



EFFICIENT AND ECONOMIC USE OF ENERGY

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OUTLINE OF PRESENTATION

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2. Ghana Basic Energy Data
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4. Energy Efficiency
5. Existing Laws and Policies for Efficient and Economic Use of Energy
6. Benefits of Using Energy Efficiently and Economically
7. Research Activities of The Energy Center

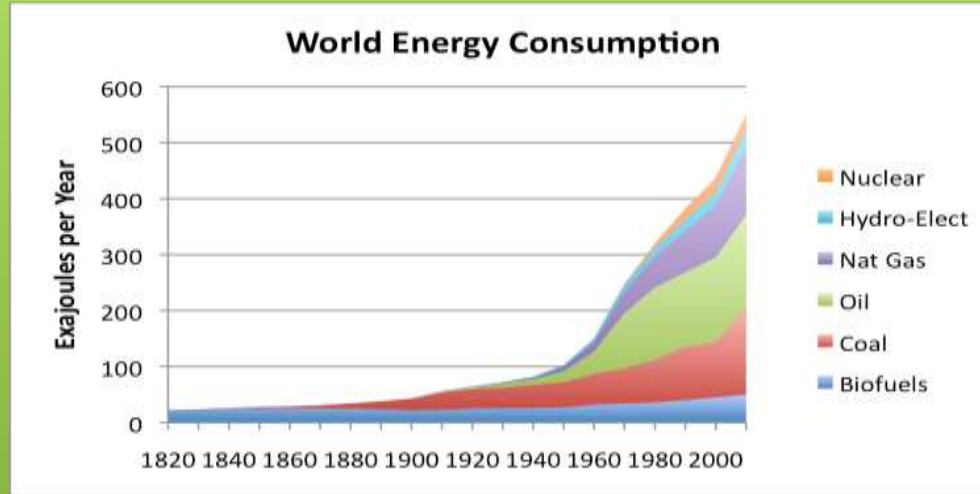
Energy and Its Importance to Our Existence (1)

- We need energy to perform our daily routines like cooking, ironing, computing etc.
- Energy drives economic growth in every country.
- Industries and other businesses need energy to operate.
- Vehicles, trains and planes need energy to move us from one place to the other.



Energy and Its Importance to Our Existence (2)

- The demand for electricity/energy consumption has increased worldwide with new developments in the world.



- This has put pressure on the power utilities to meet the increasing demand of the customer.

Ghana Basic Energy Data

- Electricity Access (2014): 74%
- Electricity Installed Capacity (2014): 2,831 MW
- Electricity Generation (2014): 12,963 GWh
- Ghana Peak Load (2014): 1970 MW

Ghana Load at Peak = Maximum Demand for Ghana (ECG + NEDCo + Direct Customers of VRA + Mines)

- System Peak Load (2014) 2,061 MW

System Peak = Ghana Load at Peak + VALCO Load + Export Load

Table 1. Installed Electricity Generation Capacity (End of December, 2014)

PLANT	FUEL TYPE	INSTALLED CAPACITY (MW)	Share (%)
Hydro			
Akosombo	Water	1,020	36.0
Bui	Water	400	14.1
Kpong	Water	160	5.7
Sub-total		1580	55.8
Thermal			
Takoradi Power Co. (TAPCO)	LCO/Natural Gas	330	11.7
Takoradi Int. Co. (TICO)	LCO/Natural Gas	220	7.8
Sunon Asogli Power (Ghana) Ltd (SAPP) - IPP	Natural Gas	200	7.1
Cenit Energy Ltd (CEL) - IPP	LCO	126	4.5
Tema Thermal 1 Power Plant (TT1PP)	LCO/Natural Gas	110	3.9
Tema Thermal 2 Power Plant (TT2PP)	DFO/Natural Gas	50	1.8
Takoradi T3	LCO/Natural Gas	132	4.7
Mines Reserve Plant (MRP)	DFO/Natural Gas	80	2.8
Sub-total		1248	44.1
Renewables			
VRA Solar	Solar	2.5	0.1
Sub-total		2.5	0.1
Total		2830.5	100

