



Bhutan



Lighting



Energy efficiency benefits from the transition to energy efficient lighting in the residential, commercial, industrial and outdoor sectors for all major lamp types through the implementation of Minimum Energy Performance Standards at two levels of ambition (minimum and high).

ANNUAL SAVINGS IN 2030*



Reduce electricity use by over **6.1 GWh** which is **0.28%** of current national electricity use

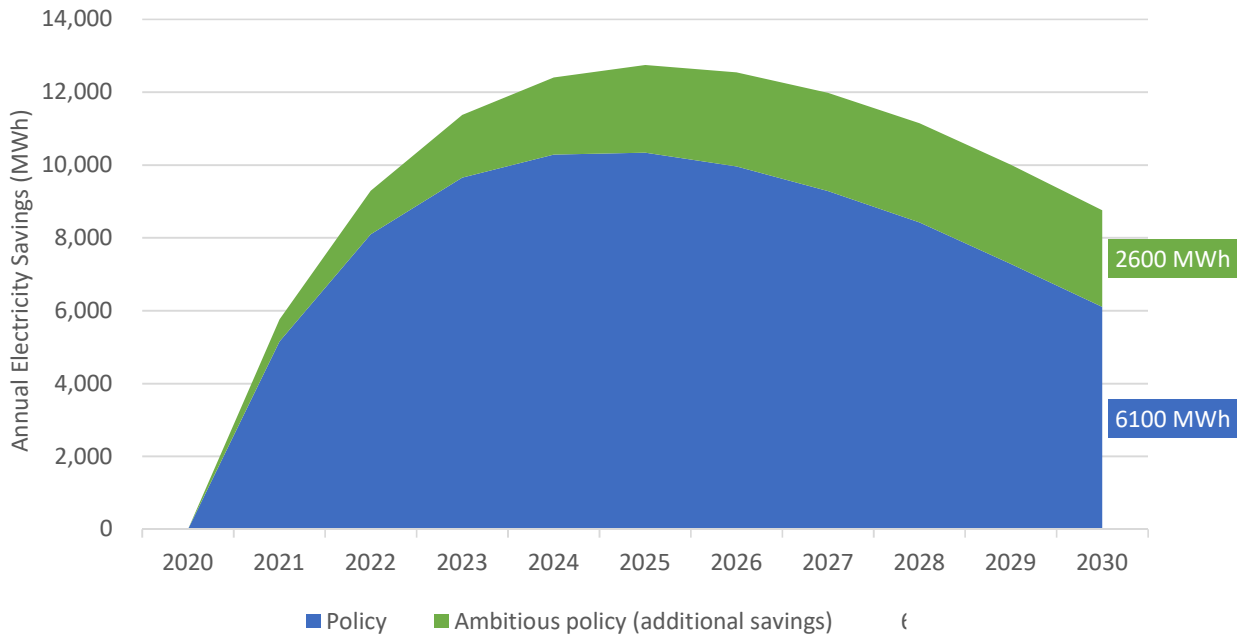


Save electricity worth **210 Thousand US\$** equivalent to **1 Power Plant [1MW each]**



Reduce electricity CO₂ emissions by over **7.6 Thousand tonnes** equivalent to **4.2 Thousand Passenger Cars**

