



Bhutan



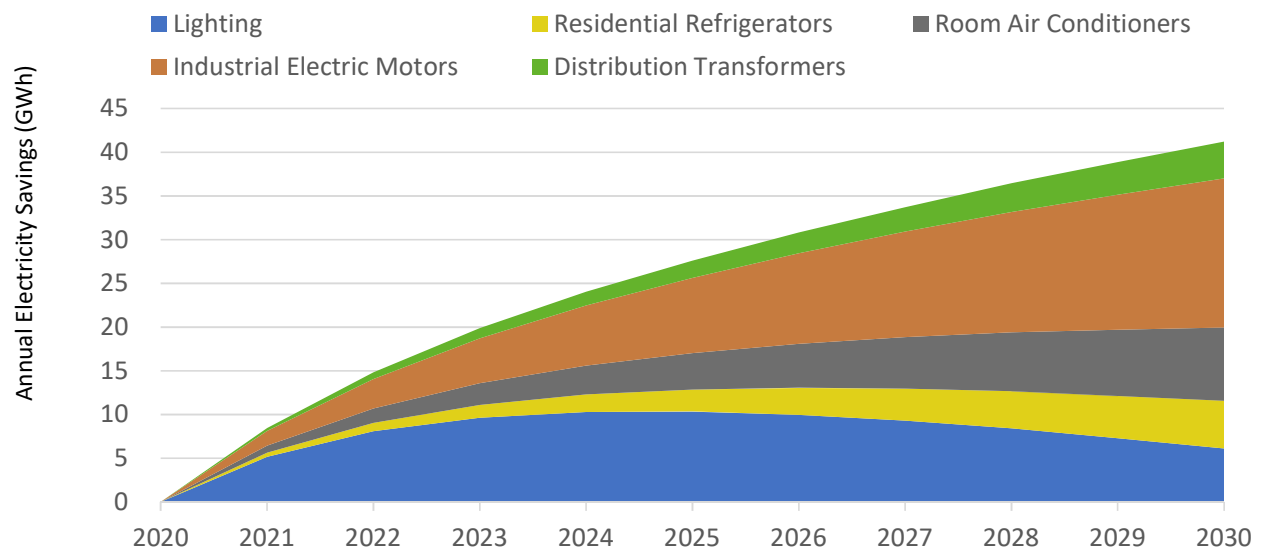
Product scope	Lighting	Cooling		Equipment	
	All Lighting	Residential Refrigerators	Room Air Conditioners	Industrial Electric Motors	Distribution Transformers

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 41 GWh which is 1.9% of current national electricity use
	Save electricity worth 1.4 Million US\$ equivalent to over 1 Power Plant [5MW each]
	Reduce electricity CO ₂ emissions by over 51 Thousand tonnes equivalent to 29 Thousand Passenger Cars

