# China

## Product scope
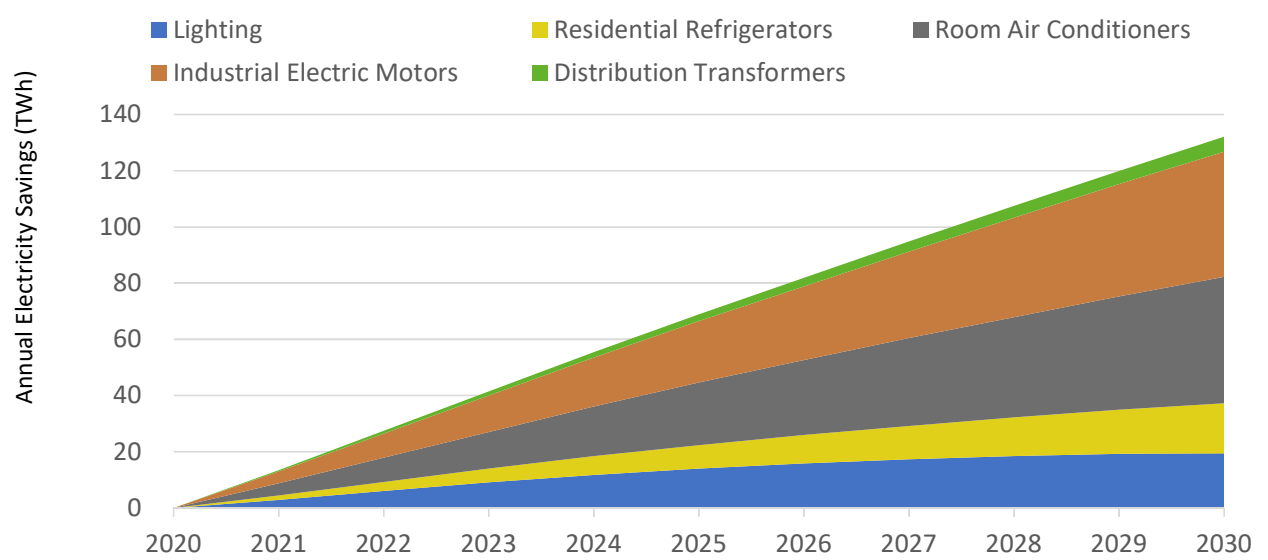
| | Lighting | Cooling | | Equipment | |
|---|---|---|---|---|---|
| **Product scope** | All Lighting | Residential Refrigerators | Room Air Conditioners | Industrial Electric Motors | Distribution Transformers |

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 **130 TWh** which is **2.4%** of current national electricity use

Save electricity worth **10 Billion US$** equivalent to over **60 Power Plants [500MW each]**

