Contribution of Energy Efficiency to Universal Access

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Energy & Development Nexus

- Energy is a requirement for Economic Development
- Energy must be supplied in the right quantities, at the right time and at the right prices to spur true economic development
- Energy Consumption must not lead to environmental degradation or increase poverty
- It is possible to grow the economy without necessarily increasing energy consumption

Increasing Access

- Increasing Access requires increased energy supply and consequent increased generation, transmission and distribution
- Generation increase can be achieved by adding more capacity or improving efficiency/reducing waste in existing system, reducing transmission and distribution system and improving end use efficiency
- Increasing Access without efficient and productive end-use especially in rural communities result in debt overhang, avoidance of payment or inability to pay for electricity service

Benefits of Energy Efficiency -1

Energy efficiency reduces the amount of energy needed to provide the same or improved level of service to the consumer in an economically efficient way.

- Reduces total electricity demand
  - access can be increased without increasing generation capacity,
  - deferred investment in generation
- Enhances the Electricity System
  - Reduces cost of electricity service, ancillary services, maintenance costs etc
  - Demand response measures aim to reduce customer energy demand at times of peak electricity demand to help address system reliability issues; reduce the need to dispatch higher-cost, less-efficient generating units to meet electricity demand; and delay the need to construct costly new generating or transmission and distribution capacity.
  - Demand response programs can include dynamic pricing/tariffs, price responsive demand bidding, contractually obligated and voluntary curtailment, and direct load control/cycling
  - Reduces risks

Benefits of Energy Efficiency -2

- Boosts the economy
  - Lowers Energy Cost
  - Increases disposable income
  - Increases jobs and investments in energy efficiency industries
- Reduces Emissions and Improves Health
  - Improves Air Quality, human health, and reduces premature deaths
- Benefits to Society
  - People avoid costly illnesses, businesses benefits from fewer worker absences, Children miss fewer school days, electricity system is more efficient, reliable and resilient, consumers and businesses have more money to spend, new businesses and jobs created.

Energy Efficiency as a measure to increases Access and Reduce Cost – 2 Case Studies from Ghana

The Efficient Lighting Project 2007

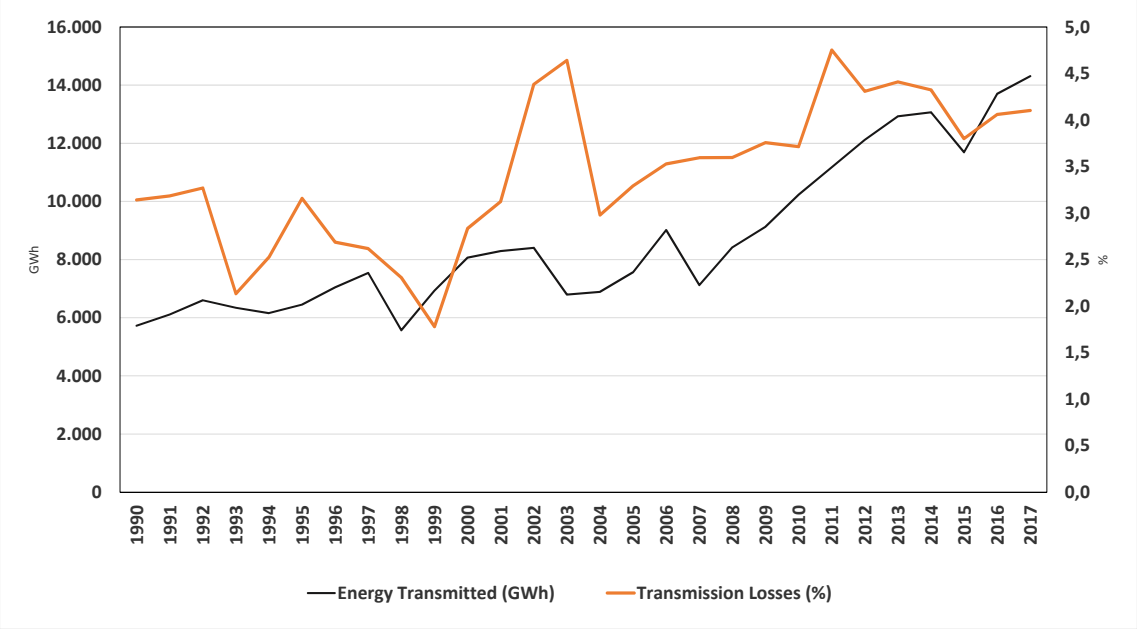
- The Government of Ghana, on the advice of the Energy Commission procured and distributed for FREE 6million CFLs as direct replacement of 6 million Incandescent Lamps as Load Reduction measure to reduce impact of Power Shortages in Ghana in 2007

