Madagascar

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.

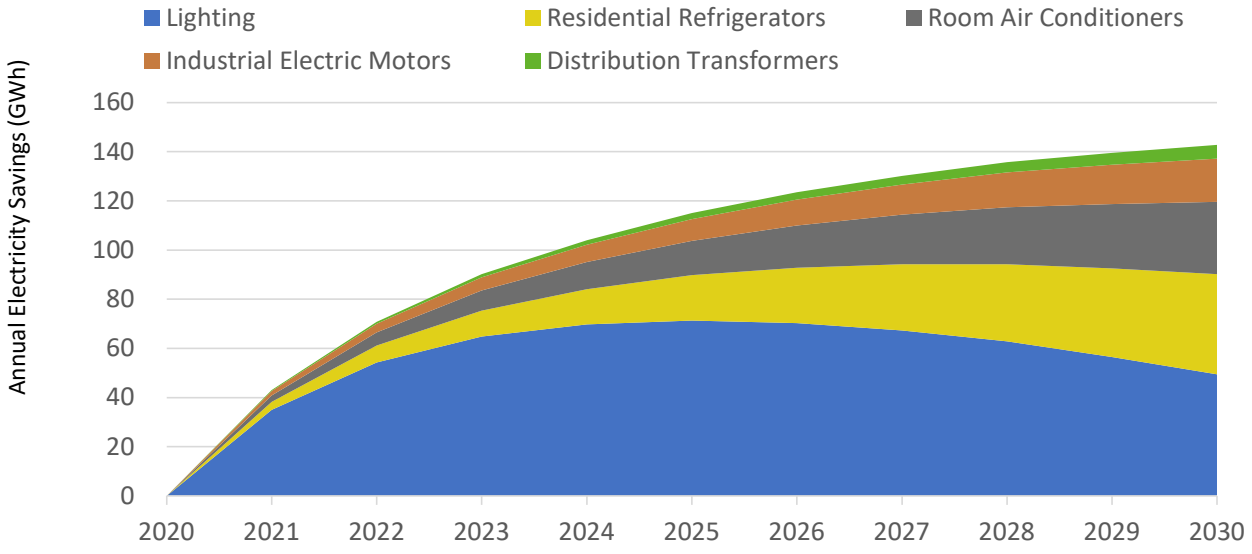
ANNUAL SAVINGS IN 2030*

Reduce electricity use by over **140 GWh** which is **8.4%** of current national electricity use

Save electricity worth **5.7 Million US$** equivalent to over **1 Power Plant [20MW each]**

Reduce electricity CO_2 emissions by over **140 Thousand tonnes** equivalent to **80 Thousand Passenger Cars**

