

MINISTRY OF ENERGY



Republic of Ghana

ENERGY SECTOR STRATEGY AND DEVELOPMENT PLAN

FEBRUARY 2010

Table of Contents

0.	INTRODUCTION.....	2
1.	ENERGY SECTOR INSTITUTIONS.....	3
2.	POWER SUB-SECTOR	4
3.	PETROLEUM SUB-SECTOR	17
4.	RENEWABLE ENERGY SUB-SECTOR	29
5.	WASTE-TO-ENERGY.....	34
5.	ENERGY EFFICIENCY AND CONSERVATION.....	37
6.	ENERGY AND ENVIRONMENT.....	43
7.	ENERGY AND GENDER.....	46
8.	FINANCING THE ENERGY SECTOR DEVELOPMENT.....	49
9.	COMMUNICATION STRATEGY.....	52
10.	CONCLUSIONS.....	54

Abbreviations & Acronyms

BOST	Bulk Oil Storage and Transport Company
BSPD	Barrels Per Stream Day
CDM	Clean Development Mechanism
EC	Energy Commission
ECG	Electricity Company of Ghana Ltd
EPA	Environmental Protection Agency
GDP	Gross Domestic Product
GNPC	Ghana National Petroleum Corporation
GoG	Government of Ghana
GOIL	Ghana Oil Company Ltd
GPRS	Ghana Poverty Reduction Strategy
GRIDCo	Ghana Grid Company Ltd
GWh	Giga Watt hours
km	kilometre
km ²	square kilometres
kms	kilometres
kV	kilovolt
kW	kilowatt
kWh	kilowatt hour
m	metre
m/s	metres per second
MDGs	Millennium Development Goals
MW	Mega Watt
MWh	Megawatt hour
NEF	National Electrification Fund
NPA	National Petroleum Authority
OMC	Oil Marketing Company
PSP	Private Sector Participation
PURC	Public Utilities Regulatory Commission
R&D	Research and Development
REP	Rural Electrification Programme
RET	Renewable Energy Technology
SHEP	Self Help Electrification Programme
SNEP	Strategic National Energy Plan
toe	Tons of oil equivalent
TOR	Tema Oil Refinery
TICO	Takoradi International Company
UNDP	United Nations Development Program
VRA	Volta River Authority
WAGPP	West African Gas Pipeline Project
WAPP	West African Power Pool
WtE	Waste-to-Energy

INTRODUCTION

The Energy Sector Vision

The vision for the energy sector is to ensure availability of and universal access to energy services and for export by 2020.

The achievement of the vision raises the following challenges:

- (i) Developing infrastructure for the production and supply of adequate energy services to meet national requirement and for export;
- (ii) Developing the requisite infrastructure to ensure universal access as well as the efficient and reliable supply of energy services;
- (iii) Ensuring that energy is produced and supplied in a form that has no adverse health, safety and environmental impact; and
- (iv) Ensuring that energy is produced, transported and used in an efficient manner.

Addressing these challenges requires the development of an effective strategy, as well as programmes and projects that are achievable.

Content of the Document

The document covers Strategies, Programmes and Projects intended to support the national economic development agenda of the Government of Ghana in the following four broad areas of the Energy Sector:

- Energy Sector Institutions
- Power Sub-sector
- Petroleum Sub-sector
- Renewable Energy Sub-sector
- Waste-to-Energy
- Energy and Gender

The Power Sub-sector covers activities related to Electricity Generation, Transmission, Distribution and Efficiency and Conservation.

The Petroleum Sub-sector covers Upstream, Midstream and Downstream.

The Renewable Energy Sub-sector relates to renewable energy resource exploitation, development and use.

The document also contains funding sources and verifiable indicators to facilitate effective monitoring and evaluation of the programmes and projects.

1. ENERGY SECTOR INSTITUTIONS

Table 1.1 shows the major institutions involved in the energy sector and their responsibilities.

Table 1.1 Major Players in the Energy Sector

AGENCY	RESPONSIBILITIES
<p><u>POWER SUB-SECTOR:</u></p> <ul style="list-style-type: none"> • Volta River Authority (VRA) • Bui Power Authority • Independent Power Producers (IPPs) • Ghana Grid Company (GRIDCo) • Electricity Company of Ghana (ECG) • Northern Electricity Department (NED) 	<ul style="list-style-type: none"> • Power generation • Power generation • Power generation • Power transmission • Power distribution in Southern Ghana • Power distribution in Northern Ghana
<p><u>PETROLEUM SUB-SECTOR:</u></p> <ul style="list-style-type: none"> • Ghana National Petroleum Corporation • Tema Oil Refinery (TOR) • Bulk Oil Traders • Bulk Oil Storage and Transportation Company (BOST) • Oil Marketing Companies (OMCs) • Ghana Cylinder Manufacturing Company 	<ul style="list-style-type: none"> • Oil and gas exploration development and production • Crude oil refining and sale of petroleum products • Petroleum products importation and sale • Bulk petroleum products transportation and storage • Petroleum products distribution • LPG cylinder manufacturing
<p><u>REGULATORY AGENCIES:</u></p> <ul style="list-style-type: none"> • Public Utilities Regulatory Commission (PURC) • Energy Commission (EC) • National Petroleum Authority (NPA) 	<ul style="list-style-type: none"> • Electricity tariffs approval, monitoring quality of service and consumer protection • Licensing of operators in the power sector and setting technical standards for their performance, sector planning and policy advice to Minister of Energy • Licensing of operators in the petroleum sector and setting of technical standards and enforcement

2. POWER SUB-SECTOR DEVELOPMENT

Electricity and National Economy

Electricity accounted for 8.4% of total national energy consumption in 2008. It is largely used in the residential sector, accounting for about 47% of total electricity consumed in the country. Electricity is also the dominant modern energy form used in the industrial and service sectors accounting for 65.6% of modern energy used in the two sectors of the national economy. In addition, the generation and supply of electricity provides employment for a significant number of Ghanaian professionals.

Electricity exports have provided an important source of foreign exchange earnings for the country as Ghana exports power to the neighbouring countries including Togo, Benin, and Burkina Faso. On the other hand Ghana imports power from La Cote D'Ivoire when necessary. Becoming a major exporter of electricity is a key objective of the energy sector vision and the opportunity exists for Ghana to expand its electricity exports under the West African Power Pool (WAPP) Project.

Structure of the Power Sub-Sector

The Ministry of Energy is responsible for formulating, monitoring and evaluating policies, programmes and projects for the power sub-sector and the energy sector in general. The Ministry is also implementing the Government's National Electrification Scheme. .

The Electricity Supply Industry (ESI) has an unbundled structure with separate operational functions in respect of power generation, transmission and distribution.

The state-owned Volta River Authority (VRA) is involved in power generation in the country. It owns and operates the Akosombo Hydro Power Station, Kpong Hydro Power Station and the Takoradi Thermal Power Plant (TAPCO) situated at Aboadze. VRA is also a minority joint partner with TAQA, a private sector company, which owns and operates the Takoradi International Power Company (TICO) thermal plant, also located at Aboadze.

Bui Power Authority, another state-owned agency, is implementing the Bui Hydroelectric Power Project, while a number of private Independent Power Producer (IPPs) projects have been licensed and are at various stages of development.

The National Interconnected Transmission System (NITS) for electricity is owned and operated by the Ghana Grid Company Ltd (GRIDCo), which is state-owned.

The distribution of electricity is mainly done by two state-owned enterprises, namely the Electricity Company of Ghana (ECG) and Northern Electricity Department (NED), which is a subsidiary of VRA. ECG distributes electricity in the southern part of the country; NED distributes power in the northern part of the country, while Enclave Power provides power to the Free Zones.

The Electricity Supply Industry is regulated by the Energy Commission (EC) and the Public Utilities Regulatory Commission (PURC). The EC is responsible for technical regulation of the power sub-sector, including licensing of operators. In addition, EC also advises the Minister of Energy on matters relating to energy planning and policy. The PURC is an independent regulatory agency, and is responsible for economic regulation of the power sector, specifically approving rates for electricity sold by distribution utilities to the public. Its functions also include monitoring of quality of electricity services delivered to consumers.

Strategy Challenges and Opportunities in the Power Sub-sector

Challenges

The power sub-sector faces the following challenges:

- (i) inadequate power supply infrastructure requiring huge investments;
- (ii) inadequate access to electricity;
- (iii) high cost of fuel for electricity generation;
- (iv) inadequate regulatory capacity and enforcement; and
- (v) operational and management difficulties in utility companies
- (vi) vulnerability to climate change

Opportunities

The following opportunities provide a strong basis for growth of the power sub-sector in the medium to long term:

- (i) Strong growth in the national economy will increase the demand for electricity and thus, open up the power market for further development.
- (ii) Enhanced sub-regional cooperation in energy will open up the sub-regional market for electricity trading. Ghana can take advantage of this opening to achieve the vision of becoming a major exporter of power by 2015.
- (iii) Strong Government commitment to private-sector led economic development will provide an incentive for private sector to increase their participation in the power sub-sector.
- (iv) Evolution of the regulatory environment in Ghana, though in an early stage of development, has led to modest progress. A transparent and strong regulatory environment will not only provide comfort for private sector investors, but also ensure efficient and optimal operation of the sector.