- All 6 million lamps were distributed and installed in 3 months

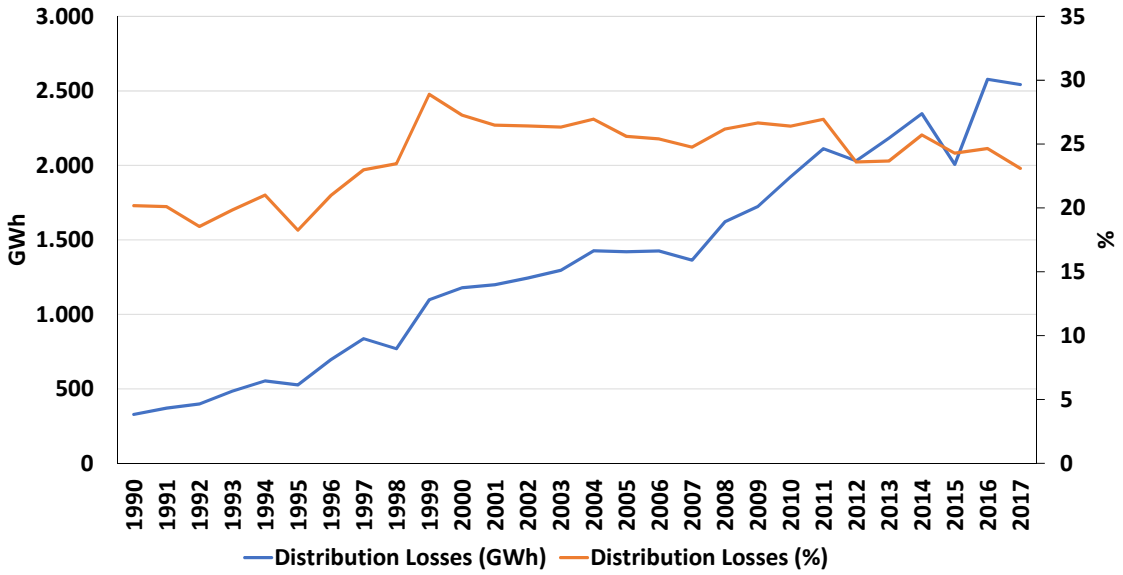
Characteristics of Ghana Energy Economy - 2007

- Annual growth in demand for fuelwood and charcoal - estimated at 3%.
- Electricity demand growing between 6%-7%
- Petroleum product demand increase at about 5% per annum.
- Losses in the production, transportation and use of energy are high.
- System losses in electricity distribution - about 25%, with wastage in the end-use of electricity also estimated at about 30%.

Electricity Transmitted and Transmission losses, 1990-2017, GWh



Electricity Distribution and Losses GWh, 1990-2017



Objectives of Efficient Lighting Project

- Peak electricity demand reduction 200-220MW and end load shedding
- Stabilisation of Electricity Grid System
- Reduction of Brownout and transformer overloads
- Reduction of Diesel and other Thermal generators to supplement the existing power generation mix

How it was done

- National Project Implementation Committee, chaired by the Minister for Energy
- Members:
  - Executive Secretary – Energy Commission
  - Chief Executive – Energy Foundation
- Procurement – Ministry of Energy
- Warehousing, Bulk Transportation – Energy Commission
- Distribution –District Assemblies, using Local Youth, Military, Police, Prisons
- Massive Public Education Campaign

