Regional Savings Assessment
Southern African Development Community

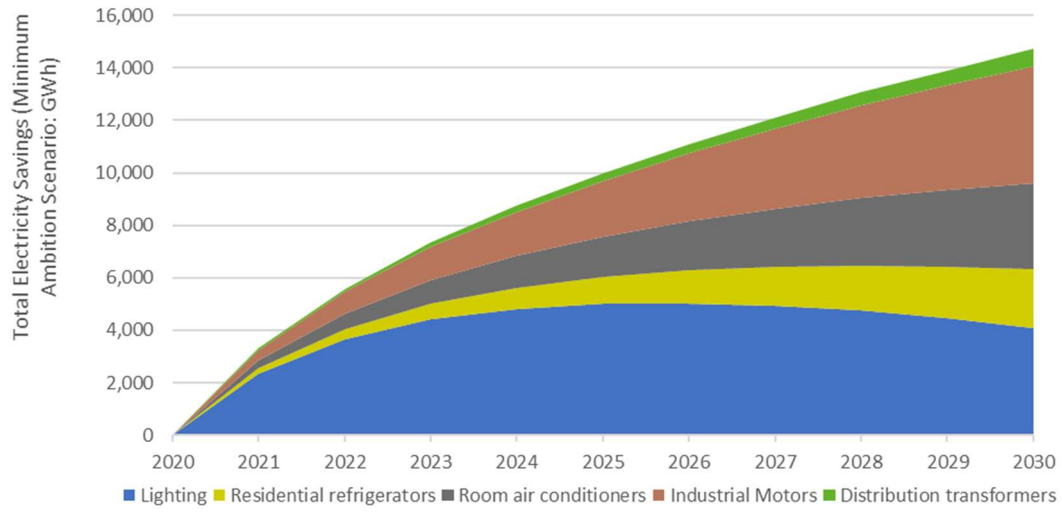
A summary of the potential benefits attained from the implementation of Minimum Energy Performance Standards for lighting, appliances and equipment at a regional level. The impacts are assessed at minimum and high ambition levels[1] as detailed in the Model Regulation Guidelines available from the United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

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

POTENTIAL SAVINGS IN 2030*

	Reduce electricity use between **15 to 24 TWh** per year which is **5 to 9%** of current regional electricity, leading to total cumulative electricity savings of between **100 TWh and 160 TWh** by 2030.
	These electricity savings are worth between **US$ 1.3 to 2.2 Billion per year** by 2030 leading to total cumulative savings on electricity bills of **US$ 9 to 14 Billion**.
	The reduction in electricity demand could prevent the need to build between **7 to 11 large power plants [500MW each]** in the region by 2030, saving a further **US$ 7 to 11 Billion** in unnecessary capacity costs**.**
	The CO_2 emissions saved from the reductions will be between **12 and 21 million tonnes** per year by 2030 contributing **87 to 140 million tonnes** in cumulative CO_2 emissions savings over 10 years.
	These emissions savings are equivalent to taking between **3 to 5 million fossil fuelled cars** off the road.

