# Brunei Darussalam

Energy efficiency benefits from lighting, residential refrigerators, room air conditioners, power and distribution transformers and industrial electric motors with the implementation of globally benchmarked minimum energy performance standards.

## ANNUAL SAVINGS IN 2030

Reduce electricity use

→ by over **339 GWh**

→ **4.9%** of future national electricity use

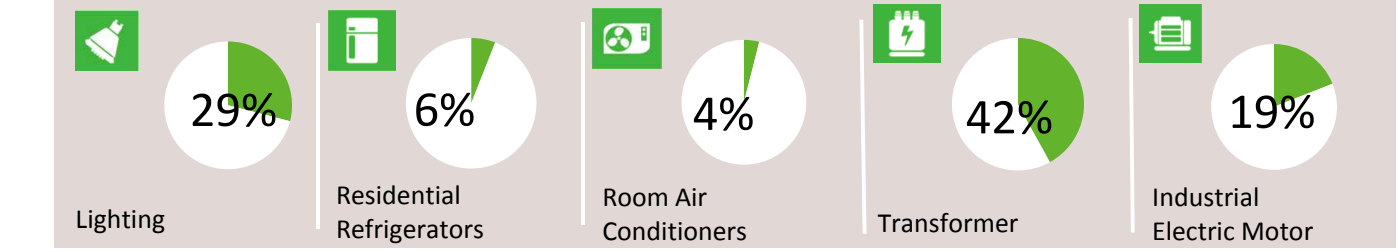
Save electricity worth **20 Million USD**

equivalent to **4 Power Plants [20MW]**

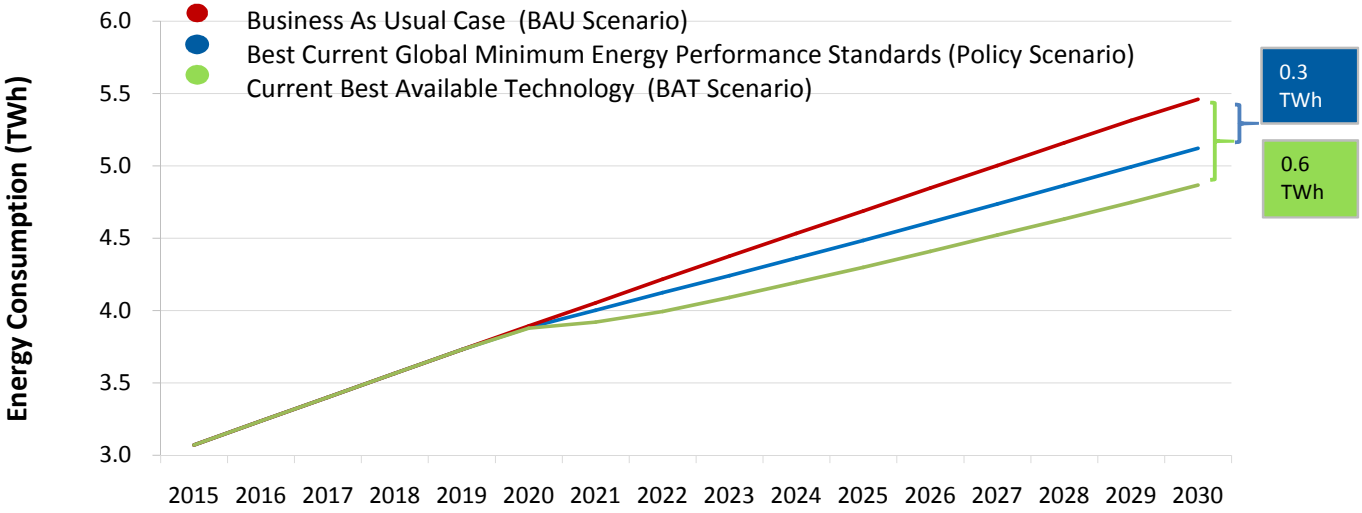
Reduce $CO_2$ emissions by **290 Thousand Tonnes**

equivalent to **160 Thousand Passenger Cars**

## SHARE OF EACH TYPE PRODUCT TO THE COUNTRY'S TOTAL SAVINGS IN 2030




## EVEN GREATER SAVINGS POSSIBLE WITH BEST AVAILABLE TECHNOLOGY



# THE PATHWAY TO ENERGY EFFICIENCY

## ANNUAL SAVINGS IN 2025 AND 2030

| | | Lighting | | Residential Refrigerators | | Room Air Conditioners | | Transformers | | Industrial Electric Motors | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 2025 | 2030 | 2025 | 2030 | 2025 | 2030 | 2025 | 2030 | 2025 | 2030 |
| | Electricity (GWh) | 79.9 | 97.0 | 11.7 | 22.1 | 9.5 | 14.8 | 72.1 | 141.5 | 31.8 | 64.0 |
| | Electricity Bills (thousand US$) | 4,152.3 | 5,042.3 | 610.2 | 1,146.7 | 492.0 | 769.6 | 3,750.0 | 7,358.2 | 1,284.1 | 2,582.8 |
| | CO2 Emissions (thousand tonnes) | 74.2 | 90.1 | 10.9 | 20.5 | 8.8 | 13.8 | 53.7 | 105.4 | 29.6 | 59.5 |