Power Sub-Sector Strategy Goals

The power sub-sector strategy is intended to roll out initiatives that will guide the development of the power sub-sector in the medium term and seeks also to achieve the following policy goals:

- (i) 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;
- (ii) Increase access to electricity from the current 66% to at least 80% by 2015;
- (iii) Secure sources of cost-effective and sustainable fuel supply for electricity generation;
- (iv) Increase financing for electricity supply infrastructure development from Government sources, Development Partners and the private sector;
- (v) Strengthen institutional and management capacity as well as regulatory regime for the smooth development and operation of the power sub-sector; and
- (vi) Ensure a cost-effective pricing regime for electricity services.

Power Sub-sector Strategy Issue 1

Power Supply Shortages

Thematic area

Infrastructure Development/Strong Economy for Real Jobs

Diagnostics

Inadequate power supply infrastructure due to failure to sustain power sector investment programmes.

Policy Responses

- Increase generation capacity;
- Reinforce and add capacity at the transmission and distribution levels;
- Open up the sub-sector to Independent Power Producers (IPPs) and private sector participation in generation.
- Continue implementation of Power Sector Reforms initiated in 1995; and
- Strengthen the regulatory environment.

Objectives to be achieved

- Increase generation capacity to 5,000 MW by 2015;
- Achieve gas-based generation for at least 50% of thermal power plant production by 2015;
- Increase participation of IPPs in the Power Sector through transparent procurement;
- Improve and modernise electricity distribution infrastructure to reduce system losses from 25% to 18% by 2015;
- Develop a non-congested electricity transmission network by 2015; and
- Strengthen Regulatory Agencies to perform their functions effectively.

The interventions to achieve the strategy goals are shown in Table 2.1, Table 2.2, Table 2.3 and Table 2.4.

Table 2.1 Strategies to achieve increased electricity generation capacity

Objectives to be achieved	Key Programmes and Projects	Possible Financing Sources	Time-frame	Verifiable Indicators/Milestones	Responsible Agency
Increase generation capacity from 2,000MW to 5,000 MW by 2015	(i) Operationalisation and expansion of the Osagyefo Power Barge Project (125MW)	Private sector	2008-2012	<ul style="list-style-type: none"> Report of Technical and Financial Audit available by June 2010 125 MW brought on stream in Dec 2010 Conversion to 185MW combined cycle by 2012 	<ul style="list-style-type: none"> Ministry of Energy Ministry of Energy
	(ii) Implementation of the Aboadze TICO Power Plant steam turbine project (to increase total capacity at Aboadze from 550 MW to 660 MW)	Private sector (TAQA)	2009-2012	<ul style="list-style-type: none"> MOU signed by June 2010 110 MW added capacity available by December 2012 	<ul style="list-style-type: none"> VRA VRA
	(iii) Development of Western Rivers Hydropower Project	GoG/Private sector	2009-2014	<ul style="list-style-type: none"> Power Purchase Agreement (PPA) signed October 2010 Construction begin by January 2011 625 MW capacity added by December 2014 	<ul style="list-style-type: none"> Ministry of Energy Ministry of Energy
	(vi) Development of Juale Hydropower Project	GoG/Gov't of Brazil	2009-2014	<ul style="list-style-type: none"> Credit Agreement signed by December 2010 PPA signed by May 2011 Construction of Juale commenced by January 2012 90 MW available by Dec. 2015 	<ul style="list-style-type: none"> Ministry of Energy/Ministry of Finance & Economic Planning Ministry of Energy

Table 2.1 Strategies to increase electricity generation capacity (continued)

Objectives to be achieved	Key Programmes and Projects	Possible Financing Sources	Time-frame	Verifiable Indicators/Milestones	Responsible Agency
Increase power generation capacity to 5,000 MW by 2015	(vi) Completion and expansion of all on-going GoG-Financed Power Projects :				
	(a) Bui Hydropower Project;	GoG/Chinese Gov't	2008-2013	<ul style="list-style-type: none"> • 400 MW added capacity by 2013 	<ul style="list-style-type: none"> • Bui Power Authority
	(b) Kpone Thermal Power Project	GoG	2008-2011	<ul style="list-style-type: none"> • 220 MW operational by 2011 and expanded to 330 MW combine cycle by 2013 	<ul style="list-style-type: none"> • Ministry of Energy/VRA
	(c) Tema Thermal 2 Power Plant (TT2PP)	GoG	2008 – 2010	<ul style="list-style-type: none"> • 50MW available by mid 2010 	<ul style="list-style-type: none"> • Ministry of Energy/VRA
	(d) Takoradi 3 Power Plant	GoG/Canadian Gov't	2009 – 2012	<ul style="list-style-type: none"> • 132MW available by December 2012 	<ul style="list-style-type: none"> • Ministry of Energy
	(vii) Completion of IPP Projects				
	(a) Completion of Sunon Asogli Power Project	Private sector	2009-2015	<ul style="list-style-type: none"> • 200 MW completed in February 2009 and expanded to 560 MW by 2015 	<ul style="list-style-type: none"> • Sunon Asogli
(b) Completion of Tema Osonor Power Plant	Private sector	2008 – 2012	<ul style="list-style-type: none"> • 126 MW of capacity added by 2011 	<ul style="list-style-type: none"> • Ministry of Energy/VRA 	
	(viii) Development of Wind Power projects.	GoG/Private sector	2009-2014	<ul style="list-style-type: none"> • MOU signed by June 2010 • 50 MW of Wind Farms added by 2013 	<ul style="list-style-type: none"> • Ministry of Energy/E.C

Table 2.2 Strategies to increase thermal generation from natural gas

Objectives to be achieved	Key Programme and projects	Possible Financing Sources	Time-frame	Verifiable Indicators/Milestones	Responsible Agency
Achieve gas-based generation for 50% of the thermal power plants production	(i) Completion of the West African Gas Pipeline Project to Tema	GoG/Private sector	2009-2011	<ul style="list-style-type: none"> • Construction of RMS at Tema commenced by December 2009 • Complete RMS by June 2010 	<ul style="list-style-type: none"> • VRA
	(ii) Acceleration of the use of natural gas from WAGPP in place of crude oil at Aboadze,	GoG/VRA	2009-2010	<ul style="list-style-type: none"> • Commissioning of natural gas utilisation by June 2010 	<ul style="list-style-type: none"> • VRA
	(iii) Construction of pipelines from the Jubilee Field Gas Project to Osagyefo Power Plant at Effasu and the Takoradi Power Plant at Aboadze	GoG/Private sector	2009-2011	<ul style="list-style-type: none"> • Construction of pipeline to commence by June 2010 • Completion and Commissioning of pipeline by June 2011 	<ul style="list-style-type: none"> • GNPC
	(iv) Intensify Exploration for Gas and Oil	GoG/Private sector	2009 - 2015	<ul style="list-style-type: none"> • On-going 	<ul style="list-style-type: none"> • GNPC

Table 2.3 Strategies to improve and modernise transmission and distribution infrastructure

Objectives to be achieved	Key Programme and Projects	Possible Financing Sources	Time-frame	Verifiable Indicators/Milestones	Responsible Agency
Develop a non-congested transmission system by 2015	(i) Completion of On-going Substation Projects:- Supply Improvement to Ho; Supply Improvement to Tema, Accra, Takoradi; Akwatia; Supply Improvement to Kumasi, Techiman, Wunneba and Akosombo Substations.	GRIDCo	2009-2011	<ul style="list-style-type: none"> • Projects completed by December 2010 	GRIDCo
	(ii) Grid Extension Projects:- Kintampo Substation; Atebubu Substation; Sunyani-Mim Upgrade; Smelter II Substation; System Reliability Enhancement Project	GRIDCo	2009-2011	<ul style="list-style-type: none"> • Contracts Awarded by December 2009 • Projects completed by December 2011 	GRIDCo
	(iii) Refurbishment of Supervisory Control and Data Acquisition (SCADA) System	GRIDCo	2009-2010	<ul style="list-style-type: none"> • Project completed by March 2010 	GRIDCo
	(iv) Aboadze-Volta 330 kV Project	World Bank	2009-2010	<ul style="list-style-type: none"> • Project completed by December 2010 	GRIDCo
	(v) Accra 3 rd Bulk Supply Point project	GoG	2009-2010	<ul style="list-style-type: none"> • Project contract awarded by December 2009 • Project completed by September 2010 	GRIDCo