ANNUAL SAVINGS BY YEAR TO 2030**

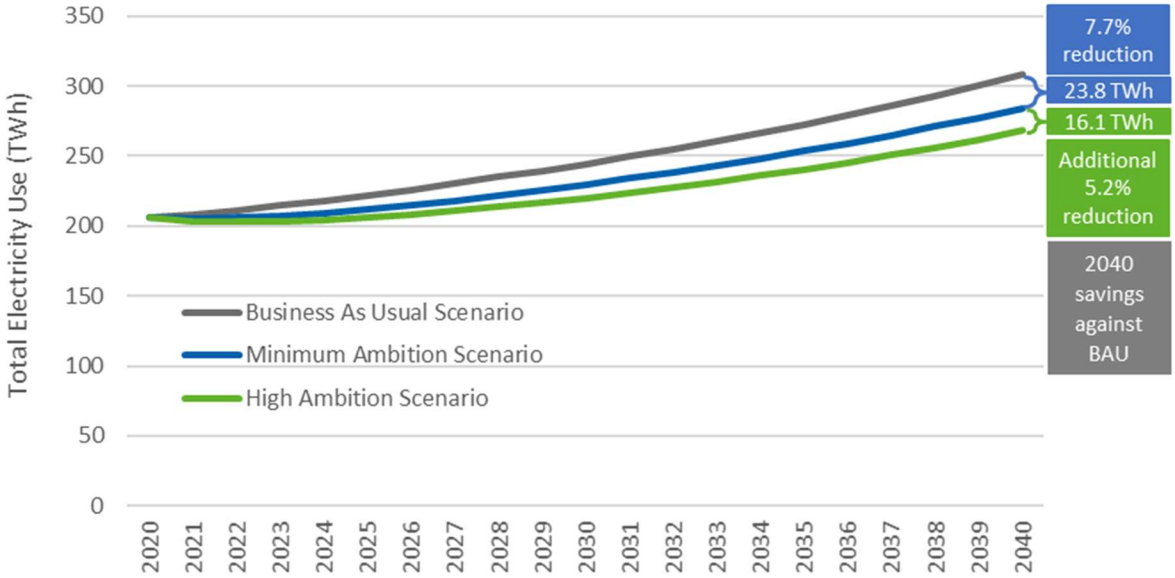


* denotes range of savings from the Minimum Ambition Scenario and the High Ambition Scenario

**denotes savings are from the Minimum Ambition Scenario

THE POTENTIAL FOR MORE BENEFITS

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



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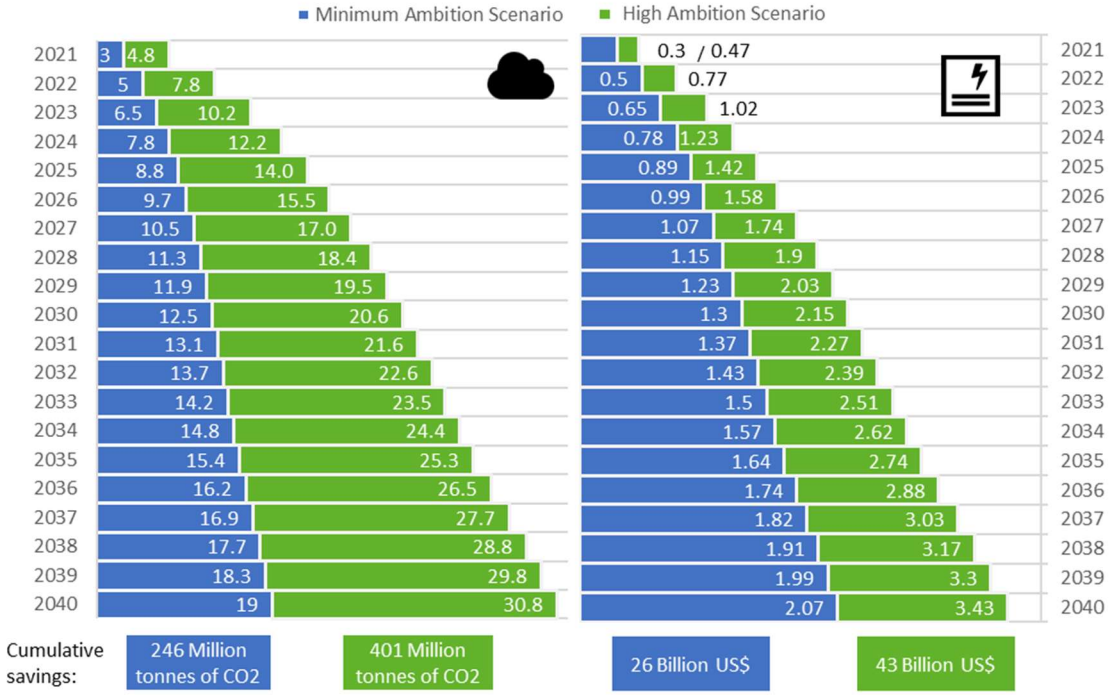
BRINGING EXTRA SAVINGS OVER TIME IN BOTH CO_2 AND ELECTRICITY BILLS