Transportation

Lamp Transportation

Training Replacement Gangs

Public Education Bill Boards

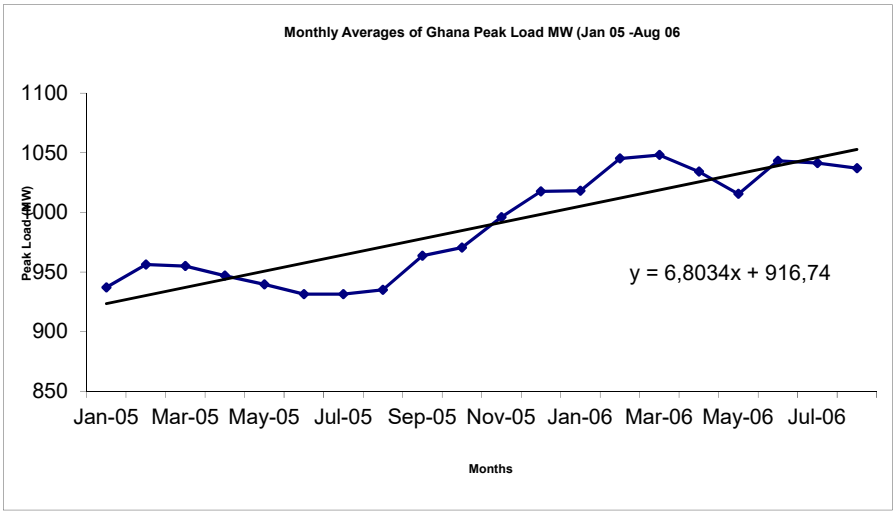
Retrieved Incandescent Lamps

Retrieved Incandescent Lamps

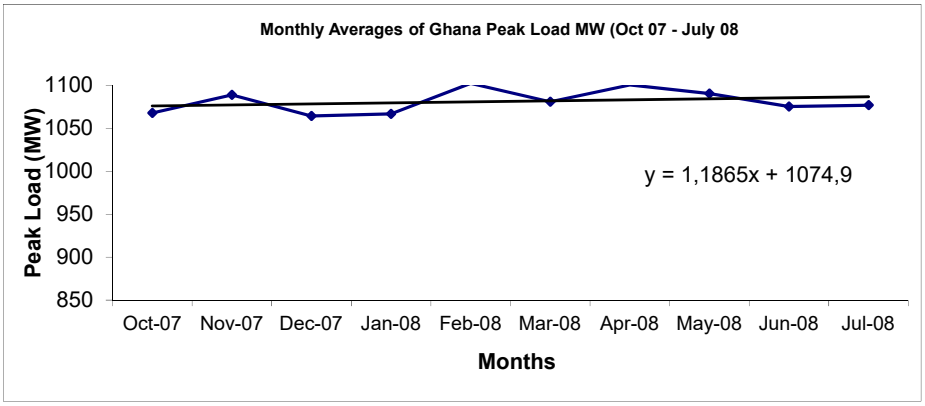
Results

- Peak Saving of 124 MW
- Energy Savings of 452MWh per day or 162.7GWh per annum
- Energy cost saving is US$3.3million per month or US$39.5million per annum.
- Between October 2007 and June 2008 Savings of US$29.6million.
- CO2 savings of 105,000tons per annum.
- Access grew by 2.44% and 2.10% in 2009 and 2010 respectively, mostly attributed to the savings made.
- Investment of US$105m in generation capacity expansion was deferred to 2011
- Factory established to produce CFLs in Ghana

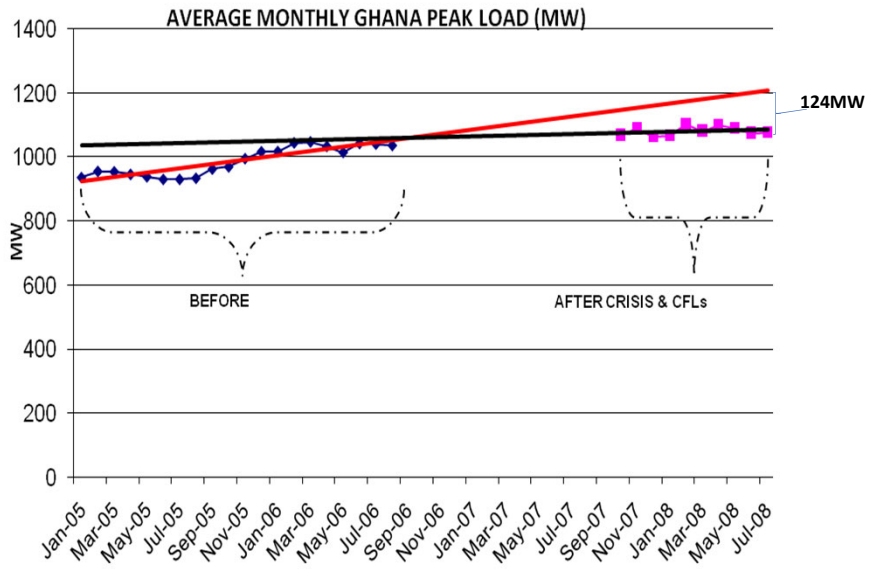
Demand Growth before Efficient Lighting Project