Table 2.5 Strategies to improve and modernise transmission and distribution infrastructure (continued)

Objectives to be achieved	Key Programme and projects	Possible Financing Sources	Time-frame	• Verifiable Indicators/Milestones	Responsible Agency
Develop a non-congested transmission system by 2015	(vii) Kumasi 2 nd Bulk Supply Point	GoG	2009-2011	<ul style="list-style-type: none"> • Contract awarded by December 2009 • Project completed by December 2011 	GRIDCo
	(viii) Buipe Sub-station	Private sector	2009-2011	<ul style="list-style-type: none"> • Project completed by October 2011 	GRIDCo
	(ix) Aboadze-Prestea-Kumasi-Wa 330 kV Project	World Bank	2009-2015	<ul style="list-style-type: none"> • Contract awarded by February 2010 • Project completed by December 2014 	GRIDCo
	(x) Tumu-Han-Wa	World Bank	2009-2015	<ul style="list-style-type: none"> • Contract awarded by March 2010 • Project completed by December 2014 	GRIDCo
	(xi) Development of Electricity Market Rules	Energy Commission/ GRIDCo	2009-2010	<ul style="list-style-type: none"> • Market Rules available by July 2010 • Stakeholders Workshop completed by October 2010 • Market Rules completed by July 2011 	EC

Table 2.4 Strategies to improve and modernise electricity transmission and distribution infrastructure

Objectives to be achieved	Key Programme and projects	Possible Financing Sources	Time-frame	Verifiable Indicators/Milestones	Responsible Agency
Improve and modernise distribution infrastructure for efficient service delivery and reduce system losses to 18% by 2015	(i) Upgrading and Rehabilitation of Electricity Distribution Network	GoG/Development Partners/Private sector	2008-2015	<ul style="list-style-type: none"> • Distribution system in major cities modernised by 2014 • Technical losses reduced to 9% by 2015 	<ul style="list-style-type: none"> • ECG
	(ii) Commercial Loss Reduction Programme	ECG/Development partners	2009-2015	<ul style="list-style-type: none"> • Commercial losses of ECG/NED reduced gradually to 9% by 2015 	<ul style="list-style-type: none"> • ECG
	(iii) Prepaid Metering Programme to replace credit metering in residential and commercial sectors	ECG	2008-2015	<ul style="list-style-type: none"> • Total coverage of customers by 2014 • Improved revenue collection of ECG/NED to over 95% by 2014 	<ul style="list-style-type: none"> • ECG

Power Sub-Sector Strategy Issue 2

Inadequate access to electricity

Thematic area

Infrastructure Development/Strong economy for real jobs

Diagnostics

- Access to electricity is not universal. Electricity access was estimated at 66% in 2009.
- Inadequate distribution infrastructure due to failure to sustain energy development programme.

Policy Responses

- Increase the momentum of the National Electrification Scheme to provide access to electricity progressively to all communities;
- Upgrade and reinforce transmission and distribution network capacity; and
- Open up the sub-sector to private sector participation in power distribution and sale.

Objectives to be achieved

- Achieve universal access by extending electricity to all communities by 2020
- Increase access to at least 80% by 2015

Interventions to achieve the goals are shown in Table 2.6.

Table 2.6 Strategies to achieve universal access to electricity.

Objectives to be achieved	Key Programme and Projects	Possible Financing Sources	Time-frame	Verifiable Indicators/Milestones	Responsible Agency
Achieve universal access by extending electricity to all households by 2020	(i). National Electrification Scheme (Extension of electricity to towns and rural communities)	GoG/Development Partners	1990-2020	<ul style="list-style-type: none"> Revised NES Master Plan developed by December 2010 All communities to be connected to the national electricity grid by 2020 	<ul style="list-style-type: none"> Ministry of Energy
	(ii) Self Help Electrification Programme (speed up rural electrification through SHEP- Complete SHEP IV and initiate SHEP V, etc)	GoG/Development Partners	2009-2015	<ul style="list-style-type: none"> 80% access attained by 2015 	<ul style="list-style-type: none"> Ministry of Energy
	(iii) Intensification of electricity supply to households in already electrified communities)	GoG/Development Partners/Private sector	2009-2015	<ul style="list-style-type: none"> Intensification Programme designed and started by December 2010 	<ul style="list-style-type: none"> Ministry of Energy
	(iv) Development and use of decentralised electricity generation sources for communities remote from national electricity grid	GoG/Development Partners/Private sector	2009-2015	<ul style="list-style-type: none"> Detailed National Decentralised Electricity Programme designed by December 2010 	<ul style="list-style-type: none"> Ministry of Energy
	(v) Productive Uses of Electricity (PUE) Programme	GoG/Development Partners/Private sector	2009 - 2015	<ul style="list-style-type: none"> Five (5) pilot projects completed by 2013 Comprehensive National PUE Plan completed by Dec 2014 Commence implementation of PUE Plan by Jan 2015 	<ul style="list-style-type: none"> Ministry of Energy

Power Sub-Sector Strategy Issue 3

Restoration of financial health of VRA and ECG

Thematic area

Infrastructure Development/Strong economy for real jobs

Diagnostics

Poor financial health of VRA and ECG are reflected in debts and inadequate return on assets. This situation makes it difficult for VRA and ECG to raise financing for projects and operations. The situation has arisen due to long periods of low tariffs coupled with high system losses.

Policy Responses

- Ensure cost-recovery tariffs for electricity production and supply;
- Strengthen the Public Utilities Regulatory Commission (PURC) to determine and implement efficient and cost-reflective tariffs for electricity; and
- Ensure the independence of regulatory agencies.

Objectives to be achieved

- Achieve economically efficient tariffs by 2011.

Table 2.7 shows the interventions to be implemented to achieve the strategy goals.

Table 2.7 Strategies to achieve economically efficient tariffs.

Objectives to be achieved	Key Programme and projects	Possible Financing Sources	Time-frame	Verifiable Indicators/Milestones	Responsible Agency
Achieve economically efficient electricity tariffs by 2011	(i) Electricity Tariff Study	GoG/Development Partners (World Bank)	2009-2011	<ul style="list-style-type: none"> • RFP issued by February 2010 • Consultants engaged by June 2010 • Final Report Submitted by September 2010 • Commence implementation of recommendations by January 2011 	<ul style="list-style-type: none"> • PURC
	(ii) Financial Recovery Plan for VRA and ECG	GoG/Development Partners (World Bank)	2009-2011	<ul style="list-style-type: none"> • RFP issued in March 2009 • Consultants engaged in June 2009 • Final Report Submitted by October 2009 • Commence implementation of recommendations by June 2010 	<ul style="list-style-type: none"> • Ministry of Energy • Ministry of Finance & Economic Planning

3. PETROLEUM SUB-SECTOR

The petroleum sub-sector consists of: (i) upstream activities, which involves exploration, development and production of oil and gas from oil or gas fields, (ii) midstream activities, which involves the transportation of oil and gas to the oil refinery or gas processing plant, and (iii) downstream activities, which involves the refining of crude oil and distribution of the petroleum products to consumers.

PETROLEUM UPSTREAM and MIDSTREAM

Hydrocarbons Resources

In 2007 commercial quantities of oil and gas were discovered in two blocks: Deepwater Cape Three Points and Deepwater Tano. Appraisals conducted indicate that the field contains expected recoverable reserves of about 800 million barrels of light crude oil, with an upside potential of about 3 billion barrels. The discovery provides Ghana an opportunity to reduce foreign exchange requirements for the importation of crude oil and also to increase export earnings significantly.

Strategy Goal

The goal is to sustain exploration, development and production of the oil and gas endowment and also the judicious management of the oil and gas revenue for the overall benefit and welfare of all Ghanaians, present and future as well as attract increased local value-added investments in the oil and gas sector and the indigenization of knowledge, expertise and technology.

Challenges

The major challenges for the upstream petroleum sub-sector are how to:

- develop the oil and gas industry with optimal local content and participation,
- effectively manage the potential revenue from oil and gas production, and ensure security for the industry as a whole.

Strategy Intervention

To address these challenges, Government will pursue the following actions:

Hydrocarbon Resources Development and Management

- Manage Ghana's oil and gas resource endowment to ensure sustainability in reserves and the environment through judicious exploitation and intensive exploration
- Set up the National Petroleum Regulatory Authority to be responsible for the regulation of all activities related to upstream, midstream and downstream oil and gas industry in Ghana

Oil Revenue Management

- Manage oil and gas revenues transparently and ensure equity for the benefit of the present and future generation of Ghanaians. This will be achieved through institutional reforms and transparent regulation for the management the oil revenue through legislative guidelines for the creation of a Future Generation Fund and stabilization fund.