AND OTHER SOCIETAL BENEFITS IN 2030 BY SCENARIO*

Increased grid connection to between **7 - 12 Million Households**

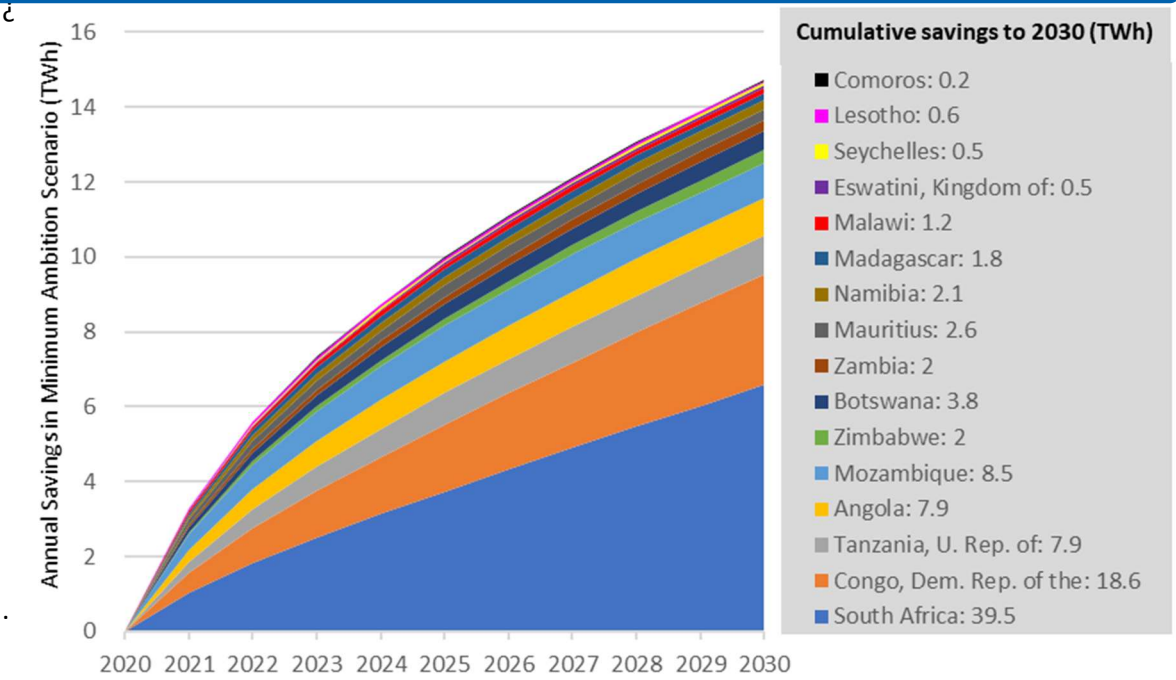
Reduced annual electricity subsidies by between **220 - 370 Million US$**

Reduced cumulative direct GHG emissions from refrigerants by **540 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 ELECTRICTY SAVINGS TO 2030 VARIES BY COUNTRY*



AND ACCUMULATES OVER TIME*

	Annual savings in 2030			Cumulative savings by 2030		
	Electricity	Electricity Bills	CO_2 emissions	Electricity	Electricity Bills	CO_2 emissions
	(GWh)	(Million US$)	(Thousand tonnes)	(GWh)	(Million US$)	(Thousand tonnes)
Angola	1,000	45	895	7,930	357	7,080
Botswana	500	42	1,130	3,770	317	8,560
Comoros	24	8	26	215	70	226
Congo, Dem. Rep. of the	2,960	186	11	18,600	1,170	66
Eswatini, Kingdom of	65	8	48	518	63	382
Lesotho	64	6	46	612	56	447
Madagascar	207	8	210	1,800	72	1,820
Malawi	124	11	39	1,180	106	366
Mauritius	270	41	263	2,650	397	2,580
Mozambique	909	109	1,290	8,530	1,020	12,100
Namibia	246	22	348	2,090	188	2,950
Seychelles	68	10	45	521	73	348
South Africa	6,580	658	6,940	39,500	3,950	41,700
Tanzania, U. Rep. of	1,050	95	669	7,910	720	5,060
Zambia	311	14	376	1,960	86	2,360
Zimbabwe	349	34	149	2,050	202	878