Reduce electricity $CO_2$ emissions by over **150 Million tonnes** equivalent to **86 Million Passenger Cars**
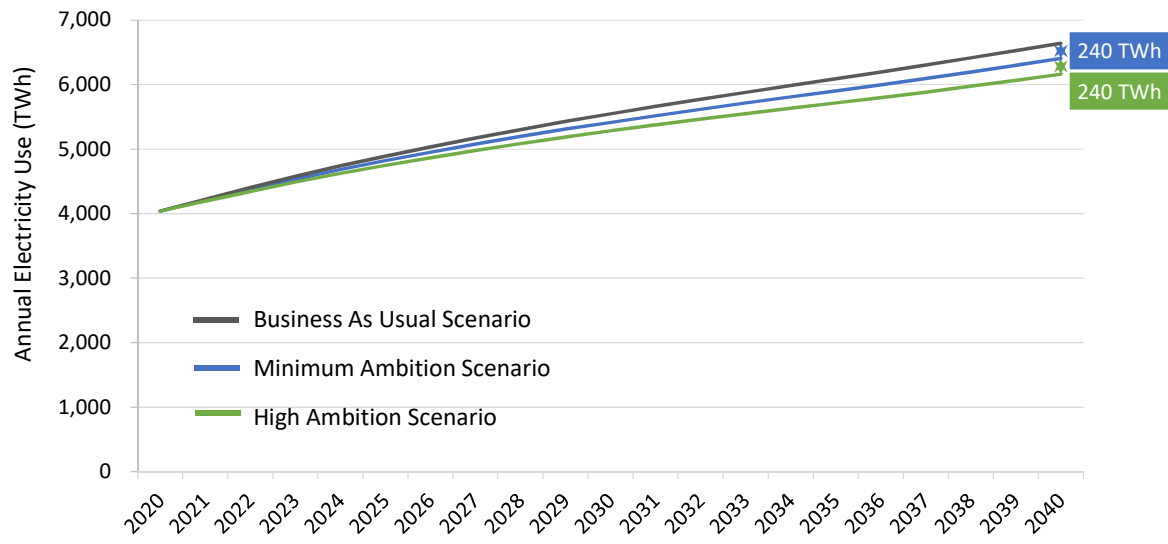
## ELECTRICITY SAVINGS OVER TIME*
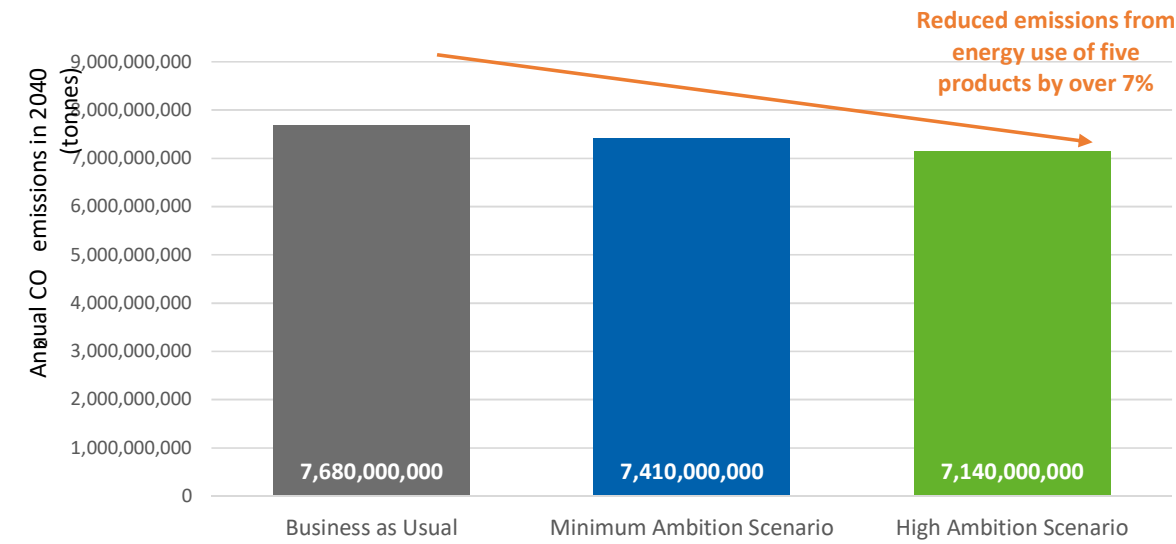


Legend: Lighting, Residential Refrigerators, Room Air Conditioners, Industrial Electric Motors, Distribution Transformers

Y-axis: Annual Electricity Savings (TWh)
X-axis: 2020, 2021, 2022, 2023, 2024, 2025, 2026, 2027, 2028, 2029, 2030

# AND EVEN MORE BENEFITS

## THE MORE AMBITIOUS THE REGULATION, THE MORE SAVINGS ARE POSSIBLE



Annual Electricity Use (TWh)

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

240 TWh
240 TWh

## MEET GLOBAL CLIMATE GOALS BY SIGNIFICANTLY DECREASED EMISSIONS

Reduced emissions from energy use of five products by over 7%



Annual $CO_2$ emissions in 2040 (tonnes)

| Business as Usual | Minimum Ambition Scenario | High Ambition Scenario |
|---|---|---|
| 7,680,000,000 | 7,410,000,000 | 7,140,000,000 |