Table 2. Electricity Purchases and Sales by ECG

Year	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Total Purchases (GWh)	5,045	5,253	5,146	5,799	6,052	6,771	7,259	7,944	8,479	8,370
Total Sales (GWh)	3,761	3,978	3,906	4,335	4,442	4,952	5,339	6,041	6,476	6,246
Distribution Losses (GWh) ¹	1,285	1,275	1,240	1,464	1,610	1,819	1,920	1,903	2,003	2,124
Percentage Losses	25.5	24.3	24.1	25.2	26.6	26.9	26.4	24.0	23.6	25.4

¹Technical and commercial losses

Source: GRIDCo, VRA and ECG

Table 3. Electricity Purchases and Sales by NEDCo

Year	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Total Purchases (GWh)	501	507	494	529	566	635	719	822	937	998
Total Sales (GWh)	365	356	365	392	404	473	581	658	737	758
Distribution Losses (GWh) ¹	136	151	129	137	162	162	138	164	200	239
Percentage Losses	27.1	29.8	26.1	25.9	28.6	25.5	19.2	20.0	21.3	24.0

¹Technical and commercial losses

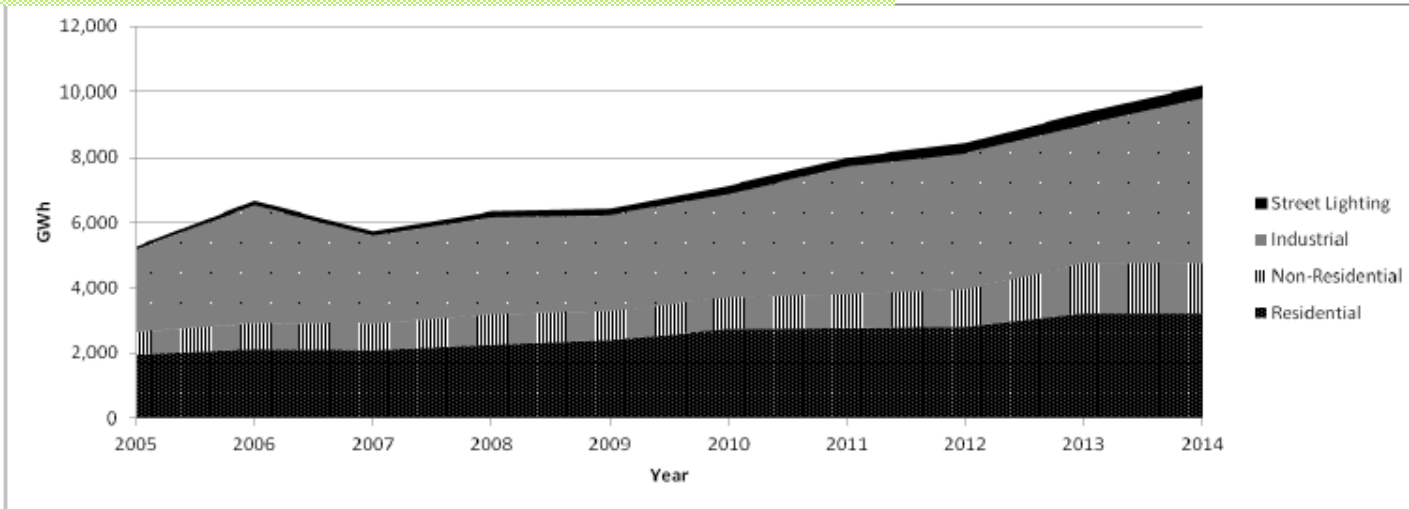
Source: GRIDCO, VRA and NEDCo

Table 4. Electricity Consumption by Customer Class (GWh)

