



# Ghana



Energy efficiency benefits from lighting, residential refrigerators, room air conditioners, power and distribution transformers and industrial electric motors with the implementation of globally benchmarked minimum energy performance standards.

## ANNUAL SAVINGS IN 2030



Reduce electricity use

→ by over **2 TWh**

→ **7.1%** of future national electricity use



Save electricity worth

**630 Million USD**

equivalent to **4 Power Plants [100MW]**



Reduce CO<sub>2</sub> emissions by

**440 Thousand Tonnes**

equivalent to **250 Thousand Passenger Cars**



## SHARE OF EACH TYPE PRODUCT TO THE COUNTRY'S TOTAL SAVINGS IN 2030



21%

Lighting



10%

Residential Refrigerators



19%

Room Air Conditioners



24%

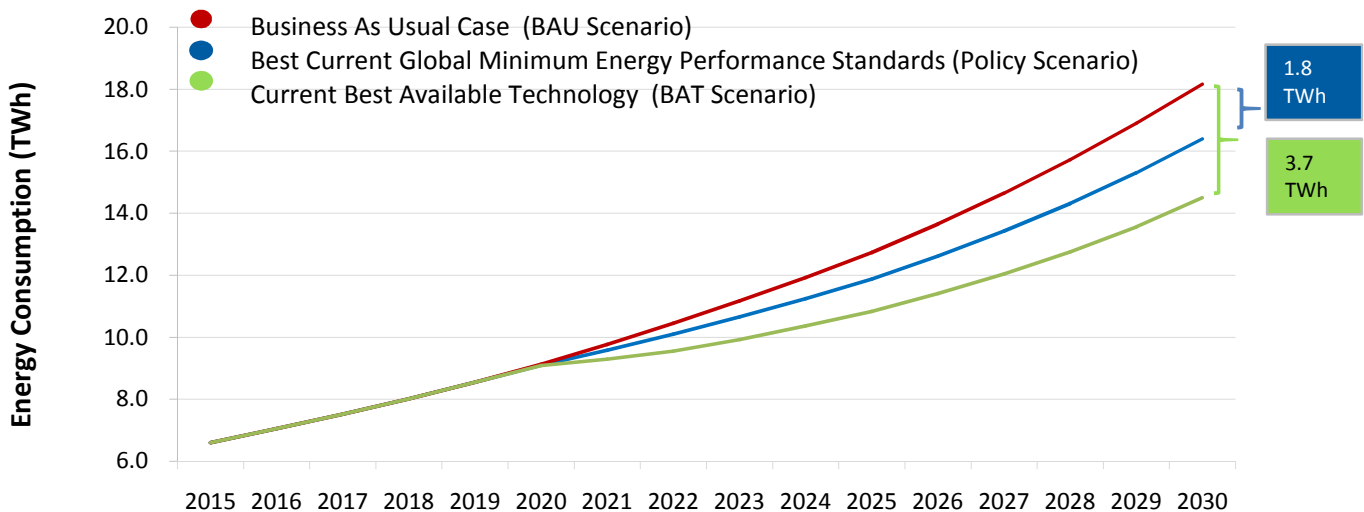
Transformer



26%

Industrial Electric Motor









## EVEN GREATER SAVINGS POSSIBLE WITH BEST AVAILABLE TECHNOLOGY











# THE PATHWAY TO ENERGY EFFICIENCY





## ANNUAL SAVINGS IN 2025 AND 2030

		 Lighting		 Residential Refrigerators		 Room Air Conditioners		 Transformers		 Industrial Electric Motors	
		2025	2030	2025	2030	2025	2030	2025	2030	2025	2030
 Electricity (GWh)		243.0	366.5	88.3	183.2	160.9	336.6	200.0	416.2	167.3	461.8
 Electricity Bills (million US\$)		70.5	106.3	25.6	53.1	46.7	97.6	58.0	120.7	92.0	254.0
 CO2 Emissions (thousand tonnes)		62.3	94.0	22.6	47.0	41.3	86.4	46.6	97.0	42.9	118.5

## CUMULATIVE SAVINGS (2020 - 2030)

		 Lighting		 Residential Refrigerators		 Room Air Conditioners		 Transformers		 Industrial Electric Motors	
		2025	2030	2025	2030	2025	2030	2025	2030	2025	2030
 Electricity (TWh)		2.5	1.0	1.8	2.3	2.1					
 Electricity Bills (million US\$)		711.6	286.3	524.7	667.4	1,164.9					
 CO2 Emissions (thousand tonnes)		629.5	253.3	464.2	536.2	543.4					