## OTHER BENEFITS ACHIEVED IN 2030*

Reduced electricity subsidies by          **600 Million US$**

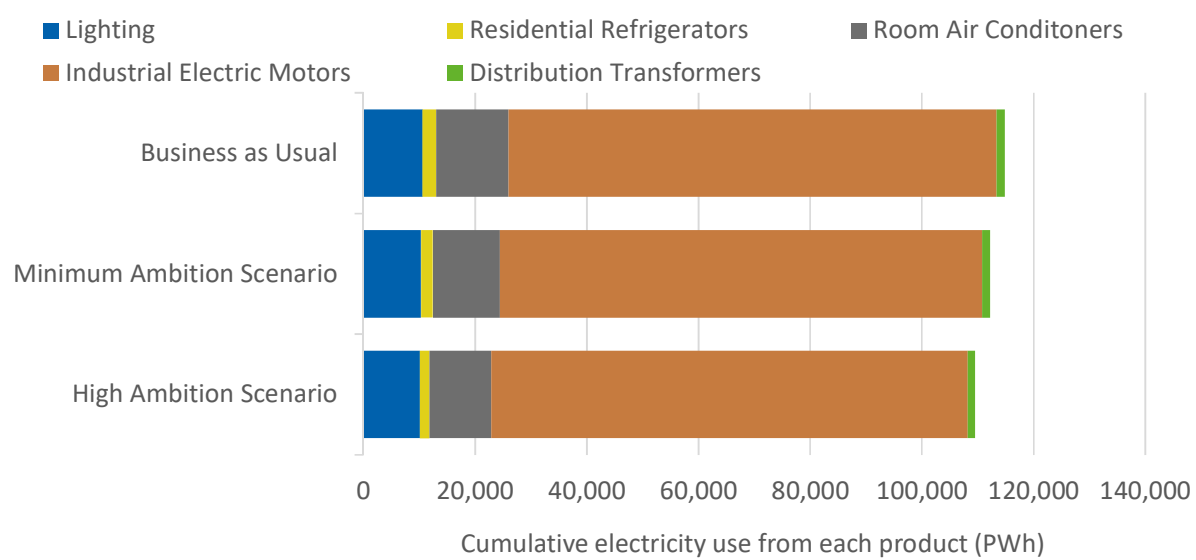Reduced direct GHG emissions by           **82 Million tonnes**

# 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 (TWh) | 19 | 2.8 | 18 | 34 | 45 | 89 | 44 | 97 | 5.4 | 12 |
| | Electricity Bills (Million US$) | 1.5 | 220 | 1,400 | 2,700 | 3,500 | 6,800 | 3,400 | 7,500 | 410 | 940 |
| | CO2 Emissions (Million tonnes) | 21 | 3.3 | 21 | 41 | 53 | 100 | 52 | 110 | 6.3 | 14 |

## 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 (TWh) | 130 | 260 | 94 | 370 | 240 | 950 | 240 | 960 | 28 | 120 |
| Electricity Bills (Billion US$) | 10 | 20 | 7.2 | 29 | 19 | 73 | 19 | 74 | 2.2 | 9.1 |
| CO2 Emissions (Million tonnes) | 160 | 310 | 110 | 440 | 290 | 1,100 | 280 | 1,100 | 33 | 140 |

## CONTRIBUTION TO CUMULATIVE ELECTRICITY USE BY 2040

- Lighting
- Residential Refrigerators
- Room Air Conditoners
- Industrial Electric Motors
- Distribution Transformers



Cumulative electricity use from each product (PWh)

# Country Data and Input Assumptions

## GENERAL INFORMATION

| | |
|---|---|
| Population | 1.42 Billion |
| GDP per capita | 9,771 US$ |
| Electrification level | 100.0% |
| CO2 Emission Factor | 1.11 kg / kWh |

## ELECTRICITY MARKET

| | |
|---|---|
| Residential Electricity tariff | 0.08 US$ / kWh |
| Transmission and distribution loss factor | 5.5% |

## ASSUMPTIONS

| | Product | Unit Energy Consumption (kWh/year) or Efficiency Level | | | Type of Product |
|---|---|---|---|---|---|
| | | Business As Usual | Minimum Ambition Scenario | High Ambition Scenario | |
| Lighting | GSL<br>Linear<br>HID | 15W CFL   15<br>36W T8   108<br>70W HPS   307 | 10W LED   10<br>20W LED   60<br>50W LED   219 | 7W LED   7<br>16W LED   48<br>40W LED   175 | 800 lumen light bulb: 1,000 hrs/year<br>4 foot tube: 3,000 hrs/year<br>Poletop street light: 4,380hrs/year |
| Cooling | Residential Refrigerators | 228 | 177 | 127 | 2-door refrigerator freezer of average size 235 liters |
| Cooling | Room Air Conditioners | 703 | 615 | 528 | A mix of 3.5 kW and 7 kW split units with a weighted-average cooling capacity of 3.9 kW |
| Equipment | Industrial Electric Motors (IEC level) | IE2 | IE3 | IE4 | 3-phase induction motors used in the industrial sector |
| Equipment | Distribution Transformers (Model regulation level) | See note | See note | Level 2 | Three-phase and single-phase liquid-filled and three-phase dry-type power distribution transformers |

*Lighting Note: China has exisiting MEPS for all products covered in the Minimum Ambition Scenario so T5 lamps are also phased out in that scenario for this analysis.*

*Cooling Note: The minimum ambition scenario MEPS are set at a higher level than the model regulations for both products because China has exisiting MEPS at that level.*

*Distribution transformers Note: BAU is based on local MEPS for all types while the minimum ambition scenario level is set as half way between local MEPS and Level 2.*

**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 (2018 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 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