Investment Framework

- Encourage investments along the oil and gas industry value chain through fiscal incentives and “even-handed” regulation

Local Content and Local Participation

- Maximise the benefits of oil and gas wealth generation through the use of local goods and services, people, businesses and financing in all aspects of the oil and gas industry value chain and retaining the benefit within Ghana

Security

- Ensure security for oil and gas industry installations and operations through the development of dedicated institutional arrangement for national oil and gas security matters and legislation of oil and gas safety requirements.

Natural Gas Utilisation and Commercialisation

- Prohibit the flaring or venting of natural gas produced within Ghana to maximise the utilization of natural gas reserves of the country.
- Discourage re-injection of natural gas unless it results in increased benefits to the associated operations.
- Develop a viable domestic petrochemical industry based on natural gas.

Human Resource Development and Technology Transfer

- Support capacity building at all levels in the country’s technical, vocational and tertiary institutions.
- Oblige Licensees to provide facilities for training and technology transfer as an integral part of their operations

Petroleum Upstream and Midstream Strategy Issue 1

Inadequate exploration, development and production of oil and gas resources of Ghana

Thematic area

Infrastructure Development/Strong Economy for Real Jobs

Diagnostics

- Low exploration, development and production of oil and gas resources
- Inadequate promotion of oil and gas resources

Policy Responses

- Improve legal framework and fiscal regime for exploration, development and production.

Objectives to be achieved

- Attract requisite private sector investment capital in oil and gas exploration and development as well as ensuring maximum benefits to the people of Ghana
- Ensure adequate funding for the operations of Ghana National Petroleum Corporation (GNPC)
- Facilitate the passing of legislation providing transparent legal and fiscal regimes for oil and gas exploration, development and production

The strategic interventions to address the goals are contained in Table 3.1.

Table 3.1 Strategic interventions to achieve oil and gas exploration, development and production goals.

Objectives to be achieved	Key Programme and projects	Possible Financing Sources	Time-frame	Verifiable Indicators/Milestones	Responsible Agency
Intensify exploration, development, production and utilisation of Ghana's oil and gas prospects;	(i) Exploration of Voltaian Basin;	GoG/Private sector	2009-2015	<ul style="list-style-type: none"> • Initial Exploration data collected and analysed by December 2010 • Road Show of Voltaian Basin by 2012 	<ul style="list-style-type: none"> • GNPC
	(ii) Development of Jubilee Oil and Gas Field	GNPC/Private sector	2009-2010	<ul style="list-style-type: none"> • Oil production starts by October 2010 	<ul style="list-style-type: none"> • GNPC
	(iii) Construction of Natural Gas Processing Plant	GNPC/Private sector	2010-2013	<ul style="list-style-type: none"> • Site selection and EPA certification completed December 2009 • Joint Venture arrangements completed by June 2010 • Construction commences by December 2010 • Gas Plant ready by June 2013 	<ul style="list-style-type: none"> • GNPC
	(iv) Construction of pipeline from Jubilee Field to Gas Processing Plant	GNPC/Private sector	2010-2012	<ul style="list-style-type: none"> • Pipeline from Jubilee field to processing plant completed by 2012 	<ul style="list-style-type: none"> • GNPC
	(v) Construction of pipeline from processing plant to West African Gas Pipeline (WAGP)	GNPC/Private sector	2010-2012	<ul style="list-style-type: none"> • WAGP pipeline completed by 2012 	<ul style="list-style-type: none"> • GNPC

Petroleum Upstream and Midstream Strategy Issue 2

Maximise the benefits of exploration, development, production and utilisation of oil and gas to Ghanaians

Thematic area

Infrastructure Development/Strong Economy for Real Jobs/Transparent and Accountable Governance/Investing in People

Diagnostics

- Ghanaians have not benefited adequately, from the exploitation of extractive natural resource such as minerals and timber. This should not occur for oil and gas.
- Some oil producing countries have had unsatisfactory/bad experiences in utilising revenue from oil and gas production

Policy Responses

- Build a transparent regulatory regime for the effective management of revenue from oil and gas development
- Maximise local content in all aspects of the petroleum industry value chain

Objectives to be achieved

- Ensure utilisation of oil revenue in the priority areas of education, health, rural development, infrastructure, water, sanitation and poverty reduction;
- Provide adequate investment for physical and social infrastructure in communities in the oil and gas production areas;
- Set up and provide adequate funding for a Future Generation Fund to ensure sustained national well being into the long term;
- Ensure adequate funding for technical training and scientific research and development;
- Maximise the participation of Ghanaians in the exploration, development, production and utilisation of oil and gas; and
- Develop petrochemical industry.

The strategies to be implemented to achieve the policy goals are contained in Table 3.2 and Table 3.3

Table 3.2 Strategies to achieve petroleum upstream and midstream objectives

Objectives to be achieved	Key Programme and projects	Possible Financing Sources	Time-frame	Verifiable Indicators/Milestones	Responsible Agency
Ensure utilisation of oil revenue in the priority areas of education, health, rural development, infrastructure, water and sanitation to reduce poverty	Develop comprehensive Oil and Gas Master Plan including Local Content and Participation Implementation Strategy	GoG/Private sector	2009-2015	<ul style="list-style-type: none"> Oil and Gas Master Plan completed by July 2010 Comprehensive Oil and Gas Master Plan approved by August 2010 Master Plan implementation started by December 2010 	<ul style="list-style-type: none"> Ministry of Energy
Ensure adequate investment in physical and social infrastructure in communities in the oil and gas production areas	Develop Rolling Strategic Infrastructure Development Plan for Communities in Oil and Gas Production Areas	GNPC/Private sector	2009-2015	<ul style="list-style-type: none"> Strategic Plan for Infrastructure Development available by June 2010 	<ul style="list-style-type: none"> Ministry of Energy
Set up and provide adequate funding for Future Generation Fund to ensure sustained well being into the long term	Develop and promote comprehensive Oil and Gas Revenue Management Law	GoG/GNPC	2009-2010	<ul style="list-style-type: none"> Oil and Gas Revenue Management Law passed by Parliament by June 2010 	<ul style="list-style-type: none"> Ministry of Finance
Ensure adequate funding for technical training and scientific research and development	<p>(i) Collaborate with other Ministries and Agencies to develop and implement curricula for tertiary institutions in petroleum industry related disciplines</p> <p>(ii) Facilitate Middle-Level Skill Training Programme for the Oil and Gas Industry</p>	GoG/GNPC/Oil and Gas Companies	2009-2015	<ul style="list-style-type: none"> Set-up Skill Development Committee put in place by December 2009 Middle-Level I Skill Development Programme available by December 2009 500 middle-level skill trainees by December 2015 	<ul style="list-style-type: none"> Ministry of Energy

Table 3.3 Strategies to maximise local content and local participation in upstream and midstream oil and gas industry

Objectives to be achieved	Key Programme and projects	Possible Financing Sources	Time-frame	Verifiable Indicators/Milestones	Responsible Agency
Maximise the participation of Ghanaians in the exploration, development, production and utilisation of oil and gas	(i) Support the development of local businesses to build expertise and capacity to participate in the oil and gas industry	GoG/Development Partners/Local Business Associations	2009-2012	<ul style="list-style-type: none"> Local Business Development Plan available by June 2010 	<ul style="list-style-type: none"> Ministry of Energy/AGI/GCC
Develop a viable Petrochemical Industry based on Natural Gas	(i) Develop the Gas-based Industrial Enclave	GoG/Private sector	2009-2015	<ul style="list-style-type: none"> Establish Natural Gas Industrial Estates Development Company Limited by Dec 2015 	<ul style="list-style-type: none"> Ministry of Energy/MOT I
	(ii) Establish Petrochemical Industry	GoG/Private Sector	2009-2015	<ul style="list-style-type: none"> Complete Feasibility Studies for Gas-based Industrial Enclave by Dec 2015 	<ul style="list-style-type: none"> Ministry of Energy

PETROLEUM DOWNSTREAM

Increasing Domestic Production of Petroleum Products

With only about 60% of the national petroleum product requirement being met from domestic production at the Tema Oil Refinery (TOR), the balance of product requirements is imported. There is also the need for Ghana to build adequate capacity to enable it become not only self sufficient in the production of petroleum products but also the “Petroleum Hub” of the West African Sub-region. This can be achieved by:

- Increasing the capacity of TOR from 45,000 BPSD to 145,000 BPSD Feasibility studies have shown that the expansion of TOR is economically justified; and
- Building new refineries. The Government has already initiated the process of building new refineries. These projects are to be fully developed and financed by the private sector.