Demand Growth after Efficient Lighting Project



Effect of CFL on National Electricity Demand



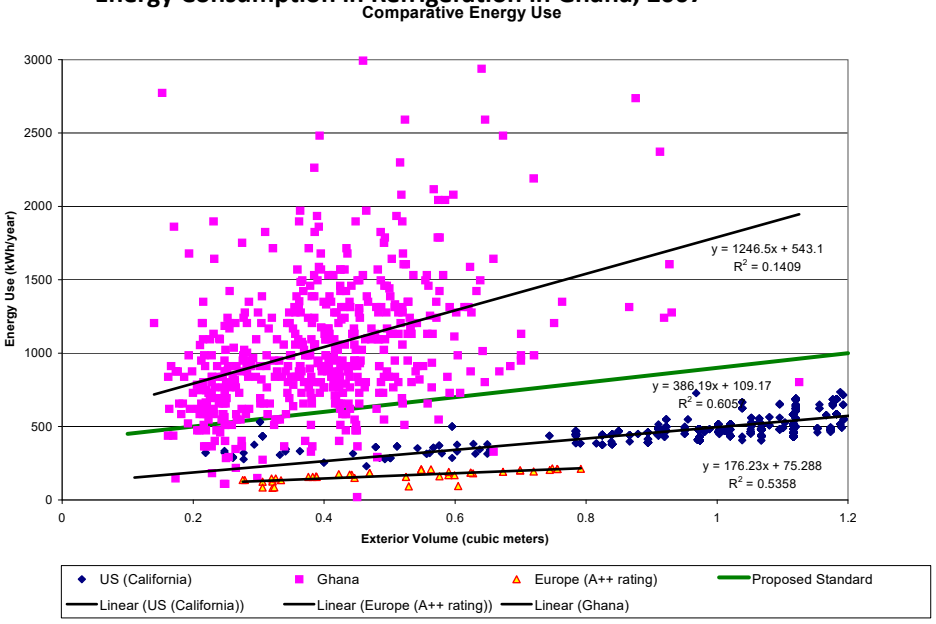
2010 EE Global Award

2012-2014 Refrigerator Efficiency Programme

Characteristics of Cooling Appliance Market 2006

- Average refrigerating appliance consumed 1,200kWh per year
- The used appliance market share was 80%, mostly imported from Europe.
- Employed over 80% of the people in the sector
- The most popular and regularly sought for AC was the most inefficient on the market but most expensive
- In 2006, 40% of the 12,000GWh generated went into domestic use (used & inefficient appliances)
- Almost all the used cooling appliances contained Ozone Depleting Substances

Energy Consumption in Refrigeration in Ghana, 2007



Used Appliance Dumping Menace & the Environment

The Dumping Process & Effect

METRO NEWS

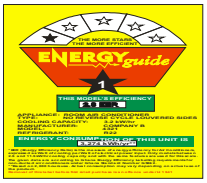
E-waste adds to filth in Odaw drain

W months ago, ion Ghana d, together with MA, embarked on ercise to clear huge of solid waste from Odawna drain, ing a *Daily Graphic* eation on the filthy of the drain caused e dumping of solid into it.

hile the clearing ise has not been fully leted, scrap dealers operate close to the have started dumping ste and refrigerator into the river, adding the huge volume of ic waste already in the n.

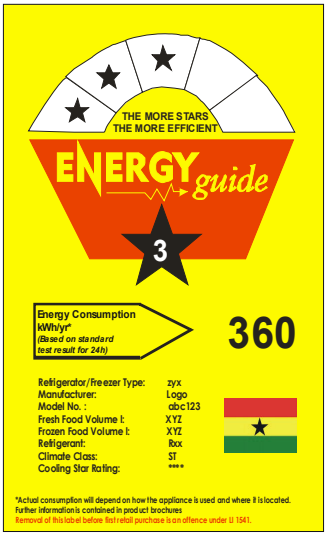
he area has also been ed into a site where the ple who live and rate there respond to call of nature.

