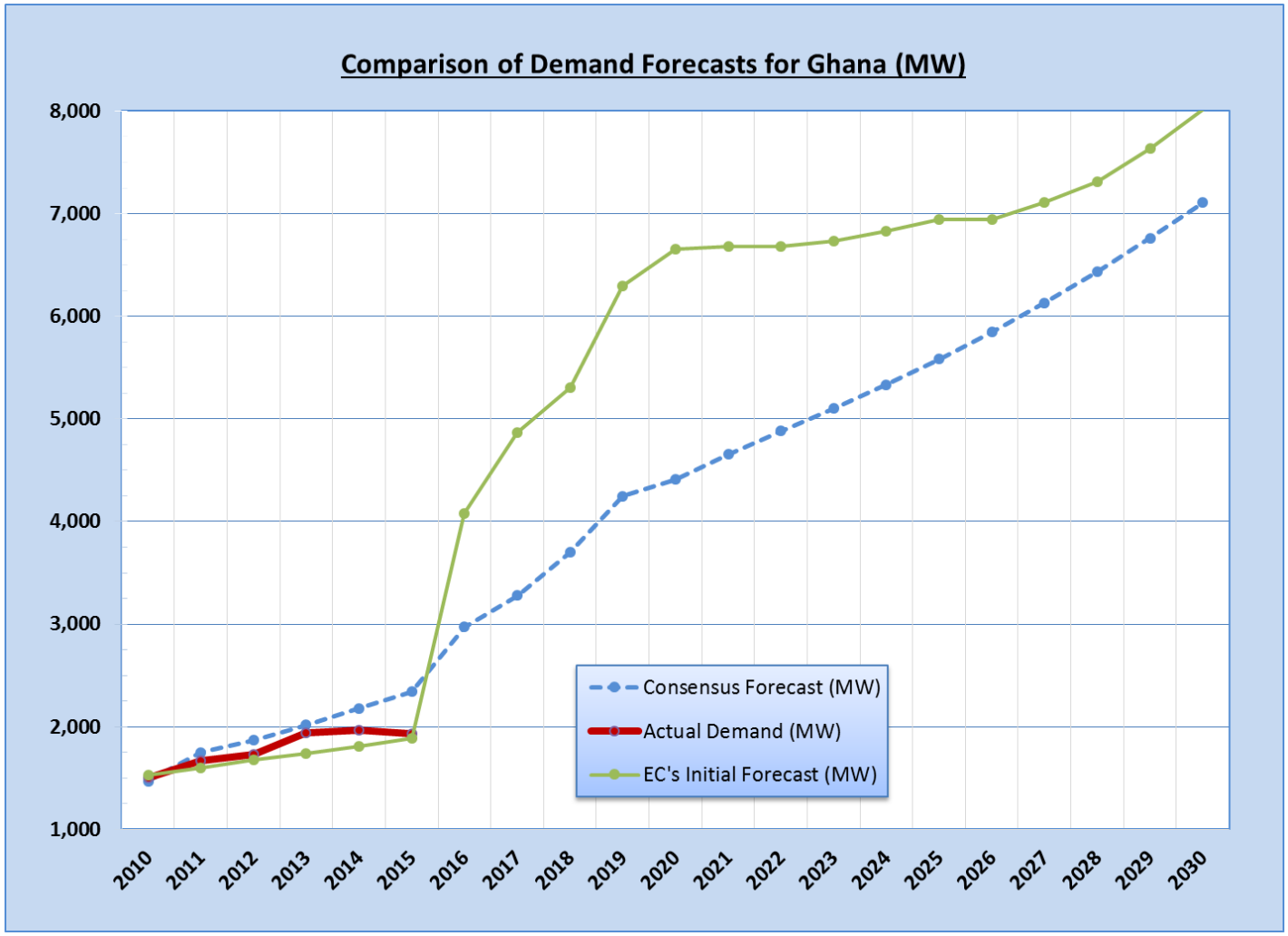
Renewable Energy

Activity/Project	Challenges	Mitigation Strategy
Hydropower Feasibility Studies & Development Project	1. Climatic change and environmental degradation around catchment areas 2. Financing for hydropower development	1. Carefully prioritize hydropower projects 2. Fence projects for conducive financing arrangements