Increasing National Access to Petroleum Products

Access to petroleum products in the rural areas is inadequate due to limited infrastructure for storage and equipment for distribution and use. The situation has led to the rural population having to purchase kerosene and LPG at higher prices than the official prices. The medium term strategic objective is to increase access to petroleum products particularly LPG and kerosene in rural areas. This objective will be achieved by:

- Continuing to finance the development of rural kerosene storage and supply infrastructure nationwide. The Ministry of Energy is giving further impetus to the Rural Kerosene Promotion Programme
- Expanding the petroleum product storage capacity nationwide. BOST is currently expanding existing bulk petroleum products storage capacity.
- Expanding marine related facilities on the Volta Lake for bulk transportation to ensure year-round supply of petroleum products to Northern Ghana.
- Facilitating the availability of more petroleum product distribution outlets in deprived areas to increase access density (number of persons per sale outlet).
- Promoting a more efficient licensing regime for sales outlets to ensure optimal economic benefits to both investors and consumers
- Supporting the rehabilitation and expansion of rail infrastructure to enhance the transportation of petroleum products

With regards to LPG, it is intended to increase access from the current level of 6% of households to 50% by 2015. This will be achieved through the development of LPG infrastructure and pricing incentives to encourage distributors to expand their operations to especially the rural and deprived areas. The following measures will be implemented in that regard:

- Speed up the establishment of a Natural Gas Processing Plant to produce LPG from the associated gas to be produced from the Jubilee Oil and Gas Field. It is estimated that 10,000 barrels (1,340 tonnes) a day of LPG could be produced from the gas from the Jubilee Field;
- Re-capitalise GCMC to expand production capacity. The production of cylinders will focus on small sized cylinders that will be affordable to households in rural communities;
- Construct LPG Storage and supply infrastructure in all regional and district capitals in the long term. In the medium term, it is intended to develop district capital LPG infrastructure;
- Increase the LPG distribution margin.

Petroleum Downstream Strategy Issue 1

Limited availability of petroleum products to consumers

Thematic area

Infrastructure Development/Strong Economy for Real Jobs

Diagnostics

- Tema Oil Refinery (TOR) has high levels of debt owing to a combination of factors including under-recovery of costs, inadequate working capital and poor management;
- Inadequate local refining capacity;
- Inadequate storage capacity, bulk transportation and distribution infrastructure for petroleum products including LPG

Policy Responses

- Competitive procurement of crude oil and petroleum products;
- Open up the refining business to both public and private sector participation;
- Ensure strict adherence to implementation of full-cost recovery principles in petroleum pricing; and
- Improve regulatory regime for petroleum products transportation, distribution and sale.

Objectives to be achieved

- Ensure uninterrupted availability and access of petroleum products and eliminate obstacles to access of fishermen to pre-mix fuel;
- Achieve LPG access to at least 50% of households and public institutions by 2015; and
- Eliminate debts incurred by TOR by ensuring full-cost recovery in its operations, strengthening management and the regulatory regime.

The interventions that will be implemented to achieve these goals are contained in Table 3.4 and Table3.5

Table 3.4 Strategies to expand availability of petroleum products to consumers

Objectives	Key Programme and projects	Possible Financing Sources	Time-frame	Verifiable Indicators/Milestones	Responsible Agency
Ensure availability and access of petroleum products	(i) Expansion of TOR by doubling its capacity with private sector involvement	GoG/Private sector	2009-2013	<ul style="list-style-type: none"> • Engage Project Consultant in 2009 • Financial closure reached by June 2010 • Contract awarded by September 2010 • Construction commenced by March 2011 • Construction completed by March 2013 	<ul style="list-style-type: none"> • TOR
	(ii) Development of Private Export-Oriented Refineries	Private sector	2009-2015	<ul style="list-style-type: none"> • MOUs signed and first refinery completed and commissioned by December 2015 	<ul style="list-style-type: none"> • Ministry of Energy
	(iii) Expansion of capacity for bulk storage of petroleum products including LPG	GoG/BOST/Private sector	2009-2011	<ul style="list-style-type: none"> • Completion of Afram Plains Depot, Akosombo, Savelugu under US Exim Bank financing by December 2011. • Project proposals for Takoradi and Wa Depots prepared by December 2009 • Land acquisition for Takoradi and Wa completed by December 2009 • Financing arrangements concluded by June 2010 • Takoradi Depot construction commence by June 2011 	<ul style="list-style-type: none"> • BOST

Table 3.4 Strategies to expand availability of petroleum products to consumers (continued)

Objectives	Key Programme and projects	Possible Financing Sources	Time-frame	Verifiable Indicators/Milestones	Responsible Agency
	(iv) Petroleum Products Pipeline Transportation Projects to Northern Ghana	GoG/Bilateral Donors	2009 - 2013	<ul style="list-style-type: none"> • Completion of Accra Plains to Akosombo Pipeline by October 2011 • Completion of Debre – Buipe Pipeline Project by October 2011 	<ul style="list-style-type: none"> • BOST
Ensure availability and access of petroleum products	v) Development of Private Export-Oriented Refineries	Private sector	2009-2015	<ul style="list-style-type: none"> • MOUs signed and first refinery completed and commissioned by December 2015 	<ul style="list-style-type: none"> • Ministry of Energy
	(vi) Establishment of a minimum of 90 days strategic stocks	GoG/Private sector	2009-2010	<ul style="list-style-type: none"> • Re-introduction of Strategic Stock levy by July 2010 • Cabinet Memorandum submitted by March 2010 	<ul style="list-style-type: none"> • BOST/Ministry of Energy

Table 3.5 Strategies to expand availability of petroleum products to consumers

Objectives	Key Programme and projects	Possible Financing Sources	Time-frame	Verifiable Indicators/Milestones	Responsible Agency
Ensure TOR is able to recover cost of operations	Implementation of strict Cost-Recovery Petroleum Pricing Formula Strengthening Capacity of Board and Management of TOR	GoG/NPA	2009-2012	<ul style="list-style-type: none"> • Preparation of HR Plan by June 2010 • Recapitalise TOR by Dec 2010 • TOR financially stable by December 2010 	<ul style="list-style-type: none"> • TOR/NPA/Ministry of Energy
Increase access to pre-mix by fishermen	Premix Supply Rationalisation Programme	GoG	2009-2012	<ul style="list-style-type: none"> • Report of Premix Supply Rationalisation available by June 2010 • Commence implementation of Premix Supply Plan by July 2010 	<ul style="list-style-type: none"> • Ministry of Energy/ Ministry of Agriculture
Achieve LPG access to 50% of households and Public Institutions by 2015	National LPG Promotion Programme	GoG/Private sector	2009-2015	<ul style="list-style-type: none"> • Prepare Medium to Long Term National LPG Promotion Programme by June 2010 • LPG Promotion Fund established by December 2010 • Commence implementation of LPG Programme by May 2011 	<ul style="list-style-type: none"> • Energy Commission/ • Ministry of Energy
Expand local cylinder manufacturing capacity in support of the National LPG Programme	Increasing Capacity Utilisation of Ghana Cylinder Manufacturing Company (GCMC);	GoG/Private sector	2010-2012	<ul style="list-style-type: none"> • GCMC Financial Recovery Plan ready by December 2009 • Commence implementation of GCMC Financial Recovery Plan by January 2010 	<ul style="list-style-type: none"> • GCMC

4. RENEWABLE ENERGY SUB-SECTOR

Ghana is well endowed with Renewable Energy Resources particularly biomass, solar, wind energy resources, and to a limited extent, and mini-hydro. The development and use of renewable and energy resources have the potential to ensure Ghana's energy security and also mitigate the negative climate change impact of energy production and use as well as solve sanitation problems.

Biomass is Ghana's dominant energy source in terms of endowment and consumption. Biomass resources cover about 20.8 million hectares of the land mass of Ghana and biomass is the source of supply of about 60% of total energy used in the country. The vast arable and degraded land mass of Ghana has the potential for the cultivation of crops and plants that can be converted into a wide range of solid and liquid biofuels.

Solar radiation levels are estimated at about 4-6 kWh/m². Average wind speed along the eastern coastal areas is estimated at 5m/s at a height of 12 metres. Wind speeds of 9 m/s have been recorded on the mountains along south eastern corner of the country. The wind speed regime along the coastline suggests that wind can be harnessed for power generation as well as for mechanical applications.

Goals

The goals of the Renewable Energy sub-sector are to increase renewable energy in the total national energy mix and ensure its efficient production and use.

Challenge

The major challenge in biomass energy supply is to improve the efficiency of its utilisation and sustain its production and use. A key challenge in the development of mini hydro, solar and wind energy is the higher cost of energy produced from these sources owing to the current state of the technologies.

The focus of the biomass strategy is the (i) regeneration of forest cover through afforestation; and (ii) improvement in the production and efficient use of woodfuels. In the long term, the focus is on fuel substitution to alternative sources of energy. As regards solar and wind, the focus is to assist Ghanaian engineers and scientists to research and develop measures to reduce the cost of renewable energy technologies and provide fiscal, financial and pricing incentives on Renewable Energy Technologies to improve their competitiveness.