Year	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Residential	1,956	2,130	2,095	2,269	2,418	2,738	2,761	2,803	3,228	3,223
Non-Residential	676	790	802	927	884	966	1,041	1,153	1,525	1,522
Industrial ¹	2,542	3,593	2,687	2,963	2,921	3,156	3,900	4,153	4,224	5,055
Street Lighting	85	144	137	171	184	264	274	315	377	382
Total	5,259	6,657	5,721	6,330	6,407	7,124	7,976	8,424	9,355	10,182

¹Special load tariff customers of ECG and NEDCo as well as bulk customers of VRA including VALCO
 Data do not include transmission and distribution (commercial and technical) losses
 Source: ECG, NEDCo, VRA and GRIDCo

Electricity Consumption by Customer Class



Ghana Basic Energy Data (3)

Thermal Power Plants Under Construction

Karpower	225 MW
AMERI	250 MW
AKSA	370 MW
TEI	110 MW
GE/ENI	300 MW
KPONE TP	220 MW
ASOGLI (Phase II)	360 MW
Total	1830 MW



The nation's peak demand is increasing each year at an average rate of 13.3% p.a. (GRIDCO).

Why Load Management?

- Best solution to practice during shortage of generation capacity is load management.
- It makes the best use of the available generating capabilities of a power utility.



Goals of Load Management

1. Reduce the **peak demand** for electricity (MW).
2. Reduce the overall **amount of energy**, that is, electricity, used over time (MWh).

Energy Efficiency

1. It is the **efficient utilization** of energy in the **most cost effective manner**.
2. We ensure that **energy waste is minimized** and the **overall consumption of primary energy resources is reduced**.
3. In essence, **energy efficiency** involves the use of programmes and technology that require **less energy to perform the same function**.
 - ✓ Energy efficiency focuses on the equipment or machinery being used.
 - ✓ One example is the use of LED (light emitting diode) bulbs throughout the house.

Energy Conservation

1. Conservation programmes

- focus on **behavioural changes** in work and **lifestyle/living habits**.
 - **are designed to encourage consumers to use less electricity.**
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- An example is the use of daylight through windows rather than turning on the lights.
 - Switching off devices when not in use.

Conservation Measures (1)

Pressing Irons

- Press fabrics which require lower temperatures first as the iron takes longer to heat than to cool.
- Iron in bulk instead of one item at a time.
- Turn off the iron before attending to other business.
- Iron during off-peak periods.



Conservation Measures (2)

Air Conditioners

- Air conditioners account for about 6.5% of energy used in our homes.
- Installing ceiling fans to supplement or replace air conditioners could greatly reduce our consumption as they generally use less electricity.



Conservation Measurement(3)

Lighting

- Making improvements to your lighting is one of the fastest ways to cut your energy bills.
- An average household dedicates more than 30% of its energy budget to lighting.
- Using new lighting technologies can reduce lighting energy use in your home by 50% to 75%.
 - Changing incandescent light bulbs to low-consuming CFL or LED bulbs
 - Devices that switch off lights automatically.



OCCUPANCY
DETECTOR



ELECTRNIC KEY
CARD SWITCH



LED BULB

Conservation Measures (4)

Refrigerators and Deep Freezers

- Fridge doors should not be left open for longer than necessary (cold air escape).
- Hot food should not be put straight in the fridge; they should be allowed to cool down first.
- Fridges should be regularly defrosted to keep them running efficiently, if it tends to frost up quickly, the door seal should be checked.
- Switch off deep freezers food materials are frozen.



Conservation Measures (5)

Use of other household appliances

- Don't leave appliances on standby! For example, TVs, stereos, computers, monitors and DVD players, on standby.
- Do not leave appliances like mobile phones or laptops on charge unnecessarily.
- Make sure your appliances, electrical circuits and cooling systems are properly maintained.
- Check your owner's manuals for the recommended maintenance.