## OTHER BENEFITS IN 2030

	Direct GHG emissions reduced by	→	<b>558 Thousand Tonnes</b>
	Increased grid connection to	→	<b>882 Thousand Households</b>

## ENERGY EFFICIENCY STRATEGY AND NATIONALLY DETERMINED CONTRIBUTION

Country Nationally Determined Contribution (NDC): Ghana's emission reduction goal is to unconditionally lower its GHG emissions by 15 percent relative to a business-as-usual (BAU) scenario emission of 73.95MtCO<sub>2</sub>e<sub>2</sub> by 2030. An additional 30 percent emission reduction is attainable on condition that external support is made available to Ghana to cover the full cost of implementing the mitigation action (finance, technology transfer, capacity building). With this external support, a total emission reduction of 45% below the BUA emission levels can be achieved by 2030.

# Country Specific Data and Input Assumptions For Ghana



## GENERAL INFORMATION

Population	26.4 million
GDP per capita	1,462 US\$
Electrification level	72%
CO2 Emission Factor	0.233 kg / kWh

## ELECTRICITY MARKET

Residential Electricity tariff	0.290 US\$ / kWh
Industrial Electricity tariff	0.550 US\$ / kWh
Transmission and distribution loss factor	9.18%

## ASSUMPTIONS

Product	Unit Energy Consumption (kWh/year) or Efficiency Level			Type of Product
	BAU	Policy Scenario	BAT	
Lighting	65.7	15.3	8.8	Low incandescent Lamp,3h/day; 14W CFL; 8W LED
Residential Refrigerators	325	191	134	2-door top-mount Average size 225 liters
Room Air Conditioners	3,252	2,653	1,738	Split unit with 3.5 kW cooling capacity
Transformers	N/A	SEAD Tier3	SEAD Tier5	three-phase and single-phase liquid-filled and three-phase dry-type power and distribution transformers
Industrial Electric Motors	IE1/IE0	IE3	IE4	3-phase induction motors Ranging from: 0.75 - 7.5 kW; 7.5 - 75 kW; 75 - 375 kW

### METHODOLOGY

The analysis uses CLASP's and Lawrence Berkeley National Laboratory's Policy Analysis Modeling System (PAMS) to forecast the impacts from implementing policies that improve the energy efficiency of new household air conditioners and refrigerators. For lighting, electric motors, and power and distribution transformers individual - models were developed, taking into account country level data, expected GDP growth, and industrialization levels. The savings potential assumes minimum energy performance standards (MEPS) are implemented in 2020 at level equivalent to the present day (2015) best global MEPS that are currently implemented. The graph on page two also shows the savings potential that is possible with the implementation of MEPS in 2020 at level equivalent to the present day best available technology (BAT).

### ASSUMPTIONS AND DATA SOURCES

- Population and GDP per capita data (2014) comes from the World Bank.
- Electrification levels come from the International Energy Agency (IEA).
- Market size was determined by data provided by industry partners; UN Comtrade database; household penetration forecasts generated by PAMS from population, climate, and macroeconomic indicators.
- Future electricity consumption was calculated using current consumption figures provided by the IEA and the U.S. Energy Information Administration (EIA).
- Baseline price, unit energy consumption (UEC), appliance lifetime were provided by country representatives (when available); industry partners; and Lawrence Berkeley National Laboratory. The business-as-usual scenario assumes a 1 per cent annual improvement in UEC.
- Electricity tariffs were provided by the IEA; and Internet research.
- Transmission and distribution loss factor is a regional average calculated from electricity production and consumption data published by the IEA.
- CO2 emission factor came from the IEA and extrapolations were made for countries lacking data.
- Consumer discount rate was derived from the Human Development Index, United Nations Development Programme (2012).
- The approach of calculating the potential direct emission saving of refrigerators and air conditioners: the typical current mix of refrigerants fillings, leakage rates and end of life emissions in the BAU compared to the best alternative with natural refrigerants (mostly R290 for splits and R600a for domestic refrigerators).
- Additional to the above sources, a questionnaire was used to gather data from country officials.