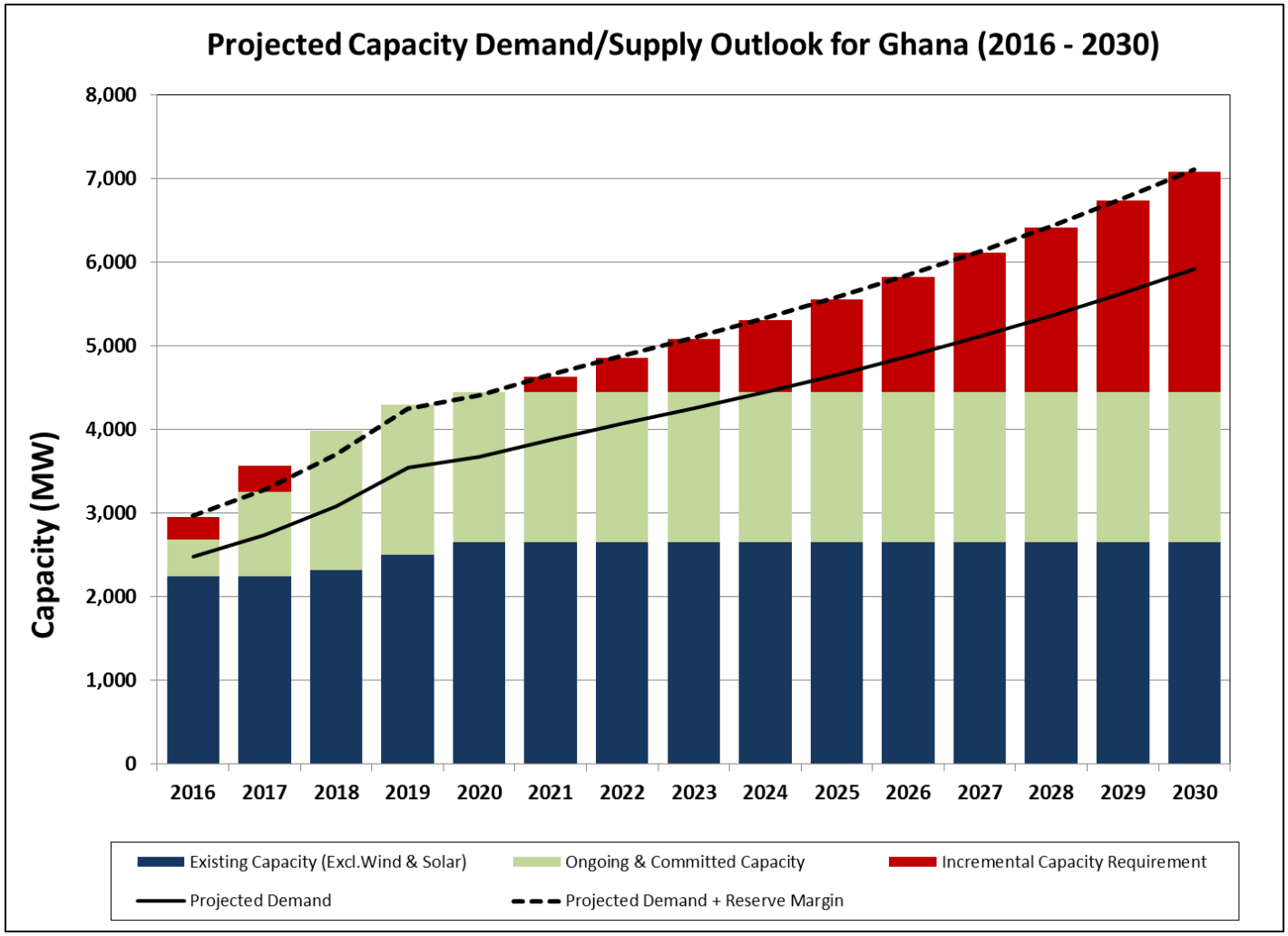
The Way Forward

- Address Security Concerns over Power Enclaves
- Diversification of generation sources
- Rapid Diversification of Fuel Supply sources to include coal, LNG and nuclear
- Energy Efficiency & Conservation
- Intensify non-utility based Renewable Energy (200,000 roof top)
- Creation of indigenous jobs in the Electricity Supply Industry – Local Content in the ESI

Demand Forecast



Graph of Demand and Supply



Courses in order of priority

- Energy Policies in Japan
- International Energy situation
- Energy demand forecast in the World/Asia
- Subsidy system for Energy Field in Japan
- Energy Balance Sheet
- Observation: Mini Hydro Power Generation

Thank You

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