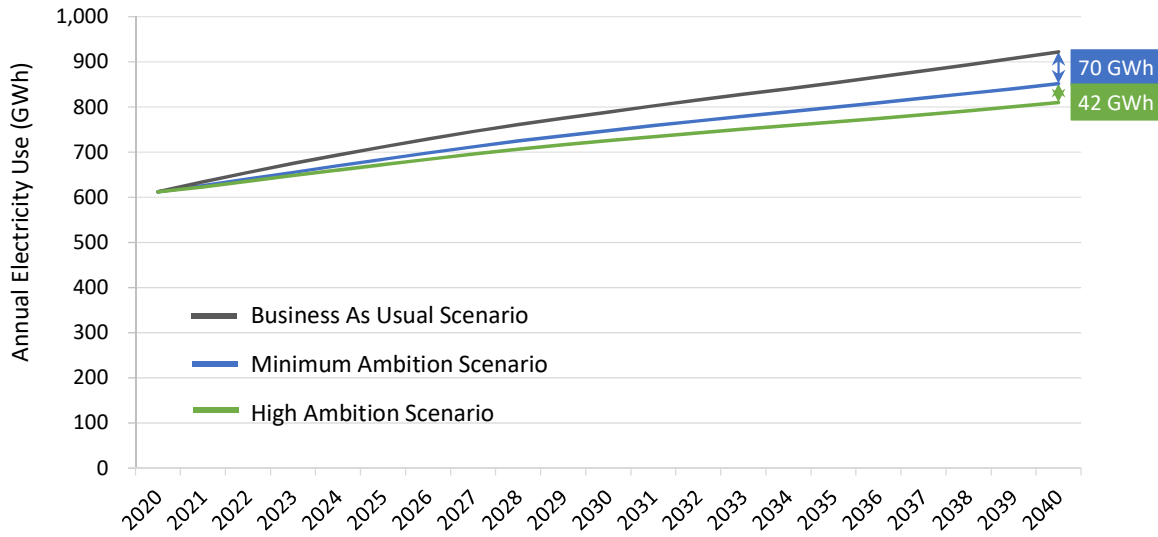
ELECTRICITY SAVINGS OVER TIME*



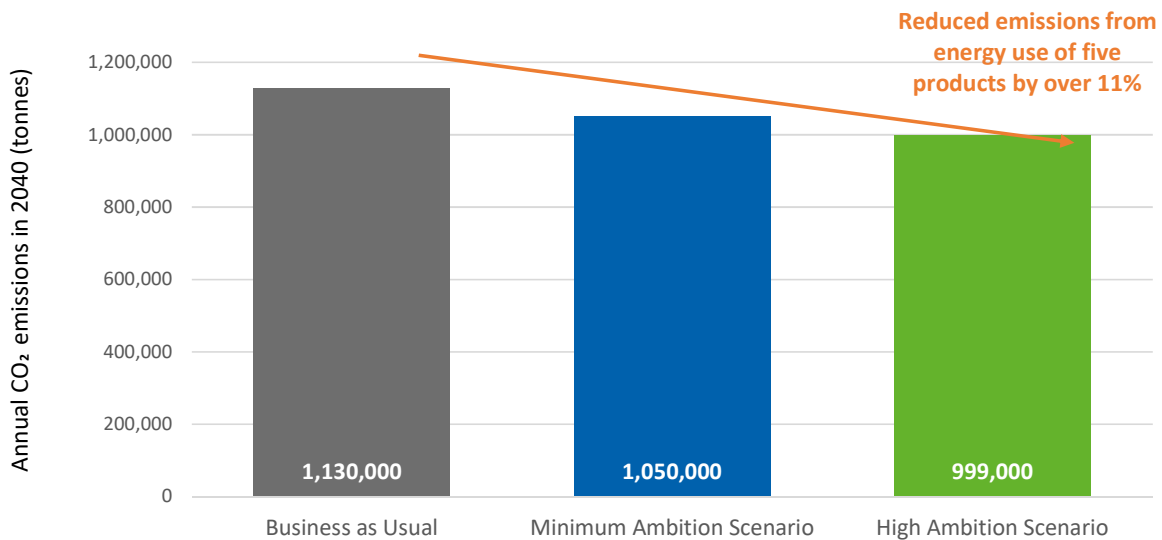
* Denotes savings are from the Minimum Ambition Scenario.
U4E COUNTRY ASSESSMENT, SEPTEMBER 2019

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*



Reduced direct GHG emissions by

7.9 Thousand tonnes

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U4E COUNTRY ASSESSMENT, SEPTEMBER 2019

DETAILED BENEFITS

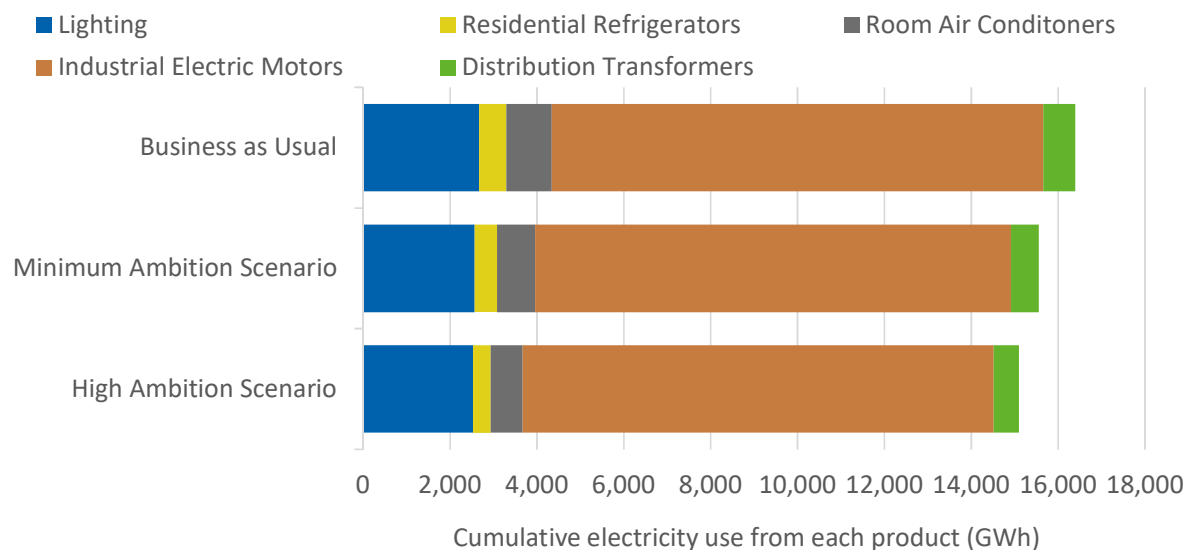
ANNUAL SAVINGS IN 2030 AND 2040*

		Lighting		Cooling				Equipment			
				Residential Refrigerators		Room Air Conditioners		Industrial Electric Motors		Distribution Transformers	
		2030	2040	2030	2040	2030	2040	2030	2040	2030	2040
	Electricity (MWh)	6,100	280	5,400	10,000	8,400	14,000	17,000	36,000	4,200	9,700
	Electricity Bills (Thousand US\$)	210	10	190	360	290	490	600	1,300	150	340
	CO2 Emissions (Tonnes)	6,800	340	6,800	13,000	10,000	18,000	21,000	45,000	5,200	12,000

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)	85	100	29	110	46	170	94	360	22	93
	Electricity Bills (Million US\$)	3.0	3.5	1.0	3.9	1.6	5.9	3.3	13	0.8	3.3
	CO2 Emissions (Thousand tonnes)	110	130	36	140	57	210	120	450	28	120

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	808 Thousand	Residential Electricity tariff	0.04 US\$ / kWh
GDP per capita	3,360 US\$		
Electrification level	100.0%	Transmission and distribution loss factor	19.8%
CO2 Emission Factor	1.00 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	15W CFL 15	10W LED 10	7W LED 7	800 lumen light bulb: 1,000 hrs/year		
	Linear	36W T8 108	20W LED 60	16W LED 48	4 foot tube: 3,000 hrs/year		
	HID	70W HPS 307	50W LED 219	40W LED 175	Poletop street light: 4,380hrs/year		
Cooling	Residential Refrigerators	251	172	86	2-door refrigerator freezer of average size 216 liters		
	Room Air Conditioners	914	983	617	A mix of 3.5 kW and 7 kW split units with a weighted-average cooling capacity of 4.7 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 (2018 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 U.S. 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.