Renewable Sub-sector Strategy Objective

In addressing the challenges, Government will:

Woodfuels

- Support sustained regeneration of woody biomass resources through legislation and fiscal incentive;
- Promote the establishment of dedicated woodlots for wood fuel production;
- Promote the production and use of improved and more efficient woodfuel utilisation technologies;
- Promote the use of alternative fuels such as LPG as substitute for fuel wood and charcoal; and
- Promote the production and use of other woodfuel energy resources (waste, biofuels).

Liquid Biomass Fuels

- Balance biofuel development against food security.
- Support development of biofuels as a transportation fuel as well as job creation initiative.
- Support private sector investments in cultivation of biofuel feedstock, extraction of the bio-oil and refining of bio-oil into secondary products by creating appropriate financial and tax incentives.

Solar, Wind and Mini Hydro

- Promote the exploitation and use of mini hydro, solar and wind energy resources.
- Support indigenous research and development aimed at reducing the cost of renewable energy technologies.
- Provide tax incentives for the importation of all equipment used in the development of renewable and waste energy projects.
- Support the use of decentralized off-grid alternative technologies (such as solar PV and wind) where they are competitive.

Cross-cutting issues

- Create favourable regulatory and fiscal regimes as well as attractive pricing incentives.

Renewable Energy Strategy Issue 1

Low level of renewable energy in national electricity supply mix

Thematic area

Infrastructure Development/Strong Economy for Real Jobs/Investing in people.

Diagnostics

- High potential but low exploitation and utilisation of renewable energy. This is due to high cost of renewable energy production.

Policy Responses

- Utilise cost-effective cutting edge technologies to reap the huge potential of renewable energy.
- Provide tax and other financial incentives to attract private sector investments in renewable energy technology.

Objectives to be achieved

- Increase the renewable energy supply in national energy mix to 10% by 2020.
- Establish legislation to encourage development of renewable energy technologies.

Interventions to achieve the strategic goals are contained in Table 4.1.

Table 4.1 Strategies to increase renewable energy in national energy supply mix.

Objectives to be achieved	Key Programme and Projects	Possible Financing Sources	Time-frame	Verifiable Indicators/Milestones	Responsible Agency
Increase the renewable energy supply in national energy mix to 10% by 2020	(i) Grid-connected Solar PV programme for public institutions	ECOWAS Bank for Investment and Development (EBID)	2009-2013	<ul style="list-style-type: none"> Finalise proposals with ECOWAS Bank by December 2009 	<ul style="list-style-type: none"> Ministry of Energy
	(ii) Grid-connected solar PV in estate development	ECOWAS Bank for Investment and Development (EBID)	2009-2013	<ul style="list-style-type: none"> Finalise proposals with ECOWAS Bank by December 2009 	<ul style="list-style-type: none"> Ministry of Energy
	(iii) Wind Farm Project (50 MW at Kpone) Development of wind power projects a). Wind farm project b). 3 Wind Mast	Private sector financing/GOG	2009-2014	<ul style="list-style-type: none"> Finalise PPA for project by December 2009 Commence construction by June 2011 3 wind mast installed and monitored by 2013 50 MW Wind Project ready by December 2014 	<ul style="list-style-type: none"> Energy Commission/Ministry of Energy
	(iv) Development of Mini Hydro Demonstration Project	GoG/Development Partners/Concessional funding	2009-2013	<ul style="list-style-type: none"> Prepare detailed Feasibility Studies on 21 mini hydro sites completed by 2010 Establishment of MOU with KNUST by June 2010 	<ul style="list-style-type: none"> Ministry of Energy
	(v) Bio-fuels Projects	Private sector financing	2009-2010	<ul style="list-style-type: none"> Complete Renewable Energy Law (Biofuels) by June 2010 Complete Biofuels Regulations by August 2010 	<ul style="list-style-type: none"> Energy Commission

Table 4.1 Strategies to increase renewable energy in national energy supply mix. (Continued)

Objectives to be achieved	Key Programme and Projects	Possible Financing Sources	Time-frame	Verifiable Indicators/Milestones	Responsible Agency
Develop legislation to encourage renewable energy technology development and utilisation	Development of Renewable Energy Law	GoG/Development Partners	2009 - 2010	<ul style="list-style-type: none"> • Renewable Energy Law passed by June 2010. 	<ul style="list-style-type: none"> • Energy Commission

5. WASTE-TO-ENERGY

Waste-to-Energy projects have become a very important mechanism for the management of the growing sanitation problem facing urban communities as well as a means of contributing to energy supply and security. Significant amounts of wastes are generated in Ghana. These include (i) municipal waste (both solid and liquid), (ii) industrial wastes, and (iii) agricultural wastes.

There are many energy technologies which can convert these waste materials into electricity, heat and fuel. The conversion technologies include (i) combustion, (ii) gasification (iii) pyrolysis (iv) anaerobic digestion (v) fermentation, (vi) esterification.

Some waste-to-energy technologies that have been developed in Ghana are anaerobic fermentation of municipal waste and industrial liquid wastes to produce biogas for heating and electricity generation, combustion of solid wastes to produce electricity in Combined Heat and Power (CHP) systems.

While many waste-to-energy technologies are mature and widely applied in other parts of the world, they are relatively more expensive compared to conventional technologies particularly due to the high cost of waste collection and management.

Policy Goal

The goal is to convert most of the wastes generated in municipal activities, industrial operations and agricultural operations to energy.

Challenge

The major challenge to the development of waste-to-energy technologies in Ghana is the high cost associated with the collection and management of waste materials.

Strategy Framework

The focus is to convert municipal, industrial and agricultural waste into energy as a means of managing the growing sanitation problems and contributing to energy supply security.

Waste-to-Energy Strategy Issue 1

High pollution of the environment by municipal, industrial and agricultural wastes

Thematic area

Infrastructure Development/ Real Jobs/Investing in people.

Diagnostics

Low exploitation of waste-to-energy technologies

Policy Responses

- Maximise energy production from waste
- Divert waste from landfills (prohibit burying of waste and landfills)
- Facilitate access to grid for waste to energy power plants
- Develop infrastructure for waste collection and supply to waste-to-energy facilities

Goals to be achieved

The goal is to convert most of the wastes generated in municipal activities, industrial operations and agricultural operations to energy.

Table 5.1 Strategies to convert wastes to energy

Objectives to be achieved	Key Programme and Projects	Possible Financing Sources	Time-frame	Verifiable Indicators/Milestones	Responsible Agency
Management of municipal, industrial, and agricultural wastes through energy production.	(i)Metropolitan waste-to-power project	GoG/Private sector/DPs	2010-2015	Framework for Metropolitan waste-to-power project ready by January 2011	MoEn/EC
	(ii)Institutional biogas project (Universities, Polytechnics and Senior High Schools)	GoG/Private	2010-2015	Framework for Institutional biogas project ready by January 2011	MoEn/MoE/Private sector
	(iii)Combined heat and power system for industries	GoG/Private sector	2010-2015	Framework for combined heat and power systems ready by January 2011	MoEn/MoTI/Private sector

6. ENERGY EFFICIENCY AND CONSERVATION

The annual growth in the demand for fuelwood and charcoal is estimated at 3% per annum. Electricity demand, on the other hand, is growing between 6% and 7% annually while consumption of petroleum products is estimated to increase at about 5% per annum. Energy efficiency and conservation can help mitigate these high growth rates.

The losses in the production, transportation and use of energy are also high. System losses in electricity distribution are about 25%, with wastage in the end-use of electricity also estimated at about 30%. Reduction of losses in energy supply and more efficient use of energy would contribute to reduction in the demand for energy.

Strategic Goal

The strategic goal is to ensure efficient production and transportation, as well as end-use efficiency and conservation of energy.

Government intends to reduce the end-use electrical wastage by implementing a comprehensive Demand-Side Management (DSM) Programme. The key objectives of the DSM Programme are to:

- (i) Encourage efficiency in energy use in all sectors of the national economy;
- (ii) Improve the productivity and competitiveness of Ghanaian industries through the use of more efficient technologies;
- (iii) Improve system reliability by reducing demand; and
- (iv) Reduce and manage power system demand through load shifting

Challenge

The challenge is to promote and finance the implementation of energy efficiency and conservation measures.

Strategy Framework

The focus will be on removing the obstacles that have constrained the promotion and implementation of energy efficiency and conservation measures. This will be achieved through the application of fiscal and financial incentives, awareness creation and institutional intermediation.

General

- Establish appropriate pricing regime for energy services that would encourage (provide incentive) domestic and industrial consumers to voluntarily manage their energy consumption;
- Develop and implement programmes and measures to help consumers optimize their energy use; and
- Support a sustained and comprehensive public education and awareness building campaign on the methods and benefits of energy conservation.