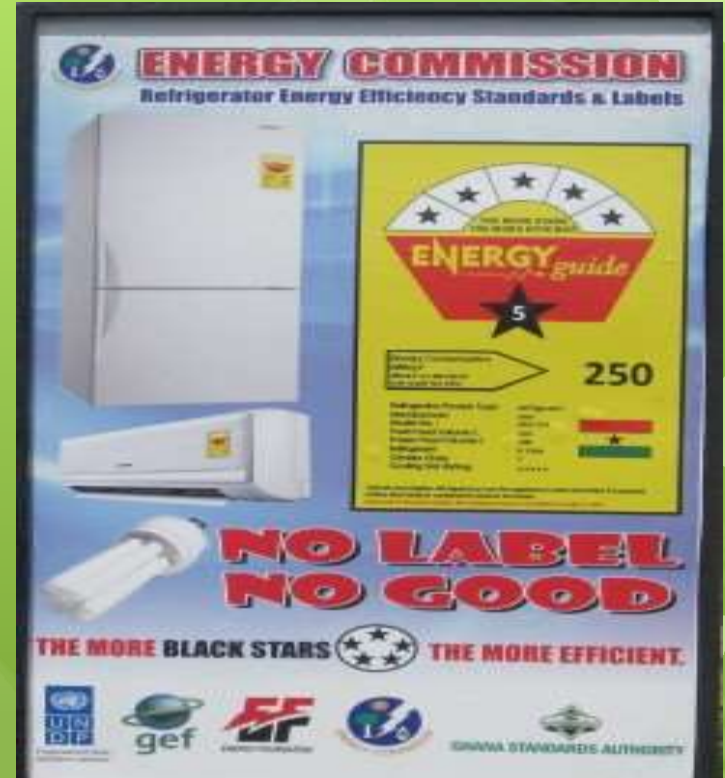


Existing Laws and Policies for Efficient and Economic Use of Energy (1)

Some laws have been enacted and enforced by the **Energy Commission** to promote energy efficiency:

- *Energy Efficiency Standards and Labelling (Household Refrigerating Appliances) Regulations, 2010*

○ **LI 1970**



Existing Laws and Policies for Efficient and Economic Use of Energy (2)

- *Prohibition of manufacture, sale or importation of*
 - incandescent filament lamps,
 - used refrigerator,
 - used refrigerator-freezer, used freezer and
 - used air-conditioner



Existing Laws and Policies for Efficient and Economic Use of Energy (3)

Promotion of renewables – 10% renewable energy target in generation mix by **2020**

- Solar
- Biogas
- Biomass
- Biofuels



DIESEL GENERATOR OF HPW (150 KVA) WHICH RUNS ON THE GENERATED BIOGAS (ADEISO, E/R)

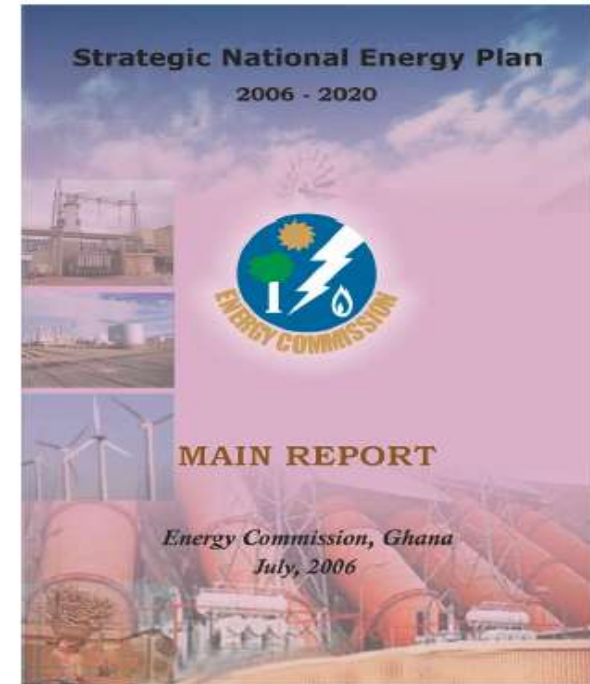
Some Measures/Programmes for Efficient and Economic Use of Energy (1)

Some measures being implemented are :