The pungent stench n the drain has pelled companies and viduals engaged in



Proposed Standards for Refrigerators in Ghana, 2007

Appliance	**Annual Energy Consumption, kWh/year**				
	******* 5-Star**	****** 4-Star**	***** 3-Star**	**** 2-Star**	*** 1-Star**
Refrigerators and Refrigerator/Freezers	<250	250 – 300	300 – 350	350-400	400 – 500
Freezers	<300	300-350	350-400	400 – 500	500 – 650

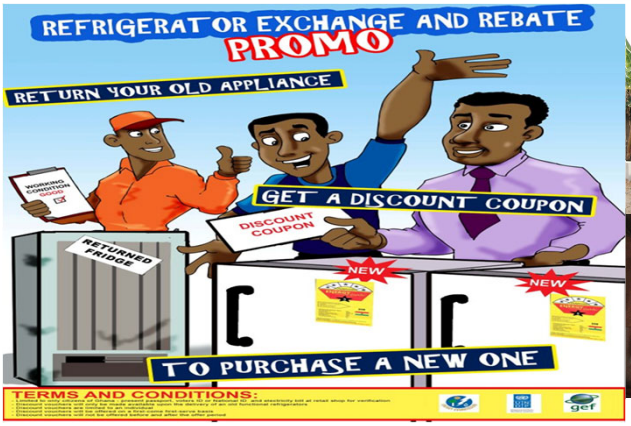


The Ghana Refrigerator Energy Efficiency Label

The Energy Efficiency Regulations on Cooling Appliances

- Energy Efficiency Standards and Labelling (Non-Ducted Air-conditioners and Self-Ballasted Fluorescent Lamps) Regulations, 2005 (LI 1815)
- Energy efficiency Standards & Labelling (Household Refrigerating Appliances) Regulations, 2009 (LI1958)
- Energy Efficiency (Prohibition of Manufacture, Sale or Importation of Incandescent Filament Lamp, Used Air-Conditioner) Regulations, 2008 (LI1932)

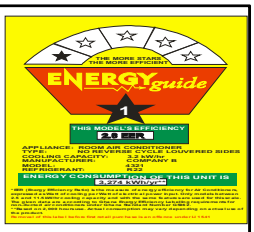
Rebate Scheme to Promote New Appliance Purchase, Opportunity for Energy Efficiency