Electricity

- Discontinue, through legislation, the local production, importation and use of inefficient electricity consuming equipment and appliances.

Petroleum Products

- Establish petroleum products lifting zones in the country;
- Encourage the development and use of efficient fuels; and
- Implement fiscal measures to discourage the importation and use of vehicles which are not fuel efficient.

Energy Efficiency and Conservation Strategy Issue 1

Substantial electricity wastage through inefficient distribution and consumption

Thematic area

Infrastructure Development

Diagnostics

- High losses in the distribution system.
- About 30% of electricity supplied to consumers is wasted as a result of inefficient electrical equipment, poor attitude towards energy conservation, and theft.

Policy Responses

- Reduce the system losses in electricity distribution ;
- Ban the importation and use of inefficient electrical appliances; and
- Provide fiscal and financial incentives to promote the use of efficient electrical equipment and appliances.

Objectives to be achieved

- Achieve 10% savings in electricity consumption through implementation of comprehensive electrical power efficiency and conservation measures

Strategic actions that will be implemented towards the achievement of the goal are contained in Table 6.1

Table 6.1 Strategies to reduce wastage and ensure more efficient use of electricity

Objectives to be achieved	Key Programme and projects	Possible Financing Sources	Time-frame	Verifiable Indicators/Milestones	Responsible Agency
Achieve 10% savings in electricity consumption through electric power efficiency and conservation measures.	(i) Power Factor Correction Programme in Public Institutions, Commercial and Industrial Entities	GoG (Electricity Demand Management Fund)/Private sector	2009-2012	<ul style="list-style-type: none"> • Equipment installed in first 25 Public institutions by Dec 2010 • Equipment installed in all 100 public and commercial and industrial businesses by 2012 	<ul style="list-style-type: none"> • Energy Commission
	(ii) Public Awareness Campaign Programme on Energy Efficiency and Conservation	GoG/ECG/VRA/Independent Power Producers	2009-2012	<ul style="list-style-type: none"> • Public Awareness Programme submitted and approved by EC by March 2010 • Commence implementation by April 2010 	<ul style="list-style-type: none"> • Energy Commission/ Energy Foundation
	(iii) Implementation of Legislation on Ban of Importation and Use of Inefficient Electrical Appliances	Energy Fund	2009-2012	<ul style="list-style-type: none"> • Importation of inefficient electrical appliances eliminated by Dec 2010 to December 2012 	<ul style="list-style-type: none"> • Energy Commission/ Ministry of Energy/CEPS/GS B

Energy Efficiency and Conservation Strategy Issue 2

Losses and wastage in the transportation, distribution and utilisation of petroleum products

Thematic area

Infrastructure Development

Diagnostics

- Perceptible losses in the production, transportation and distribution of petroleum products;
- High influx of over-aged and inefficient vehicles.

Policy Responses

- Reduce the losses in petroleum product transportation, distribution and consumption;
- Ban the importation of high-fuel consuming vehicles;
- Encourage the use of fuel enhancing additives.

Objectives to be achieved

- Achieve 15% savings in petroleum product transportation, distribution and consumption.

Interventions being implemented in the medium term to achieve the above goal are contained in Table 6.2.

Table 6.2 Strategies to reduce wastage and ensure more efficient use of petroleum products

Objectives to be achieved	Key Programme and projects	Possible Financing Sources	Time-frame	Verifiable Indicators/Milestones	Responsible Agency
Achieve 15% savings in petroleum products consumption	(i) Strict Implementation of Petroleum Products Lifting Zoning Mechanisms	GoG (Petroleum Demand Management Fund)/ OMCs/NPA/Private sector	2009-2012	<ul style="list-style-type: none"> Letter to Re-introduce Zoning issued by Minister of Energy by January 2010 Programme commences December 2009 	• BOST/Ministry of Energy/TOR
	(ii) Prohibition of Importation of Over-aged Vehicles above 10 years	GoG	2009-2011	<ul style="list-style-type: none"> Bill available by June 2010 Parliamentary approval by December 2010 	• Ministry of Energy/ Energy Commission
	(iii) Public Awareness Campaign Programme on Fuel Efficiency and Conservation in transportation	GoG/NPA/BOST/OMCs	2009-2014	<ul style="list-style-type: none"> Public Awareness Programme approved by Ministry of Energy/EC by March 2010 Programme under implementation 	• Energy Commission/ Energy Foundation
	(iv) Promotion of the use of improved fuel performance additives.	OMCs/NPA	2009-2012	<ul style="list-style-type: none"> Sale of new petroleum products formulations for transportation by 2015 	• Ministry of Energy
	(v) Establishment of Centre for Research in Petroleum Efficiency and Conservation	GoG/Development Partners/OMCs/NPA/Private sector	2009 – 2012	<ul style="list-style-type: none"> Feasibility studies completed by June 2010 Recommendations approved by cabinet by August 2012 	• Ministry of Energy

7. ENERGY AND ENVIRONMENT

The production and use of energy impact on the environment and global climate in varying degrees. The exploitation of biomass for energy purposes results in deforestation, while the use of fossil-based fuels contributes to climate change. The use of inferior cooking equipment also has negative health impact. The production, transportation of crude oil, flaring of natural gas associated with petroleum production and the production of petroleum products have associated environmental risks.

Strategic Goal

The goal is to ensure that energy is produced, supplied and used in an environmentally sustainable manner.

Challenge

The challenge is to mainstream environmental issues in all energy projects and to implement and enforce adherence to environmental mitigation plans associated with energy project development.

Strategy Framework

The strategies will focus on the conduct of Strategic Environmental Assessment (SEA) and Environmental Impact Assessment (EIA) Studies and Social Impact Assessment (SIA) Studies of all energy projects, with associated adaptation and mitigation plans for environment and climate change.

Energy and Environment Strategy Issue 1

Energy production and supply produce emissions that have undesirable health and global climate change implications

Thematic area

Infrastructure Development

Diagnostics

- Poor working environment and health conditions in the production and utilisation of energy;
- Perceptible global warming conditions

Policy Responses

- Produce and use environmentally friendly energy forms;
- Deploy mechanisms to limit the emission of environmentally undesirable substances from energy production;
- Use fiscal and financial incentives to promote the production and use of environmentally friendly energy forms.

Objectives to be achieved

- Ensure that in the production and use of energy adverse environmental impacts are minimized;
- Ensure environmental and social impact assessments are a major part of all energy projects.

Interventions to be pursued to achieve the above goals are contained in the

Table 7.1 shows the strategies to mainstream environmental concern in the energy sector.

Table 7.1 Strategies to mainstream environmental concerns in energy development projects.

Objectives to be achieved	Key Programme and projects	Possible Financing Sources	Time-frame	Verifiable Indicators/Milestones	Responsible Agency
Ensure production that in the production and use of energy adverse environmental impacts are minimized	(i) Environmental and Social Impact Assessment review of existing Energy Projects	GoG/VRA/ECG/NPA/GNP C/BOST/TOR/Private sector operators	2009-2010	<ul style="list-style-type: none"> • Prepare TOR for Consultancy services by June 2010 • Engage Consultant by August 2010 • Environmental and Social Impact Assessment review Report available by December 2010 	<ul style="list-style-type: none"> • Ministry of Energy
	(ii) Creation and funding of Environmental and Social Impacts Assessment Unit in the Ministry of Energy	GoG/VRA/ECG/NPA/GNP C/BOST/TOR/Private sector operators/Development Partners	2009-2015	<ul style="list-style-type: none"> • Design of Organogram for the Unit by June 2010 • Staff recruitment completed by December 2010 	<ul style="list-style-type: none"> • Ministry of Energy
Ensure environmental and social impact assessments are a major part of all energy projects	(i) Development of Environmental and Social Impact Assessment Guidelines for Energy projects	GoG/VRA/ECG/NPA/GNP C/BOST/TOR/Private sector operators/Development Partners	2009-2010	<ul style="list-style-type: none"> • TOR for consultancy services available by June 2010 • Consultant engaged by August 2010 • Guidelines available by December 2010 	<ul style="list-style-type: none"> • Ministry of Energy
Maximise the benefits of Environmental Credit (Carbon Credits) mechanisms for energy projects/Adaptation fund	(i) Establishment and Implementation of Environmental Credit Facility for development of energy project	GoG/Energy Fund	2009-2015	<ul style="list-style-type: none"> • Develop Concept Paper by June 2010 • Complete studies by December 2010 	<ul style="list-style-type: none"> • Energy Commission

8.0 ENERGY AND GENDER

Energy issues are of concern to all. However, women are the most important actors in the energy sector, in terms of their contact, use and management of renewable energy sources, which in their very crude or primary form are used mostly by women. Biomass (primarily wood fuel and charcoal) constituted 67% of the total energy consumed in Ghana. Women in Ghana bear the brunt in the use of the wood fuel based energy economy in the country. The health impacts of indoor air pollution from traditional biomass fuels and their negative impacts on women, girls and babies remain a critical issue.

