









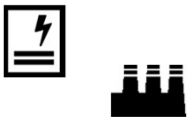

# Botswana



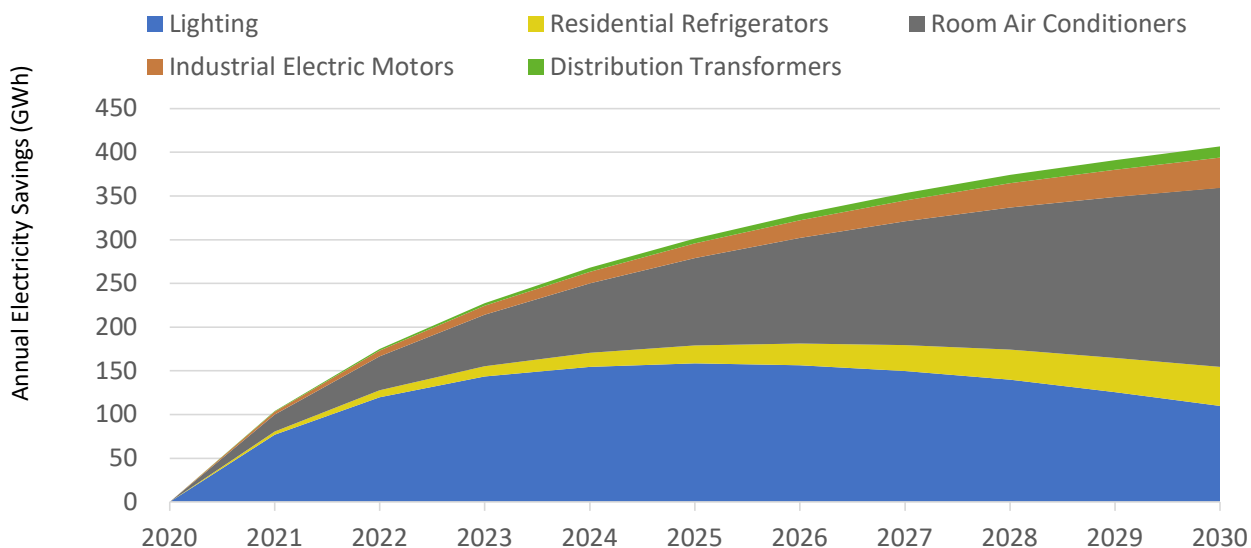
Product scope	Lighting	Cooling		Equipment	
	 All Lighting	 Residential Refrigerators	 Room Air Conditioners	 Industrial Electric Motors	 Distribution Transformers

A summary of the benefits attained from improved energy efficiency through the implementation of Minimum Energy Performance Standards at two levels of ambition (minimum and high). More detailed reports for lighting, cooling and equipment can be downloaded from the United Nations Environment Programme (UNEP) United For Efficiency (U4E) website.

## ANNUAL SAVINGS IN 2030\*

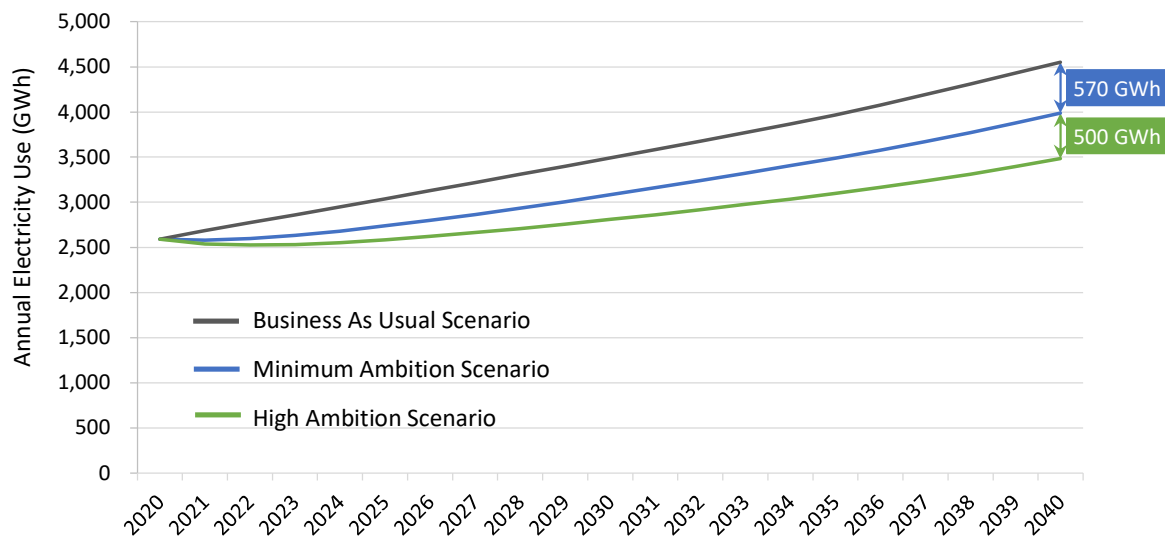
	Reduce electricity use by over <b>400 GWh</b> which is <b>10.1%</b> of current national electricity use
	Save electricity worth <b>34 Million US\$</b> equivalent to over <b>4 Power Plants [20MW each]</b>
	Reduce electricity CO <sub>2</sub> emissions by over <b>920 Thousand tonnes</b> equivalent to <b>510 Thousand Passenger Cars</b>