EVEN GREATER SAVINGS POSSIBLE WITH MORE STRINGENT REGULATION



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

DETAILED BENEFITS



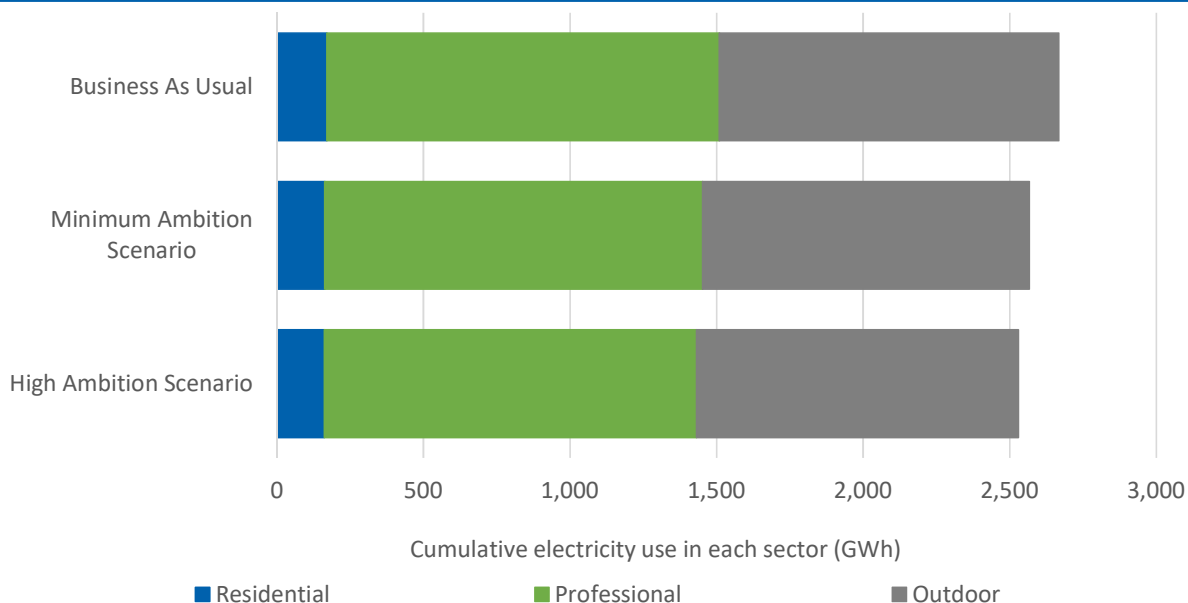
ANNUAL SAVINGS IN 2030 AND 2040*

		Residential		Professional		Outdoor	
		2030	2040	2030	2040	2030	2040
	Electricity (GWh)	0.4	0.0	3.1	0.1	2.7	0.1
	Electricity Bills (Thousand US\$)	14	0.6	110	4.8	93	4.2
	CO2 Emissions (Thousand tonnes)	0.5	0.0	3.8	0.2	3.3	0.1

CUMULATIVE SAVINGS BY 2030 AND 2040*

		Residential		Professional		Outdoor	
		2030	2040	2030	2040	2030	2040
	Electricity (GWh)	5.4	6.5	42	51	37	44
	Electricity Bills (Million US\$)	0.2	0.2	1.5	1.8	1.3	1.5
	CO2 Emissions (Thousand tonnes)	6.7	8.1	53	63	46	55

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	817 Thousand	Residential Electricity tariff	0.04 US\$ / kWh
GDP per capita	3,360 US\$	Transmission and distribution loss factor	19.8%
Electrification level	100.0%		
CO2 Emission Factor	1.00 kg / kWh		

ASSUMPTIONS

Product	Unit Energy Consumption (kWh/year)				Type of Product
	Legacy	Business As Usual	Minimum Ambition Scenario	High Ambition Scenario	
General Service Lighting (domestic use)	60W lamp 60	15W CFL 15	10W LED 10	7W LED 7	800 lumen light bulb burning for 1,000 hrs/year
Linear Lighting (commercial use)	40W T12* 120	36W T8 108	20W LED 60	16W LED 48	4 foot tube burning for 3,000 hrs/year
HID Lighting (residential roads)	70W HPS 307	70W HPS 307	50W LED 219	40W LED 175	Poletop street light burning for 4,380hrs/year**

*still used in emerging markets ** LED has 2 to 3 times the life & better colour

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 lighting in the residential, commercial and outdoor sectors. 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 was estimated using a combination of stock estimates from multiple sources and a top-down estimate of the electricity used for lighting in each country. Electricity savings over time are calculated by estimating the impact on the overall efficacy of the lighting stock caused by transitioning to efficient lamps at different rates in each scenario. The analysis includes the following data:
 - Current total electricity consumption comes from the World Bank and the U.S. Energy Information Administration (EIA). Future electricity demand is based on forecasts from the IEA's World Energy Outlook 2018.
 - Population (2018 and future forecasts) comes from the UN Population Division.
 - 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.
 - Transmission and distribution loss factor is a regional average calculated from electricity production and consumption data published by the IEA.
 - CO2 emission factors come from the IEA and the Institute of Global Environmental Strategies (IGES) and are assumed constant in future years.
 - Baseline wattages, efficacies, operating hours and appliance lifetimes for each technology in each country are based on analysis from the UNEP U4E Model Regulation Guidelines and data provided by country representatives (when available) and product experts.
 - 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

