














# Regional Savings Assessment Southern African Development Community



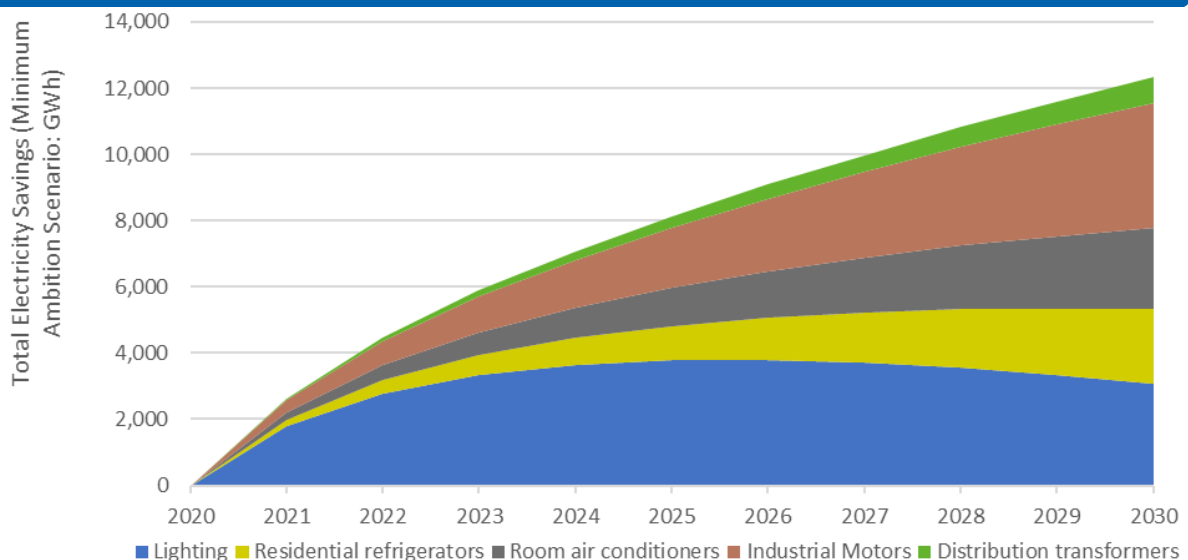
A summary of the potential benefits attained from the implementation of Minimum Energy Performance Standards for lighting, appliances and equipment at a regional level. The impacts are assessed at minimum and high ambition levels<sup>1</sup> as detailed in the Model Regulation Guidelines available from the United Nations Environment Programme (UNEP) United For Efficiency (U4E).

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

## POTENTIAL SAVINGS IN 2030\*

	Reduce electricity use by <b>12.4 TWh</b> per year which is <b>3.8 %</b> of current regional electricity use which leads to total savings of <b>82 TWh</b> by 2030.
	These electricity savings are worth <b>1.1 Billion US\$</b> a year in 2030 leading to a total saving on electricity bills of <b>7.3 Billion US\$</b> by that year.
	The reduction in electricity demand could prevent the need to build <b>6 power plants [500MW each]</b> in the region by 2030.
	The CO <sub>2</sub> emissions saved from these reductions will be <b>11.2 million tonnes</b> per year by 2030 contributing <b>75.7 million tonnes</b> to savings over 10 years.
	These emissions savings are equivalent to taking <b>7.3 million cars</b> off the road.
	More stringent policies in the high ambition scenario increase annual savings to <b>20.7 TWh</b> per year which leads to total savings of <b>135 TWh</b> by 2030.