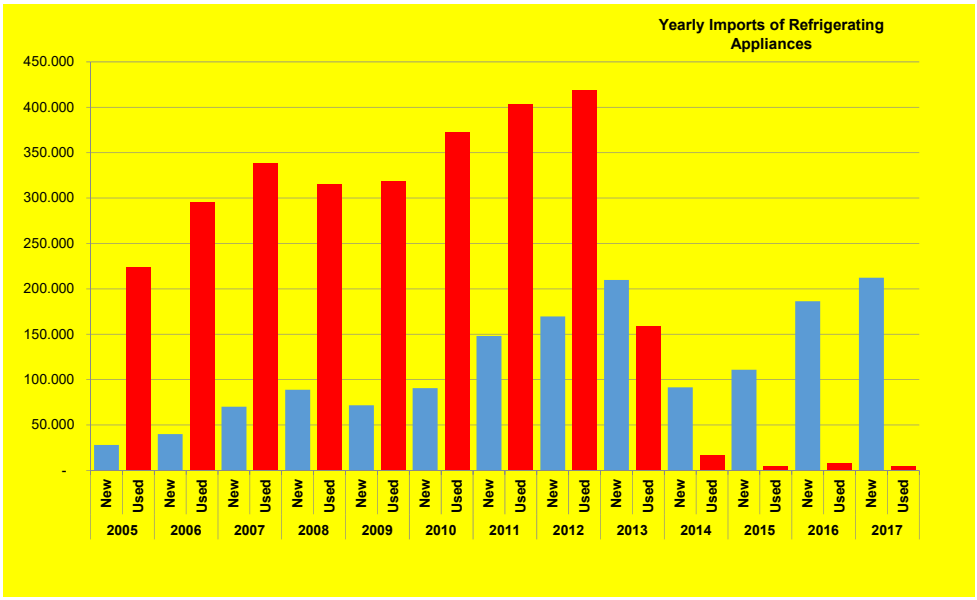


Results of MEPS & Labeling Implementation

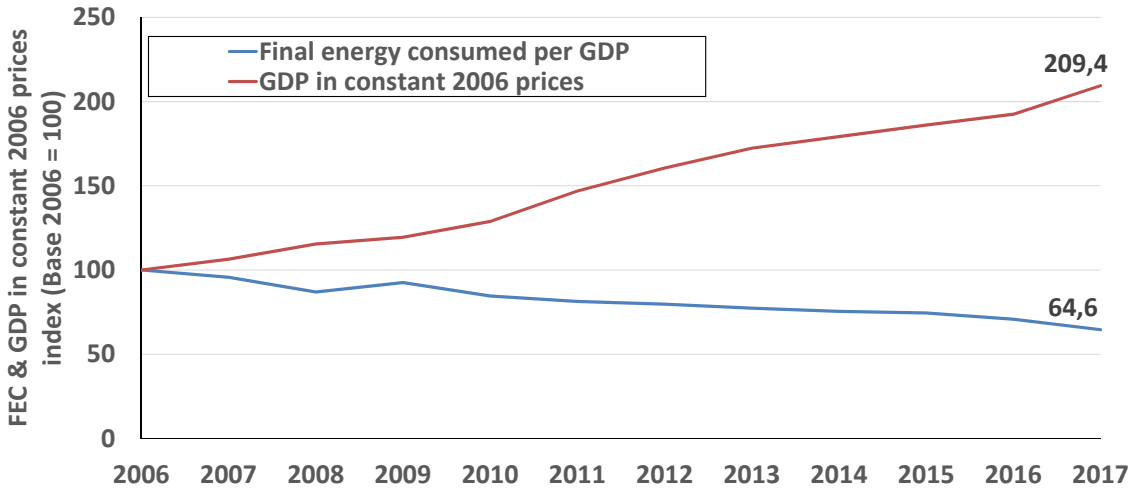
- Over 10,000 used and inefficient refrigerating appliances replaced with same number of new and efficient ones through rebate scheme
- Over 34,000 illegally imported refrigerating appliances confiscated and dismantled
- **400GWh of electricity per annum has been saved, 40% of 400MW Bui Hydro Power Plant's annual output**
- 1,500kg of CFC recovered.
- 1.1 million tons of CO_2 saved