## ELECTRICITY SAVINGS OVER TIME\*

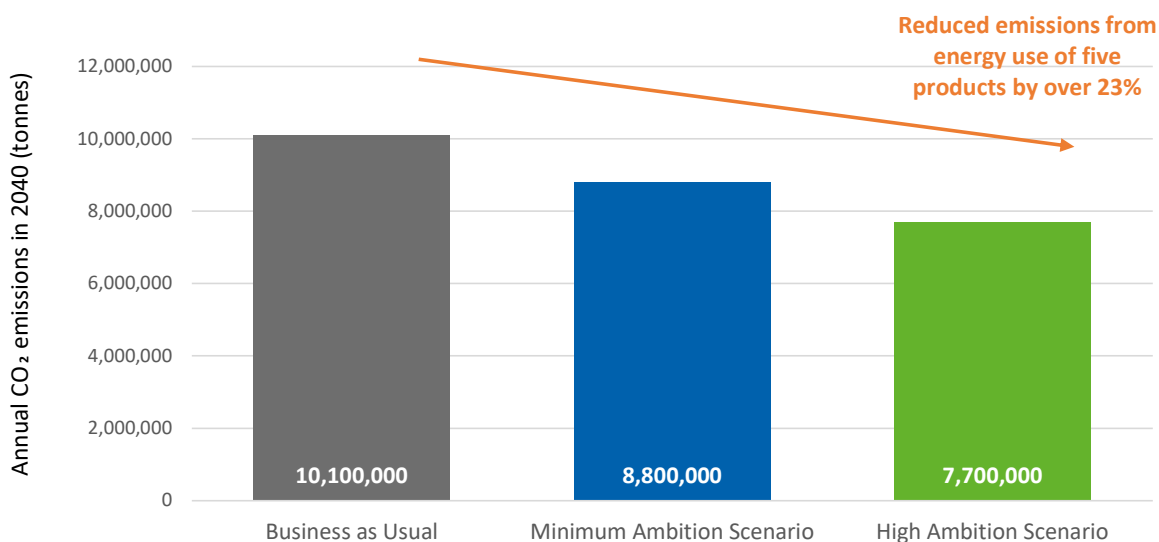


# AND EVEN MORE BENEFITS

## THE MORE AMBITIOUS THE REGULATION, THE MORE SAVINGS ARE POSSIBLE



## MEET GLOBAL CLIMATE GOALS BY SIGNIFICANTLY DECREASED EMISSIONS



## OTHER BENEFITS ACHIEVED IN 2030\*



Increased grid connection to

**200 Thousand households**









Reduced cumulative direct GHG emissions by







**22 Thousand tonnes**

# DETAILED BENEFITS

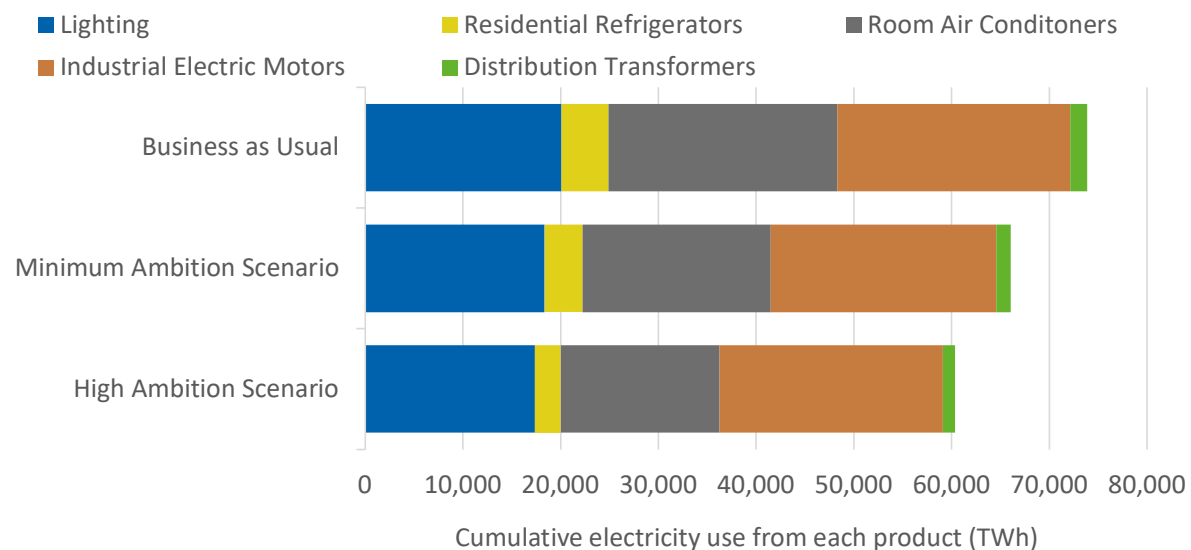
## ANNUAL SAVINGS IN 2030 AND 2040\*

		Lighting 		Cooling 				Equipment 			
				Residential Refrigerators		Room Air Conditioners		Industrial Electric Motors		Distribution Transformers	
		2030	2040	2030	2040	2030	2040	2030	2040	2030	2040
	Electricity (GWh)	110	9.3	45	89	200	360	35	74	13	35
	Electricity Bills (Thousand US\$)	9,200	780	3,700	7,400	17,000	30,000	2,900	6,200	1,100	2,900
	CO2 Emissions (Thousand tonnes)	250	21	100	200	460	820	78	170	29	78