## ANNUAL SAVINGS BY YEAR TO 2030\*

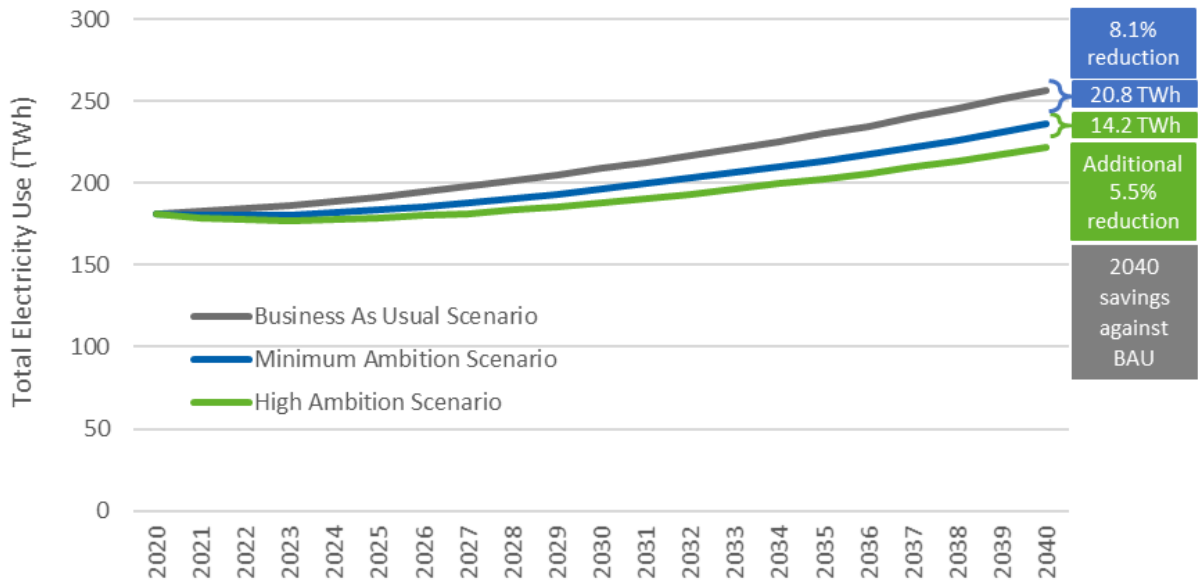


\* denotes savings are from the Minimum Ambition Scenario

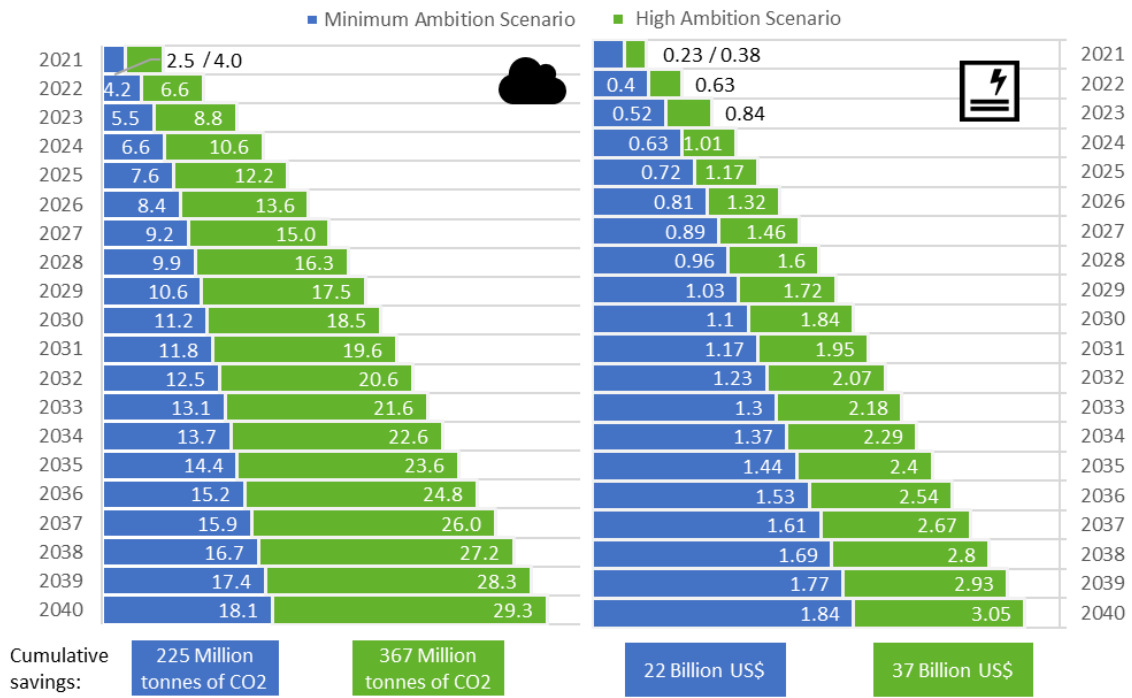
<sup>1</sup> The assumptions for each of these scenarios in each country are detailed on p5 of this report.