Strategic Goal

The goal is to mainstream gender concerns in the energy sector

Challenge

- Unequal access of men and women to modern forms of energy
- Limited involvement of women in the planning and management of Energy services

Strategy Framework

The strategies will focus on minimizing the adverse health effects of energy use on women by promoting the use of modern forms of energy in households; and ensuring participation of women in the formulation and implementation of energy interventions

Energy and Gender Strategy Issue 1

The health impacts of indoor air pollution from traditional biomass fuels and their negative impacts on women, girls and babies remain a critical issue.

Thematic area

Infrastructure Development

Diagnostics

High exposure to women to indoor pollution from the use of wood fuels.

Policy Responses

Promote the use of modern forms of energy in households

Objectives to be achieved

Minimize the adverse health effects of the use of wood fuels on women

Energy and Gender Strategy Issue 2

Concerns of women in the policies in the energy sector.

Thematic area

Infrastructure Development

Diagnostics

Women's influence in decision making in the energy sector

Policy Responses

- Ensure participation of women in the formulation and implementation of energy interventions
- Build capacity of women in the energy Sector

Objectives to be achieved

Address the concerns of women in energy policy formulation and implementation

Table 8.1 Strategies to mainstream Gender in Energy Sector Programmes and Project

Objectives to be achieved	Key Programmes and Projects	Possible Financing Sources	Time-frame	Verifiable Indicators/Milestones	Responsible Agency
Minimize the adverse health effects of the use of wood fuels on women	Women in LPG Promotion Programme	GoG/ Private Sector	2010-2012	Number of women in LPG promotion programme	MoEn
	Women in Energy Efficiency and Conservation Programmes	GOG	2010-2012	Number of women in Energy Efficiency and Conservation Programmes	MoEn
Address the concerns of women in energy policy formulation and implementation	Capacity building for Women in Energy	GOG/ Private Sector	2010-2012	Number of female professionals in the energy sector	MoEn/ Energy sector agencies
	Establishment of Gender Desk at the Ministry of Energy	GoG	2010-2012	Gender desk established in the Ministry of Energy	

9. FINANCING THE ENERGY SECTOR

Strategy Goal

The strategy focuses on enhancing private sector investment in partnership with the public sector.

Financing the Power Sub-Sector

The strategy to mobilize financing for the development of the power sub-sector will focus on:

- Restoring the financial and economic soundness of utility companies. In the past the power sector companies have posted negative net revenues, leading to negative returns. This situation is as a result of inadequate tariffs and poor revenue collection rate. The unhealthy financial positions of the utility companies have limited their ability to adequately maintain and expand the power system infrastructure, leading to deterioration in supply quality. Resolving this concern will require efforts by Government and PURC in managing the tariff setting process and may require introduction of new and innovative pricing mechanisms in the tariff setting framework.
- Securing private sector investments in re-capitalisation of power sector institutions, Owing to the poor financial health of the companies and the inability of Government to inject funds into the sector, the most viable option is to secure private sector capital to finance the power sector infrastructure.
- Increasing public financial support for investments in the power sub-sector.

Policy Direction

Restoring the financial health of Utility Companies.

The following measures will be pursued in the medium term:

- Support revision of electricity rates such that utility companies are allowed cost recovery in the immediate term to achieve ROR of 10% by 2011.
- Enhance managerial efficiency in order to improve cooperate governance and profitability of the utilities
- Raise revenue for critical power sector projects, with the approval of Parliament, by the imposition of levies on electricity consumption.
- Review the rationale for setting up of various funds in order to ensure that they accrue the appropriate amount of funding and also that they are used judiciously for the purposes for which they were established. Currently, there are a number of Funds into which levies on energy consumption are paid to finance specific development activities in the power sector. These include: (i) Rural Electrification Levy which is paid into the National Electrification Fund, (ii) Street Lighting Levy, and (iii) the Power Factor Surcharge Levy which is paid into the Electricity Demand Management Fund.

Securing increased private sector involvement.

The strategic actions and measures to be pursued in the medium term are:

- Support PPAs between distribution utility companies and prospective IPPs
- Examine the possibility of private sector capital injection in Government-owned power plants.
- Complete the necessary legal, institutional and regulatory framework that will provide comfort to the private sector. Energy Commission Act 541 provides for a number of regulations that are intended to support private sector participation in the power sector. The related legislative instrument would be completed by June 2010.

Financing the Petroleum Sub-Sector

Financing of the petroleum sub-sector has, in recent times, posed a major challenge. Government has recognised this challenge and steps are being taken to address this challenge. To this end, the implementation of the cost recovery pricing regime is expected to improve financial health of the players in the sub-sector. This will enable them to improve their financial health, generate adequate internal financial resources and also secure commercial loans on their own to implement their infrastructure development projects.

Strategy Focus

Government intends to take the following actions:

- Maintain the existing pricing regime and ensure that the full costs of petroleum products production and importation are fully recovered;
- Support private sector participation and investment in refining as well as oil and gas exploration, development and production activities;
- Increase funding from Government sources to GNPC in order to accelerate exploration of indigenous hydrocarbon resources. In that regard, Government will revise the exploration levy to cover the full budget for exploration activities; and
- Continue to source funding from commercial loans and capital market to support exploration, development and production activities of GNPC.

Financing of Renewable Energy Sub-Sector

In the past, Government has collaborated with Development Partners to fund renewable energy activities in Ghana. Investment fund have come from the consolidated national budget, while loans and grants from bilateral and multilateral donor agencies have been used for basic research and pilot projects. Direct private sector funding and investment has not been significant.

It is the intention of Government, as a priority medium term objective, to reach out to and encourage the private sector to play a lead role in the development of the renewable energy sector.

Strategic Actions

The following actions will be implemented to create the necessary environment for the mobilization of financing for renewable energy projects:

- Increase Government funding for non-grid connected renewable energy technologies for agriculture and social services including schools, health centres, provision of potable drinking water, etc.;
- Provide fiscal incentives to attract private sector investment in the development of renewable energy technologies (RETs);
- Fund the collection of primary data on renewable energy resources and conduct Pre-Feasibility Studies for RETs with promising prospects for development. This is intended to reduce the up-front investment by private sector, and thus speed up private sector involvement in the implementation of renewable energy projects;
- Seek bilateral and multilateral financing sources including CDM facility for development of RETs projects;
- Establish LPG fund to support LPG promotion; and
- Allocate a significant portion of the Rural Electrification Fund (to be established) to support implementation of renewable energy programmes.

Financing of R & D

In the past, Government had collaborated with Development Partners to fund R&D activities in energy sector. Government funds came from the Energy Fund while grants from bilateral and multilateral donor agencies have been used for basic research and pilot projects. Direct private sector investment has been negligible.

Strategic Actions

Government proposes, as a priority medium term objective, to pursue the following actions:

- Allocate at least 20% of the Energy Fund annually for R&D activities relating to policy, renewable energy, energy conservation and institutional development;
- Allocate at least 10% of the Exploration Levy annually for R&D activities relating to petroleum sub-sector;
- Allocate at least 10% of Electricity Demand Management Fund annually for R&D activities related to Energy Conservation and Efficiency;
- Secure donor grants for energy R&D activities;
- Encourage private sector and industry to support energy R&D and also the local manufacture of energy technologies. Government will provide fiscal and financial incentives for industries which support energy R&D; and

10. COMMUNICATION STRATEGY

The implementation of the Medium Term Strategy will require a robust communication plan backed by a sustainable strategy to ensure ownership and support for the Medium Term Plan.

Objectives to be achieved

The goal of the Communication Strategy is to create awareness and acceptance among all stakeholders and the general public about the Energy Policy and Programmes of Government of Ghana

Strategic Actions

To ensure an effective communication programme to reach all stakeholders and the general public:

Table 9.1 contains the programmes to be implemented to roll-out the communication strategy.

Table 10.1 Communications strategies and programmes

Objectives to be achieved	Key Programme and projects	Possible Financing Sources	Implementation Time-frame	Verifiable Indicators/Milestones	Responsible Agency
Increase public awareness on Energy Policy and Programmes of Government	(i) National Energy Sector Development Communication Plan	GoG/VRA/ECG/NPA/GNPC/BOST/TOR/Private sector operators in energy	2009-2015	<ul style="list-style-type: none"> • Engage Communication Expert by March 2010 • Communication Plan available June 2010 • Commence full implementation of Communication Plan by July 2010 	<ul style="list-style-type: none"> • Ministry of Energy

11. CONCLUSIONS

While this document intends to achieve a vibrant energy sector, the successful implementation of the energy sector policy will require the support and cooperation of all stakeholders, including the Development Partners.

