Papua New Guinea

U4E United for Efficiency | UN environment

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 **500 GWh** which is **14.7%** of current national electricity use

Save electricity worth **150 Million US$** equivalent to over **1 Power Plant [100MW each]**

Reduce electricity CO_2 emissions by over **410 Thousand tonnes** equivalent to **230 Thousand Passenger Cars**
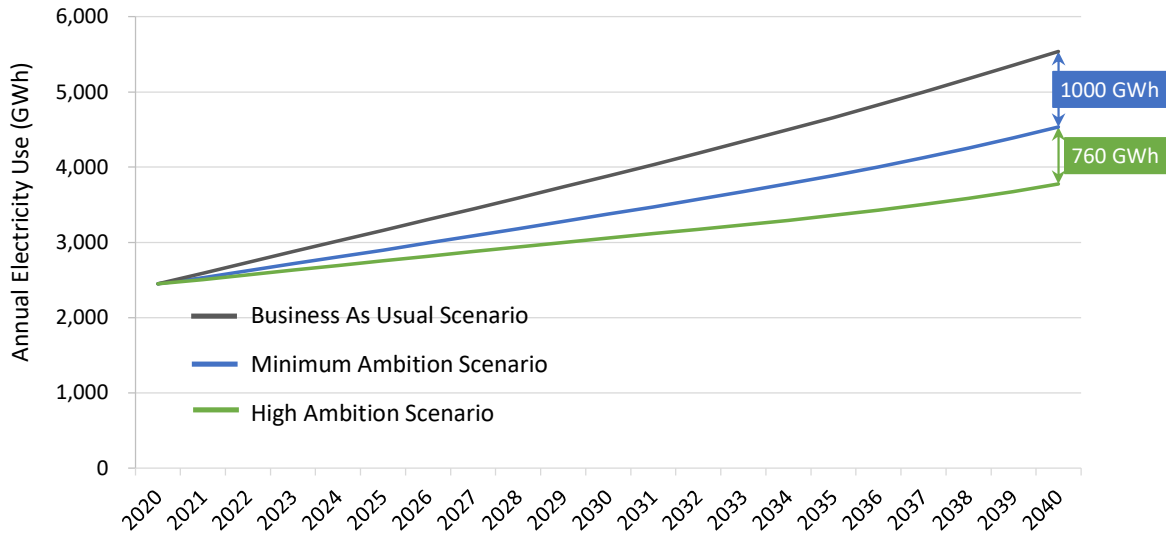
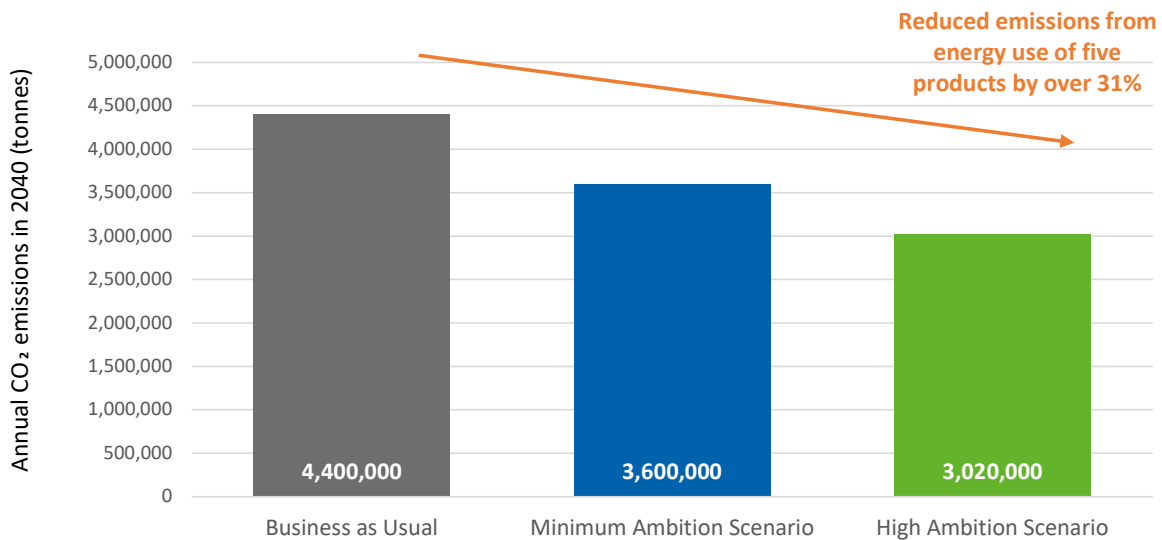## ELECTRICITY SAVINGS OVER TIME*
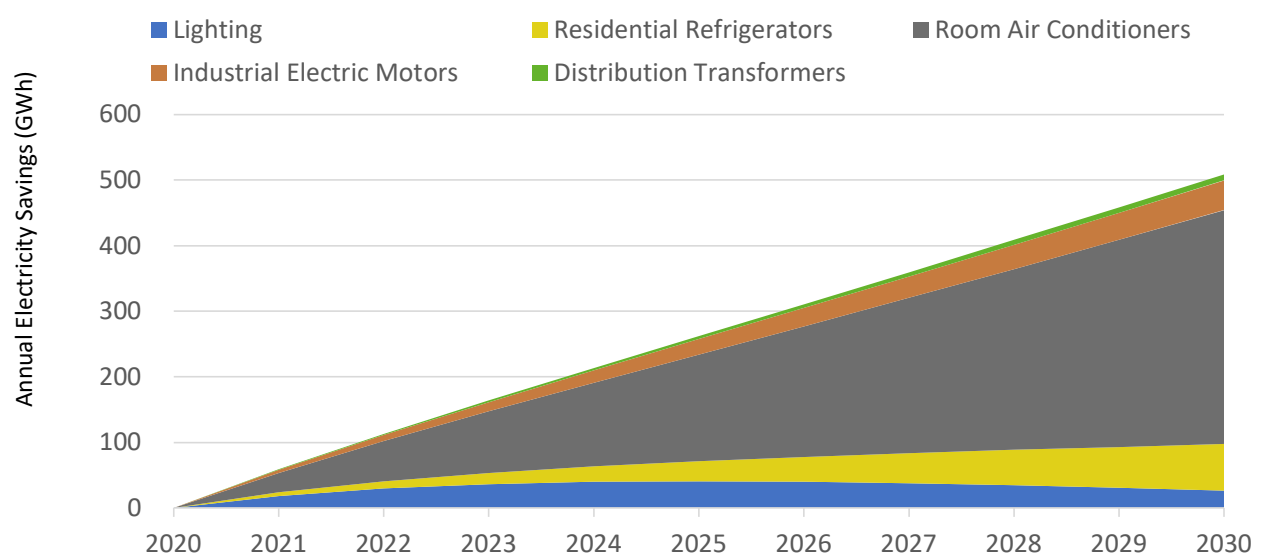
Legend:
- Lighting
- Residential Refrigerators
- Room Air Conditioners
- Industrial Electric Motors
- Distribution Transformers