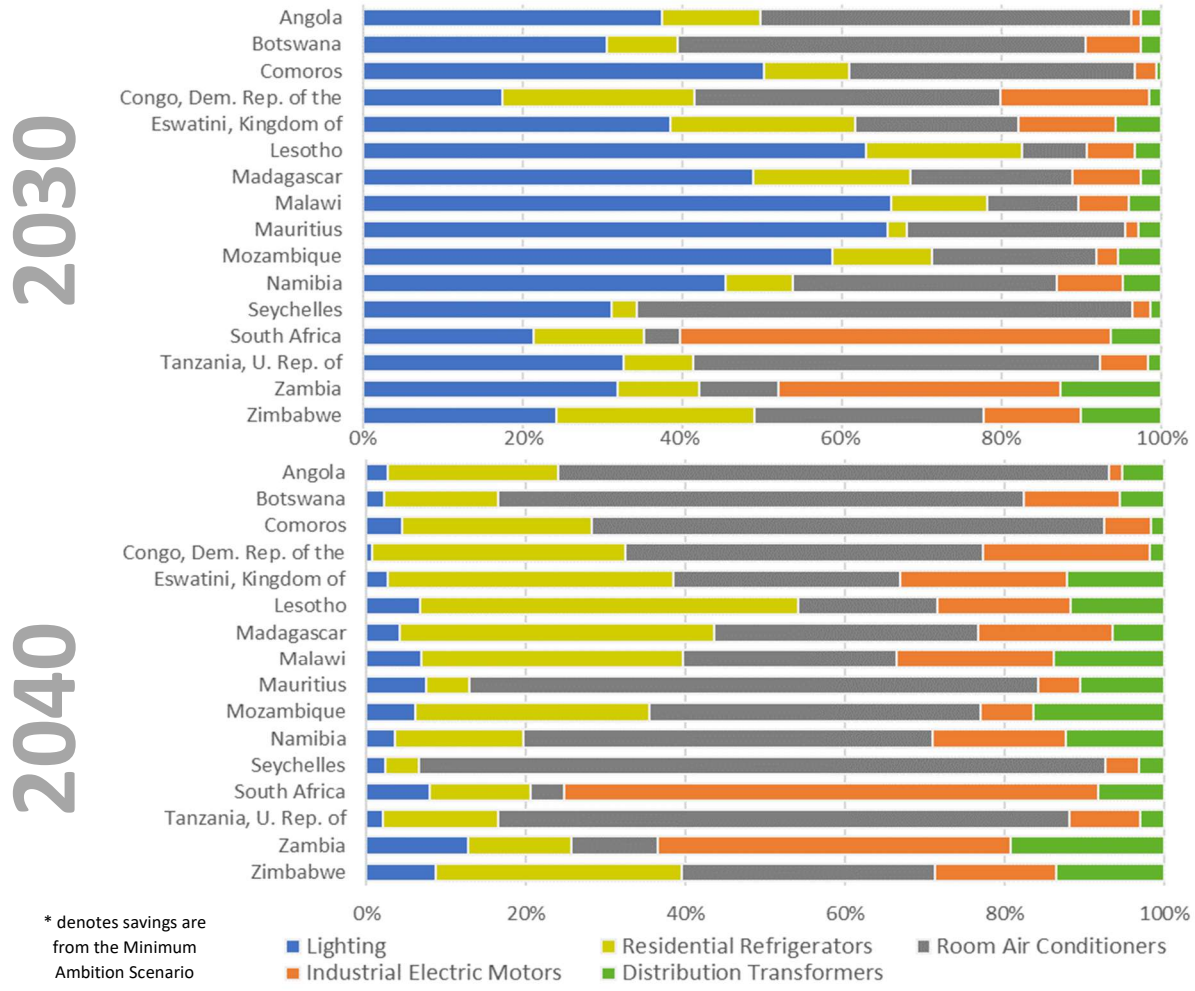
* denotes savings are from the Minimum Ambition Scenario

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	4,080	2,230	3,290	4,450	665
	C	43,400	11,700	17,500	23,800	3,410
Electricity Bills (Million US$)	A	372	187	259	417	63
	C	3,930	988	1,380	2,230	322
CO_2 emissions (Thousand tonnes)	A	3,840	1,570	2,290	4,120	661
	C	40,300	8,460	12,600	22,200	3,400

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



* denotes savings are from the Minimum Ambition Scenario

INPUT ASSUMPTIONS FOR EACH PRODUCT

GENERAL PRODUCT ASSUMPTIONS

	Product	Unit Energy Consumption (UEC: kWh/y) or Efficiency Level (Eff.) Business As Usual	Minimum Ambition Scenario	High Ambition Scenario	Typical product/usage pattern assumed to be:
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 Business As Usual	Minimum Ambition Scenario	High Ambition Scenario	Average capacity
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$)	Electrification Level	CO_2 Emissions factor (kg/kWh)	Residential Electricity Tariff (US$/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 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