## CUMULATIVE SAVINGS (2020 - 2030)

| | | Lighting | Residential Refrigerators | Room Air Conditioners | Transformers | Industrial Electric Motors |
|---|---|---|---|---|---|---|
| | Electricity (GWh) | 739.4 | 126.0 | 95.2 | 811.9 | 350.8 |
| | Electricity Bills (million US$) | 38.5 | 6.6 | 5.0 | 42.2 | 14.2 |
| | CO2 Emissions (thousand tonnes) | 687.1 | 117.1 | 88.5 | 604.9 | 326.0 |

## OTHER BENEFITS IN 2030

Reduced electricity subsidies by → **9 Million USD**

## ENERGY EFFICIENCY STRATEGY AND NATIONALLY DETERMINED CONTRIBUTION

Country Nationally Determined Contribution (NDC): The draft INC estimates that in 2010 Brunei Darussalam's GHG emissions were approximately 10.02 million tonnes of CO2 equivalent (Mt CO2eq).It is also estimated that land-use change and forestry (LUCF) contributes to the removal of 2.63 million tonnes equivalent CO2 sequestration. The net GHG emissions were approximately 7.40 million tonnes of CO2 equivalent.

Energy sector: to reduce total energy consumption by 63% by 2035 compared to a Business-As-Usual (BAU) scenario; and to increase the share of renewables so that 10% of the total power generation is sourced from renewable energy by 2035.

# Country Specific Data and Input Assumptions

# For Brunei Darussalam

| GENERAL INFORMATION | |
|---|---|
| Population | 0.4 million |
| GDP per capita | 40,776 US$ |
| Electrification level | 100% |
| CO2 Emission Factor | 0.745 kg / kWh |

| ELECTRICITY MARKET | |
|---|---|
| Residential Electricity tariff | 0.052 US$ / kWh |
| Industrial Electricity tariff | 0.040 US$ / kWh |
| Transmission and distribution loss factor | 19.83% |

## ASSUMPTIONS

| Product | Unit Energy Consumption (kWh/year) or Efficiency Level | | | Type of Product |
|---|---|---|---|---|
| | BAU | Policy Scenario | BAT | |
| Lighting | 65.7 | 15.3 | 8.8 | Low incandescent Lamp,3h/day; 14W CFL; 8W LED |
| Residential Refrigerators | 352 | 207 | 159 | 2-door top-mount<br>Average size 280 liters |
| Room Air Conditioners | 2,376 | 1,997 | 1,313 | Split unit with 2.64 kW cooling capacity |
| Transformers | N/A | SEAD Tier3 | SEAD Tier5 | three-phase and single-phase liquid-filled and three-phase dry-type power and distribution transformers |
| Industrial Electric Motors | IE1/IE0 | IE3 | IE4 | 3-phase induction motors<br>Ranging from:<br>0.75 - 7.5 kW; 7.5 - 75 kW;75 - 375 kW |

METHODOLOGY

The analysis uses CLASP's and Lawrence Berkeley National Laboratory's Policy Analysis Modeling System (PAMS) to forecast the impacts from implementing policies that improve the energy efficiency of new household air conditioners and refrigerators. For lighting, electric motors, and power and distribution transformers individual - models were developed, taking into account country level data, expected GDP growth, and industrialization levels. The savings potential assumes minimum energy performance standards (MEPS) are implemented in 2020 at level equivalent to the present day (2015) best global MEPS that are currently implemented. The graph on page two also shows the savings potential that is possible with the implementation of MEPS in 2020 at level equivalent to the present day best available technology (BAT).

ASSUMPTIONS AND DATA SOURCES

- Population and GDP per capita data (2014) comes from the World Bank.
- Electrification levels come from the International Energy Agency (IEA).
- Market size was determined by data provided by industry partners; UN Comtrade database; household penetration forecasts generated by PAMS from population, climate, and macroeconomic indicators.
- Future electricity consumption was calculated using current consumption figures provided by the IEA and the U.S. Energy Information Administration (EIA).
- Baseline price, unit energy consumption (UEC), appliance lifetime were provided by country representatives (when available); industry partners; and Lawrence Berkeley National Laboratory. The business-as-usual scenario assumes a 1 per cent annual improvement in UEC.
- Electricity tariffs were provided by the IEA; and Internet research.
- Transmission and distribution loss factor is a regional average calculated from electricity production and consumption data published by the IEA.
- CO2 emission factor came from the IEA and extrapolations were made for countries lacking data.
- Consumer discount rate was derived from the Human Development Index, United Nations Development Programme (2012).
- The approach of calculating the potential direct emission saving of refrigerators and air conditioners: the typical current mix of refrigerants fillings, leakage rates and end of life emissions in the BAU compared to the best alternative with natural refrigerants (mostly R290 for splits and R600a for domestic refrigerators).
- Additional to the above sources, a questionnaire was used to gather data from country officials.