Chart: Annual Electricity Savings (GWh) vs years 2020–2030, y-axis from 0 to 600.

AND EVEN MORE BENEFITS

THE MORE AMBITIOUS THE REGULATION, THE MORE SAVINGS ARE POSSIBLE

Annual Electricity Use (GWh)

- Business As Usual Scenario
- Minimum Ambition Scenario
- High Ambition Scenario

1000 GWh
760 GWh

MEET GLOBAL CLIMATE GOALS BY SIGNIFICANTLY DECREASED EMISSIONS

Reduced emissions from energy use of five products by over 31%

Annual CO_2 emissions in 2040 (tonnes)

Business as Usual	Minimum Ambition Scenario	High Ambition Scenario
4,400,000	3,600,000	3,020,000

OTHER BENEFITS ACHIEVED IN 2030*

Increased grid connection to   **250 Thousand households**

Reduced cumulative direct GHG emissions by   **26 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)	27	1.5	71	160	360	730	45	90	9.3	20
Electricity Bills (Thousand US$)	7,700	450	21,000	47,000	100,000	210,000	13,000	26,000	2,700	5,800
CO2 Emissions (Thousand tonnes)	22	1.3	58	130	290	600	37	74	7.6	16

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)	340	410	360	1,600	1,900	7,600	250	950	50	200
Electricity Bills (Million US$)	98	120	100	460	540	2,200	74	280	15	58
CO2 Emissions (Thousand tonnes)	280	340	290	1,300	1,500	6,300	210	780	41	160

CONTRIBUTION TO CUMULATIVE ELECTRICITY USE BY 2040
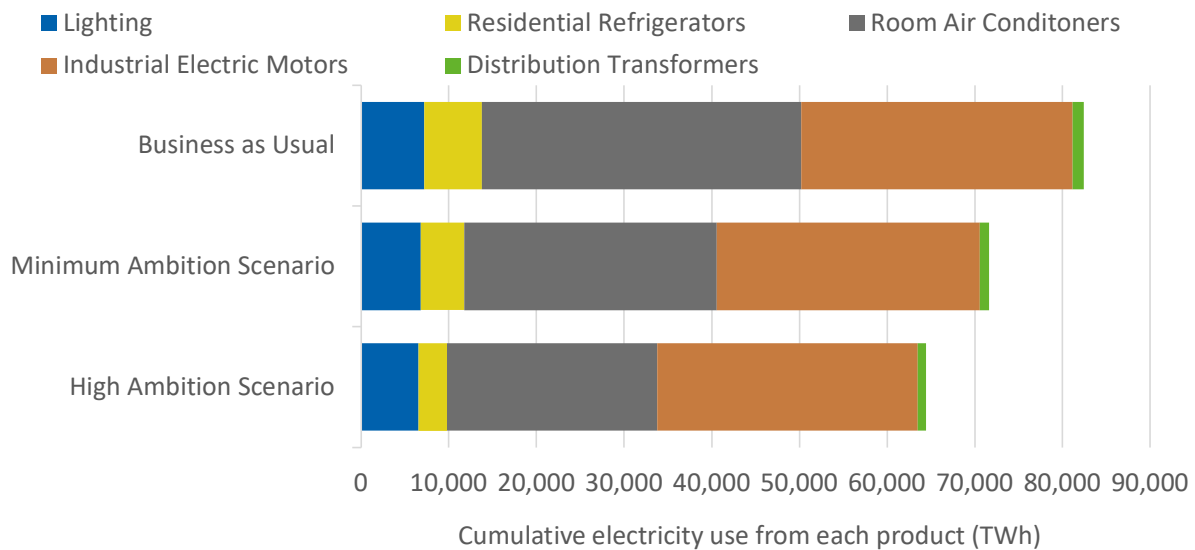
- ■ Lighting
- ■ Residential Refrigerators
- ■ Room Air Conditoners
- ■ Industrial Electric Motors
- ■ Distribution Transformers

Cumulative electricity use from each product (TWh)

* Denotes savings are from the Minimum Ambition Scenario.

Country Data and Input Assumptions

GENERAL INFORMATION

Population	8.42 Million
GDP per capita	2,723 US$
Electrification level	29.2%
CO2 Emission Factor	0.66 kg / kWh

ELECTRICITY MARKET

Residential Electricity tariff	0.29 US$ / kWh
Transmission and distribution loss factor	19.8%

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	398	273	136	2-door refrigerator freezer of average size 300 liters
Room Air Conditioners	3,417	2,229	1,661	A mix of 3.5 kW and 7 kW split units with a weighted-average cooling capacity of 4.2 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 Word 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.
U4E COUNTRY ASSESSMENT, OCTOBER 2020 (UPDATE)

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