# THE POTENTIAL FOR MORE BENEFITS

THE MORE AMBITIOUS THE POLICY, THE MORE ELECTRICITY SAVINGS ARE POSSIBLE



BRINGING EXTRA SAVINGS OVER TIME IN BOTH CO<sub>2</sub> AND ELECTRICITY BILLS



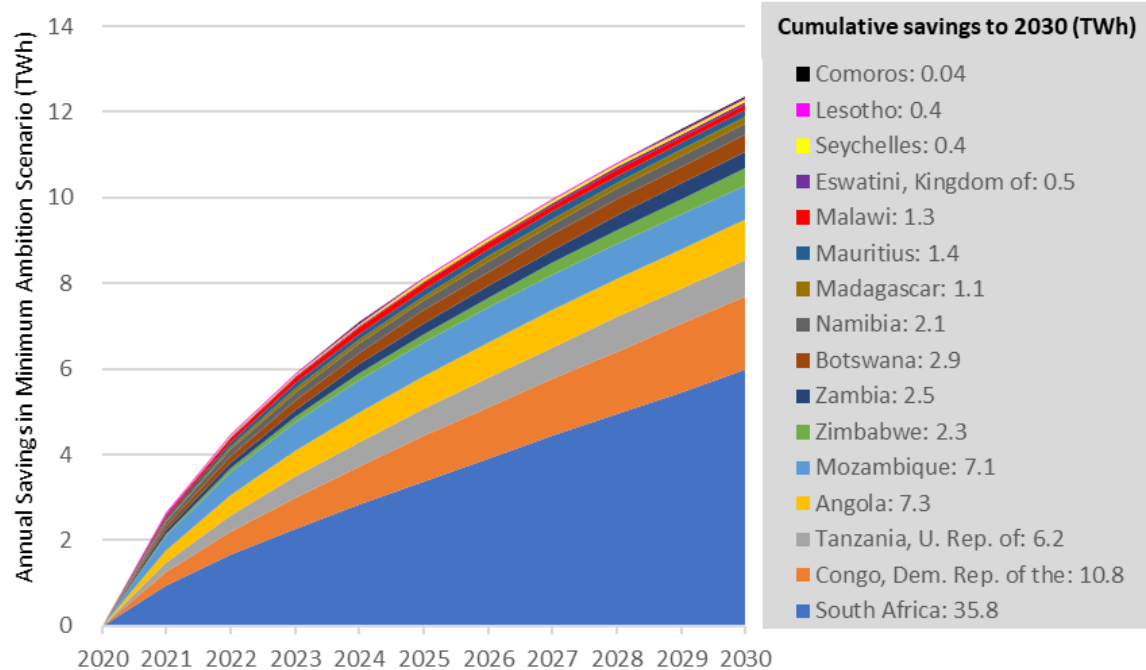
AND OTHER SOCIETAL BENEFITS IN 2030 BY SCENARIO\*\*

- Increased grid connection to between **6.1 – 10.2 Million households**
- Reduced annual electricity subsidies by between **140 - 230 Million US\$**
- Reduced cumulative direct GHG emissions by **480 Thousand tonnes**

\*\* denotes a range of savings are shown from the Minimum Ambition to the High Ambition Scenario

## DETAILED BENEFITS BY COUNTRY

THE SHARE OF ELECTRICITY SAVINGS TO 2030 VARIES BY COUNTRY\*



AND ACCUMULATES OVER TIME\*

	Annual savings in 2030			Cumulative savings by 2030		
	Electricity ⚡ (GWh)	Electricity Bills ⚡ (Million US\$)	CO <sub>2</sub> emissions ☁️ (Thousand tonnes)	Electricity ⚡ (GWh)	Electricity Bills ⚡ (Million US\$)	CO <sub>2</sub> emissions ☁️ (Thousand tonnes)
Angola	930	42	830	7,280	328	6,500
Botswana	407	34	923	2,930	246	6,650
Comoros	7.3	2.4	7.7	43	14	45
Congo, Dem. Rep. of the	1,720	108	6	10,800	681	38
Eswatini, Kingdom of	66	8.0	49	523	63	385
Lesotho	46	4.2	33	394	36	288
Madagascar	143	5.7	145	1,090	44	1,110
Malawi	138	12	43	1,300	117	405
Mauritius	165	25	161	1,380	207	1,340
Mozambique	790	95	1,120	7,100	852	10,100
Namibia	244	22	345	2,060	186	2,920
Seychelles	53	7.4	36	354	50	237
South Africa	5,970	597	6,300	35,800	3,580	37,800
Tanzania, U. Rep. of	866	79	554	6,180	563	3,960
Zambia	402	18	486	2,490	110	3,010
Zimbabwe	402	40	172	2,260	223	970