- Free distribution of Compact Fluorescent Lamps (CFL) to about six million consumers by Energy Commission
- Replacement of grid-connected street and traffic lights with solar street and traffic lights by Government of Ghana
- Illumination and presence detection sensors for rooms based on the occupancy patterns of the rooms and intensity of sunlight in some hotels and offices

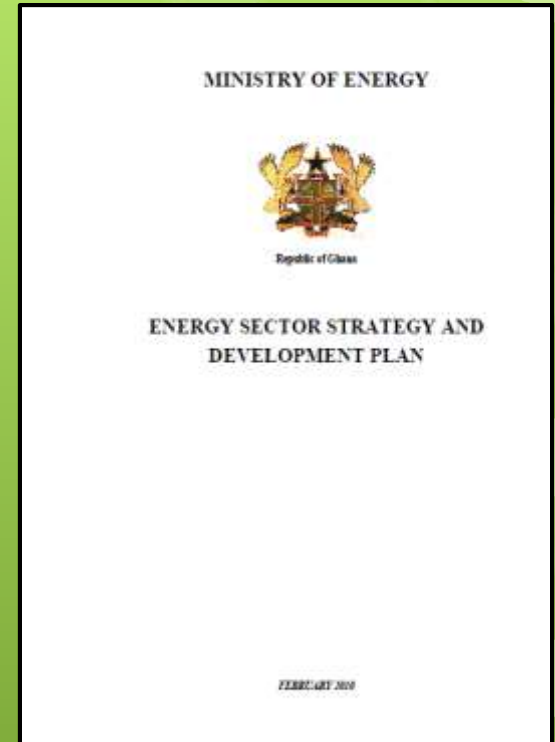
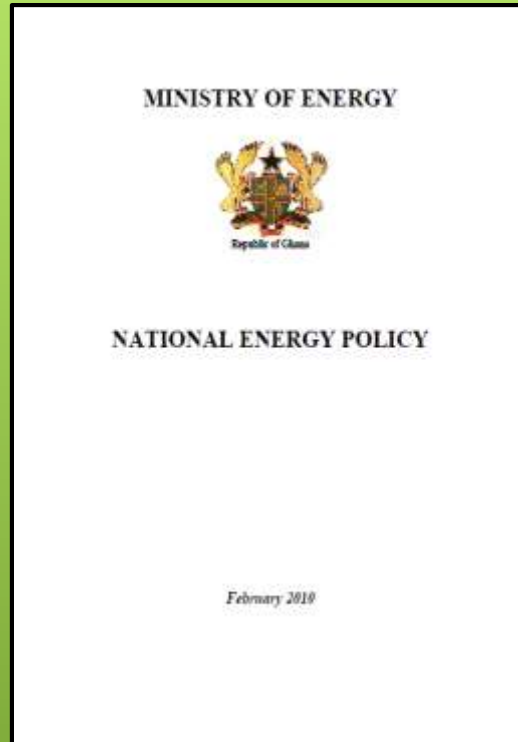
Renewable Energy Sector – Policies and Development

- ❑ 2006 – Strategic National Energy Plan (SNEP) published
 - *The goal of SNEP is to contribute to the development of a sound energy market that would provide sufficient, viable and efficient energy services for Ghana's economic development through the formulation of a comprehensive plan that will identify the optimal path for the development, utilisation and efficient management of energy resources available to the country.*
- ❑ Covered both supply and demand sides in an integrated approach.




Renewable energy sector – policies and development (2)

2010 – recommendations of the plan formally adopted as national energy policy, with accompanying strategy document.



Benefits of Using Energy Efficiently and Economically

- Cost savings for consumers 
- Reduction of carbon dioxide emissions
- Slowing down of the rate at which domestic energy resources are depleted
- Reduction of the nation's dependence on power imports



TEC's SOLAR PV INSTALLATIONS





TEC INSTALLATIONS IN WALEWALE TO STUDY IMPACT OF SOLAR ENERGY INJECTION ON LV GRID SYSTEM



Smart Hybrid Energy Management System

TEC's BIOGAS LABORATORY





Thank You