Energy Efficiency Transforms Market & Enhances consumer Welfare

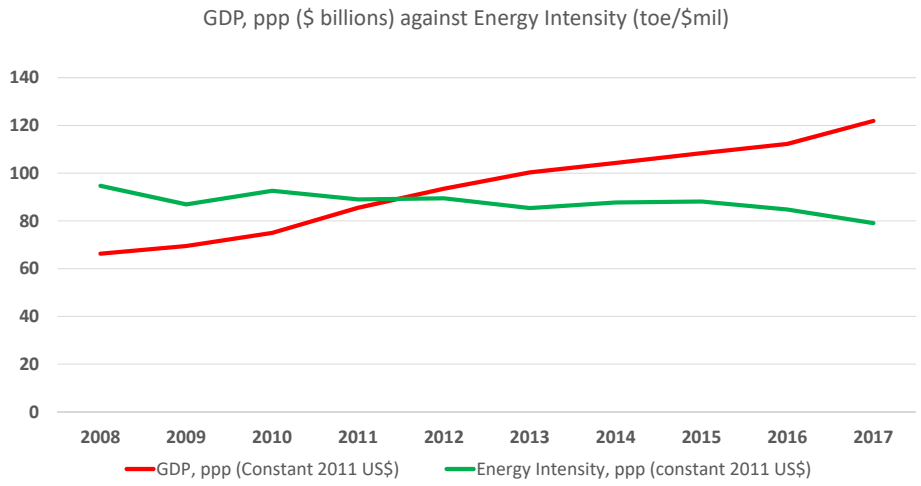


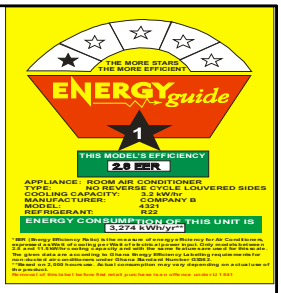


Final Energy Consumed per GDP, 2006-2017



Energy Efficiency reduces Energy Intensity

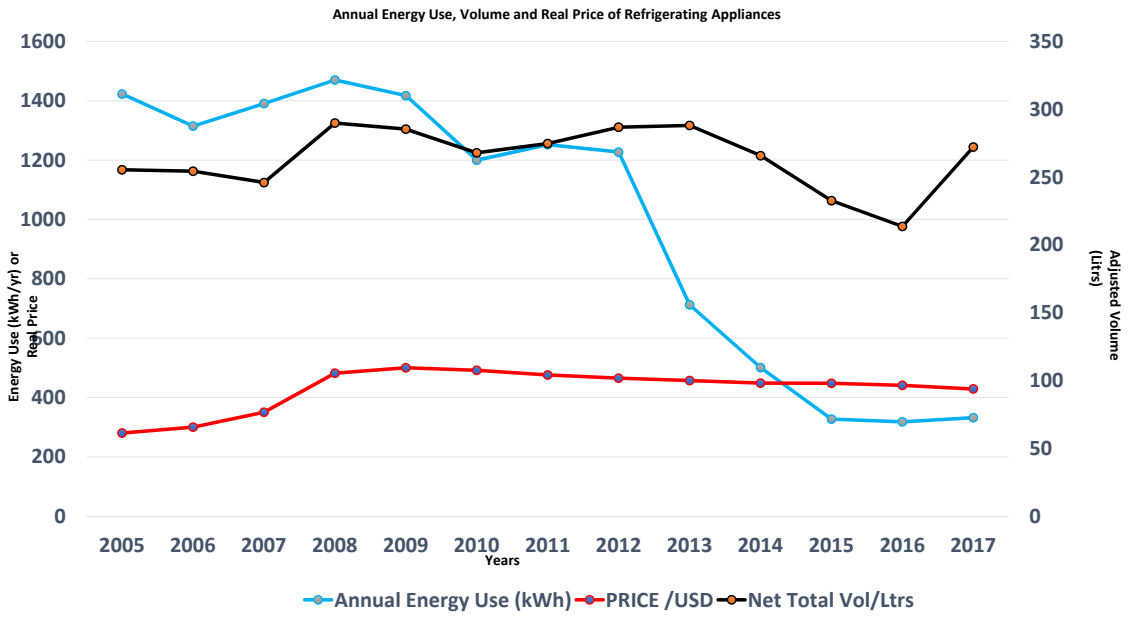




1. The energy intensity in Ghana is declining in the face of economic growth
2. Declining energy intensity means that resources available for other economic activities – economic growth
3. Environmental concern is of high priority- GDP growth without compromise on environment (Sustainable Development)

Potential to enhance consumer welfare:

Declining energy consumption of refrigerators



1. Consumers of refrigerating appliances enjoy savings of $100/yr.
2. Lighting retrofit in 2007 also resulted in average household savings of US$36.
3. Nascent assembly plant bubbling up creating jobs
4. Public-Private-Partnership was the business model used

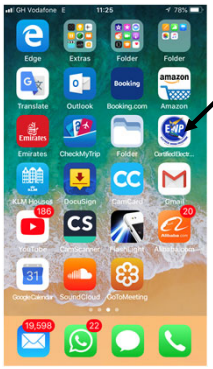
Refrigerator Efficiency Intervention and Access

- A record access of 7.6% was recorded in 2014 mostly attributed to the savings of 400GWh/yr. from the energy efficient refrigerating appliances project.

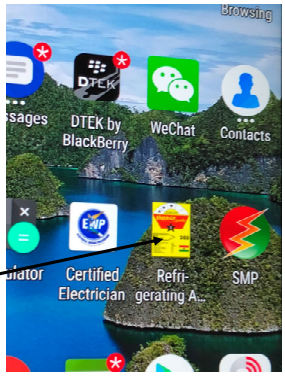
- Ghana was going through a power crisis in 2014.

Refrigerator with Label on Ghana Market

SmartPhone APPs



CEWP SMARTPHONE APP on Android and IOS



Certified Refrigerator APP on Android

The LED initiative

- Government on the advice of the Energy Commission in January 2011 removed import duty and VAT on all Lighting made of LED.
- LED is used in Renewable Energy and Grid Electricity applications
- Standards and Labels developed for LED to protect consumers from inferior products
- Legislative Instrument L.I. 2353, 2017 passed by Parliament to enforce MEPS for all lighting devices

Coming next?

- Drive Electric Initiative – for efficient and productive use of electricity

We have the Power to Transform!

Thank You