## CUMULATIVE SAVINGS BY 2030 AND 2040\*

		Lighting 		Cooling 				Equipment 			
				Residential Refrigerators		Room Air Conditioners		Industrial Electric Motors		Distribution Transformers	
		2030	2040	2030	2040	2030	2040	2030	2040	2030	2040
	Electricity (GWh)	1,300	1,700	230	940	1,100	4,100	190	740	64	300
	Electricity Bills (Million US\$)	110	140	20	79	93	350	16	62	5.4	25
	CO2 Emissions (Thousand tonnes)	3,000	3,900	530	2,100	2,500	9,400	420	1,700	150	690

## CONTRIBUTION TO CUMULATIVE ELECTRICITY USE BY 2040








\* Denotes savings are from the Minimum Ambition Scenario.

# Country Data and Input Assumptions



GENERAL INFORMATION		ELECTRICITY MARKET	
Population	2.33 Million	Residential Electricity tariff	0.08 US\$ / kWh
GDP per capita	8,259 US\$		
Electrification level	61.0%	Transmission and distribution loss factor	21.2%
CO2 Emission Factor	1.79 kg / kWh		

## ASSUMPTIONS

Product			Unit Energy Consumption (kWh/year) or Efficiency Level						Type of Product	
			Business As Usual		Minimum Ambition Scenario		High Ambition Scenario			
Lighting		GSL Linear HID	15W CFL 36W T8 70W HPS	15 108 307	10W LED 20W LED 50W LED	10 60 219	7W LED 16W LED 40W LED	7 48 175	800 lumen light bulb: 1,000 hrs/year 4 foot tube: 3,000 hrs/year Poletop street light: 4,380hrs/year	
	Cooling		Residential Refrigerators	340		247		123		2-door refrigerator freezer of average size 210 liters
			Room Air Conditioners	2,673		1,829		1,375		A mix of 3.5 kW and 7 kW split units with a weighted-average cooling capacity of 5 kW
Equipment		Industrial Electric Motors (IEC level)	IE0		IE2		IE3		3-phase induction motors used in the industrial sector	
		Distribution Transformers (Model regulation level)	See note		Level 1		Level 2		Three-phase and single-phase liquid-filled and three-phase dry-type power distribution transformers	

Distribution transformers Note: it is assumed that distribution transformers have losses in line with those assumed in the CENELEC harmonization research for the development of the EU standards.

## METHODOLOGY

The analysis uses the UNEP-U4E's Country Savings Assessment Models to estimate the impacts of implementing policies that improve the energy efficiency of each product analysed. The savings potential in each scenario assumes Minimum Energy Performance Standards (MEPS) are introduced in 2020 at two different levels of ambition (minimum and high) as shown above.

## ASSUMPTIONS AND DATA SOURCES

- Market size is based on data from industry partners, the UN COMTRADE database and market penetration forecasts generated by U4E Country Savings Assessment Models using data on population, climate, income and other macroeconomic indicators as detailed below.
- Population (2019 and future forecasts) comes from the UN Population Division.
- GDP per capita data (2018) comes from the World Bank with future growth forecasts derived from the IPCC's SSP3 scenario.
- Cooling Degree Days are based on average monthly temperatures from weatherbase.com, degreedays.net or given by wunderground.com.
- Current total electricity consumption comes from the World Bank and the US Energy Information Administration (EIA) with future forecasts derived from the International Energy Agency's (IEA) World Energy Outlook 2018.
- Residential electricity tariffs are based on IEA data.
- Transmission and distribution loss factor is a regional average calculated from electricity production and consumption data published by the IEA.
- Electrification levels come from the IEA's World Energy Outlook 2018 and the World Bank.
- CO2 emission factors come from the IEA and the Institute of Global Environmental Strategies (IGES) and are assumed constant in future years.
- Product typical characteristics are based on analysis from the UNEP-U4E Model Regulation Guidelines and other data from UNEP-U4E industry partners and technical experts including the US Lawrence Berkeley National Laboratory (LBNL), the International Copper Association (ICA) and GIZ.
- The approach of calculating the potential direct emissions saving of refrigerators and air conditioners is based on expert input from GIZ and LBNL.
- Additional to the above sources, a questionnaire was used to gather data from country officials.
- In a small number of instances, additional data was obtained from internet research or by using proxy data from similar markets.

Further details of the modelling approach and assumptions are available on the U4E website. For more information contact: U4E@un.org



\* Denotes savings are from the Minimum Ambition Scenario.