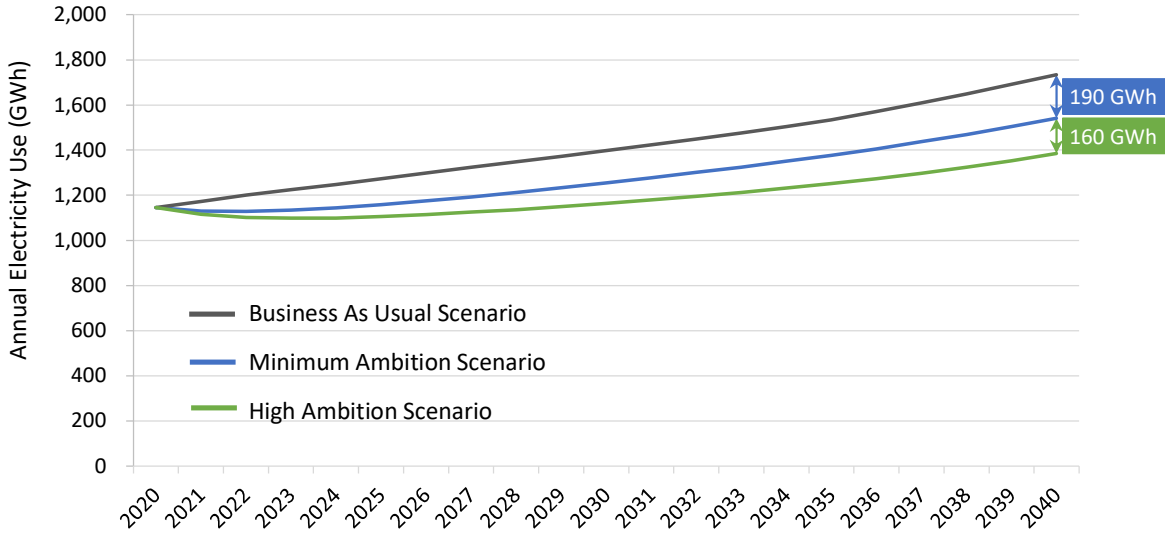
ELECTRICITY SAVINGS OVER TIME*



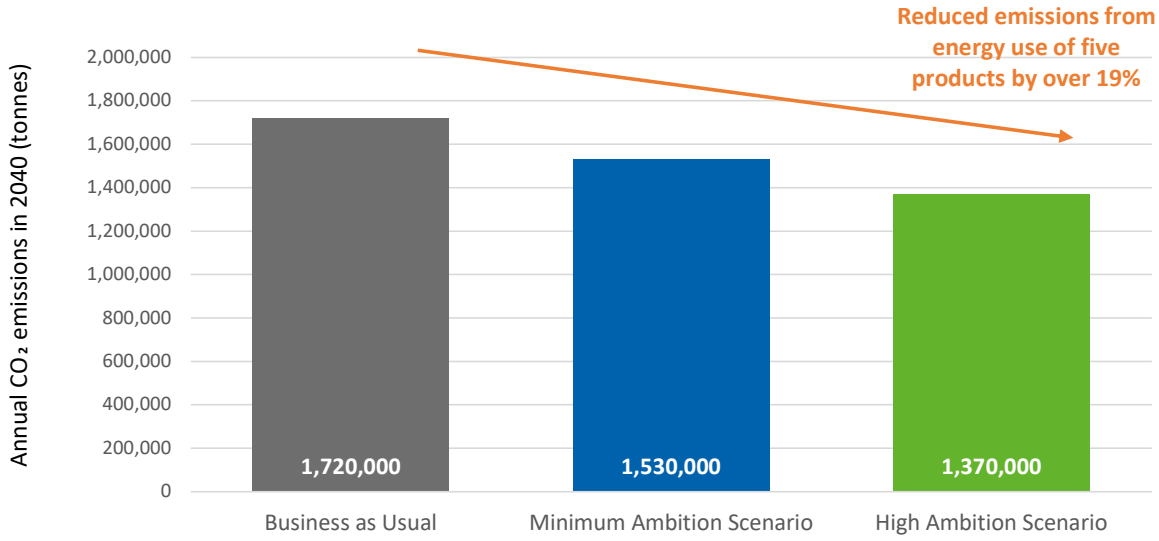
* Denotes savings are from the Minimum Ambition Scenario.

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 **71 Thousand households**

Reduced cumulative direct GHG emissions by **10 Thousand tonnes**

* Denotes savings are from the Minimum Ambition Scenario.

DETAILED BENEFITS

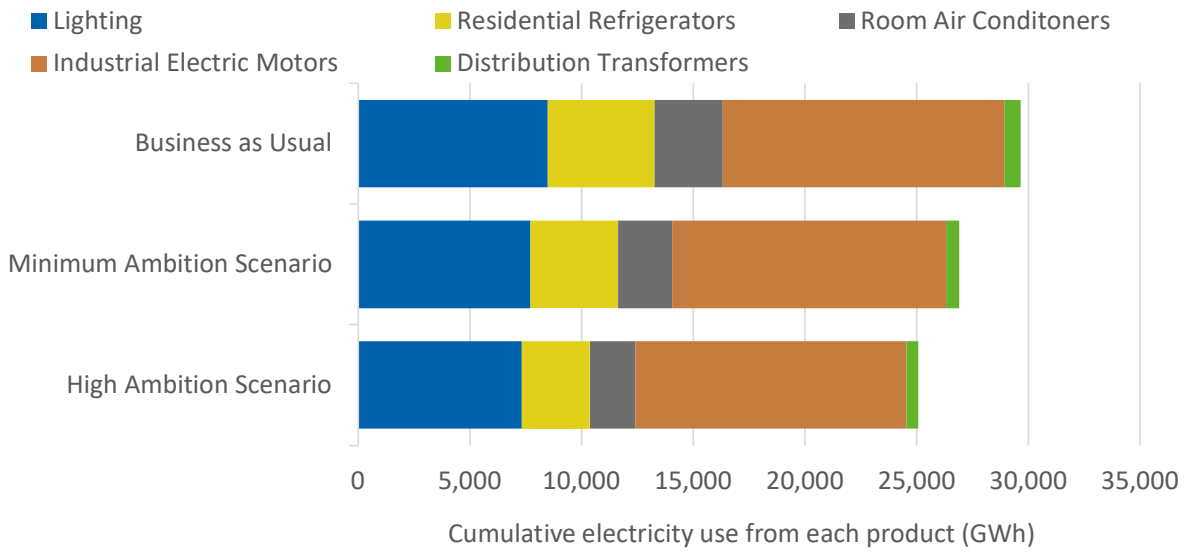
ANNUAL SAVINGS IN 2030 AND 2040*

		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)	49	4.3	41	83	29	55	18	36	5.5	14
	Electricity Bills (Thousand US$)	2,000	170	1,600	3,300	1,200	2,200	700	1,400	220	580
	CO2 Emissions (Thousand tonnes)	50	4.3	41	84	30	56	18	36	5.6	15

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)	600	780	210	870	160	610	97	370	28	130
	Electricity Bills (Million US$)	24	31	8.4	35	6.3	24	3.9	15	1.1	5.1
	CO2 Emissions (Thousand tonnes)	610	790	210	880	160	620	99	380	28	130

CONTRIBUTION TO CUMULATIVE ELECTRICITY USE BY 2040



* Denotes savings are from the Minimum Ambition Scenario.

Country Data and Input Assumptions

GENERAL INFORMATION

Population	26.3 Million
GDP per capita	461 US$
Electrification level	17.0%
CO2 Emission Factor	0.71 kg / kWh

ELECTRICITY MARKET

Residential Electricity tariff	0.04 US$ / kWh
Transmission and distribution loss factor	30.0%

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	300		224		148		2-door refrigerator freezer of average size 350 liters
	Room Air Conditioners	813		526		386		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

Cooling Note: Local data suggests that refrigerator UECs are close to the model regulation guidelines so the minimum ambition scenario is set at a higher level here.

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.