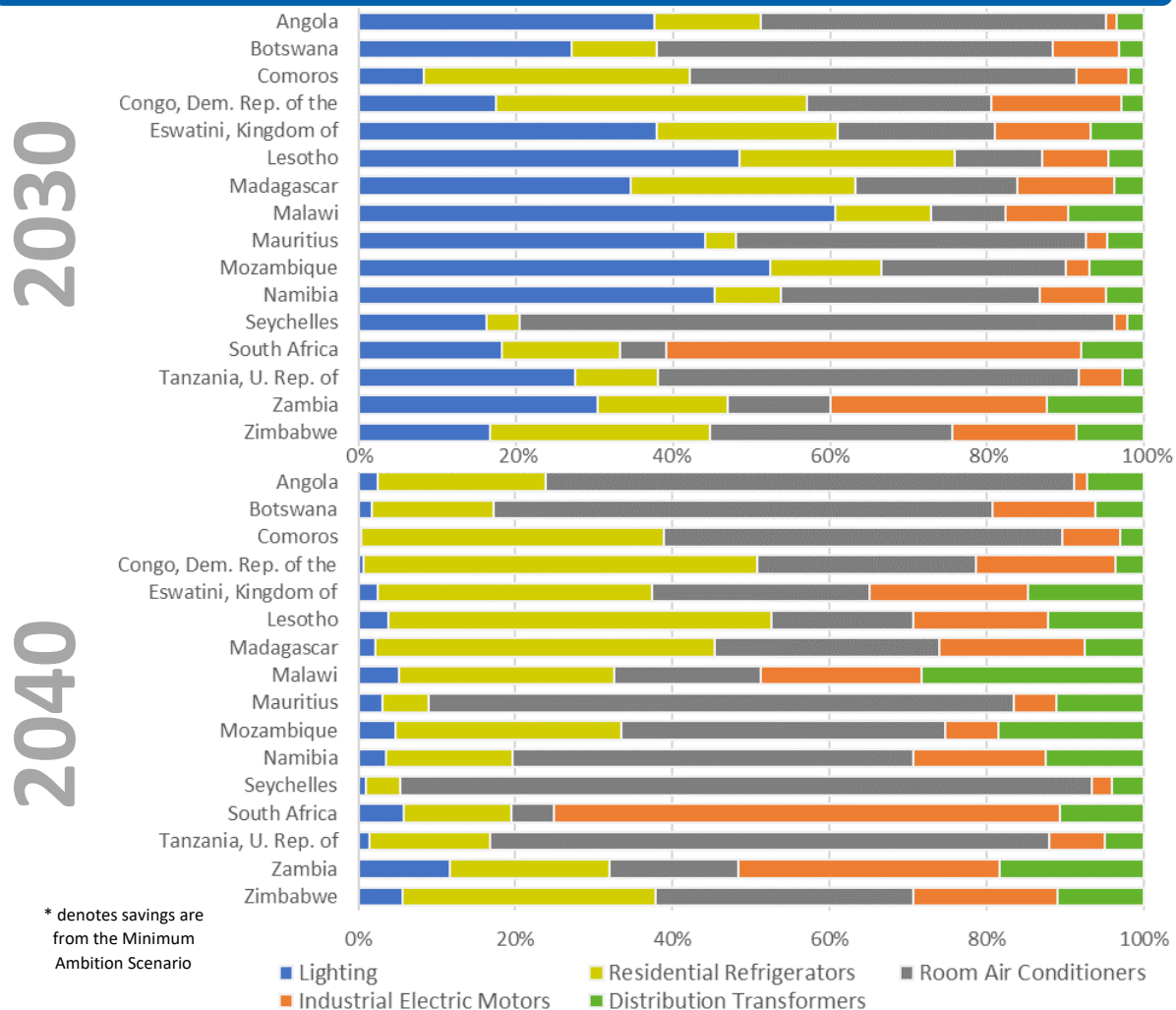
\* denotes savings are from the Minimum Ambition Scenario  
U4E AFREC Regional Savings Assessment, October 2020 (Update)

# DETAILED BENEFITS BY PRODUCT

THE SHARE OF SAVINGS IN 2030 ALSO VARIES BY PRODUCT\*




	Annual (A) Cumulative (C)	Lighting	Residential Refrigerators	Room Air Conditioners	Industrial Electric Motors	Distribution Transformers
Electricity (GWh)	A	3,060	2,250	2,450	3,790	789
	C	32,800	11,800	13,000	20,300	4,050
Electricity Bills (Million US\$)	A	273	188	205	361	73
	C	2,900	997	1,100	1,930	375
CO <sub>2</sub> emissions (Thousand tonnes)	A	2,970	1,620	2,140	3,700	777
	C	31,500	8,730	11,600	19,900	3,990

AND THOSE ANNUAL SAVING SHARES VARY BY COUNTRY AND OVER TIME\*



## INPUT ASSUMPTIONS FOR EACH PRODUCT







### GENERAL PRODUCT ASSUMPTIONS




Product	Unit Energy Consumption (UEC: kWh/y) or Efficiency Level (Eff.)				Typical product/usage pattern assumed to be:
	Business As Usual	Minimum Ambition Scenario	High Ambition Scenario		
Lighting (UEC) 	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 (UEC) 	Residential Refrigerators	340	247	123	2-door refrigerator freezer of average size 210 litres
	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 (Eff.) 	Industrial Electric Motors	IE0	IE2	IE3	3-phase induction motors used in the industrial sector
	Distribution Transformers	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.*

### COUNTRY SPECIFIC PRODUCT ASSUMPTIONS

As shown below, some country assumptions vary from those listed above for a number of reasons:

-  1- Minimum Energy Performance Standards in South Africa, Zambia and Zimbabwe affect all lamps covered in the Minimum Ambition Scenario so some CFL lamps are also phased out in that scenario.
-  2- Minimum Energy Performance Standards for refrigerators and air conditioners in South Africa reduce the UEC of those products in the BAU scenario in line with those MEPS.
-  3- Variations in local climate affect the underlying UEC assumptions within the Model Regulations.
-    4- Local data provides a more accurate basis for the assumptions used in the BAU scenario.

Product	Country	Unit Energy Consumption (kWh/year) or Efficiency Level				Average capacity
		Business As Usual	Minimum Ambition Scenario	High Ambition Scenario		
Residential Refrigerators 	Madagascar	300	224	148	350 litres	
	Malawi	263	214	107	118 litres	
	Mauritius	300	261	130	250 litres	
	South Africa	247	184	122	200 litres	
Room Air Conditioners 	Angola	3,198	2,049	1,503	5 kW	
	Botswana	2,673	1,829	1,375	5 kW	
	Comoros	4,481	2,786	2,022	5 kW	
	Congo, Dem. Rep. of the	3,198	2,049	1,503	5 kW	
	Lesotho	970	623	464	5 kW	
	Mauritius	2,717	2,260	1,503	5 kW	
	Mozambique	3,198	2,049	1,503	5 kW	
	Namibia	2,673	1,829	1,375	5 kW	
	Seychelles	4,481	2,786	2,022	5 kW	
	South Africa	329	200	142	5 kW	
Tanzania, U. Rep. of	3,198	2,049	1,503	5 kW		
Industrial Electric Motors 	Mauritius	IE2 & IE1	IE3 & IE2	IE4 & IE3	Mixed	
	Seychelles	IE1	IE2	IE3	Mixed	

## COUNTRY DATA AND METHODOLOGY

### COUNTRY DATA

### ELECTRICITY MARKET

	Population (million)	GDP Per Capita (US\$)	Electrification Level	CO <sub>2</sub> Emissions factor (kg/kWh)	Residential Electricity Tariff (US\$/kWh)	Transmission and Distribution loss factor
Angola	30.8	3,432	44.6%	0.79	0.05	11.0%
Botswana	2.3	8,259	61.0%	1.79	0.08	21.2%
Comoros	0.8	1,445	63.7%	0.62	0.33	41.4%
Congo, Dem. Rep. of the	84.0	562	28.4%	0.00	0.06	15.1%
Eswatini, Kingdom of	1.4	4,140	79.3%	0.64	0.12	12.7%
Lesotho	2.3	1,324	47.2%	0.64	0.09	12.0%
Madagascar	26.3	461	17.0%	0.71	0.04	30.0%
Malawi	19.2	389	11.4%	0.26	0.09	18.0%
Mauritius	1.3	9,430	99.0%	0.90	0.15	8.0%
Mozambique	30.5	490	29.3%	1.00	0.12	30.0%
Namibia	2.6	5,931	56.2%	0.95	0.09	32.8%
Seychelles	0.1	16,434	98.6%	0.62	0.14	7.8%
South Africa	57.4	6,340	85.0%	0.96	0.10	9.0%
Tanzania, U. Rep. of	59.1	1,051	35.5%	0.54	0.09	15.8%
Zambia	17.6	1,540	34.3%	1.00	0.04	17.6%
Zimbabwe	16.9	2,147	39.2%	0.36	0.10	16.4%

### 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 (2019) 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.
- CO<sub>2</sub> 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](mailto:U4E@un.org)