Date: December 2018

AGEP
ASEAN-German Energy Programme

Country Profile

CAMBODIA

GENERAL OVERVIEW

Cambodia population counts to 15.7 million[1] with total GDP of around USD 22.3 billion[1] in 2017. According to the economic report by ministry of finance, garment industry is counted as the biggest sector of the economy and it acts as the largest share of the country export (70%). Cambodia still faces many challenges in terms of infrastructure and economic performance. However, in 2005, the vast domestic oil and natural gas reserves were discovered. They could significantly speed up Cambodia's economic growth if they are entirely utilized. However, the government does not have plans for exploration in the near future due to domestic bureaucracy and technical reasons. The capital city of Cambodia is Phnom Penh. Khmer is the official language, while French and English are often used throughout the country.

ENERGY SECTOR

ENERGY POLICIES

The Electricity Authority of Cambodia (EAC) was established under the Electricity Law (2001) to regulate the power sector. Each of the electricity provider is required to obtain a license from EAC. Environment Protection and Natural Resource Management Law (1996) was introduced to reduce adverse effects of power sector on the environment. The law obliges all energy-related project developers to perform Environmental Impact Analysis (EIA), which then must be reviewed and approved by the Environmental Steering Committee and the Project Review Teams.

Cambodia's Power Strategy under the Energy Policy sets three major developments:

a) Development of Generation;
b) Development of Transmission Lines;
c) Development of Rural Electrification.

[1] ASEAN Secretariat. ASEAN Statistical Leaflet 2018

Cambodia considers renewable energy as a tool for rural development. The Master Plan Study on Rural Electrification by Renewable Energy in the Kingdom of Cambodia in 2012 defines rural electrification in three levels: (i) battery lighting, (ii) mini-grid, and (iii) national grid. The plan aims to provide universal village electrification via mini-grid or battery lighting by 2020. The grid quality electrification is expected to reach 70% of household by 2030. The targets are to be achieved by grid expansion, mini-grid, cross-border supply from neighboring countries, and indigenous renewable energy sources.

As stated in the energy Master Plan by Ministry of Mines and Energy, all 23 provinces and Phnom Penh will be connected to the national power grid by year 2018. The strategy on power sector aims to ensure an energy supply nationwide with affordable prices in order to facilitate the economic development that mostly coming from garment manufacturing.

ENERGY MIX

The latest available energy balance of Cambodia for year 2015 was reported by ASEAN Centre for Energy (ACE) based on the available data from Cambodia Ministry of Mines and Energy (**Figure 1**). Biomass is the dominant source of energy in the national energy mix (44%). However, the application of biomass is limited to almost exclusively thermal energy generation in the residential sector. The biomass sources come mainly from the plantation forests (e.g. rubber wood) and agricultural crops (e.g. rice husk).

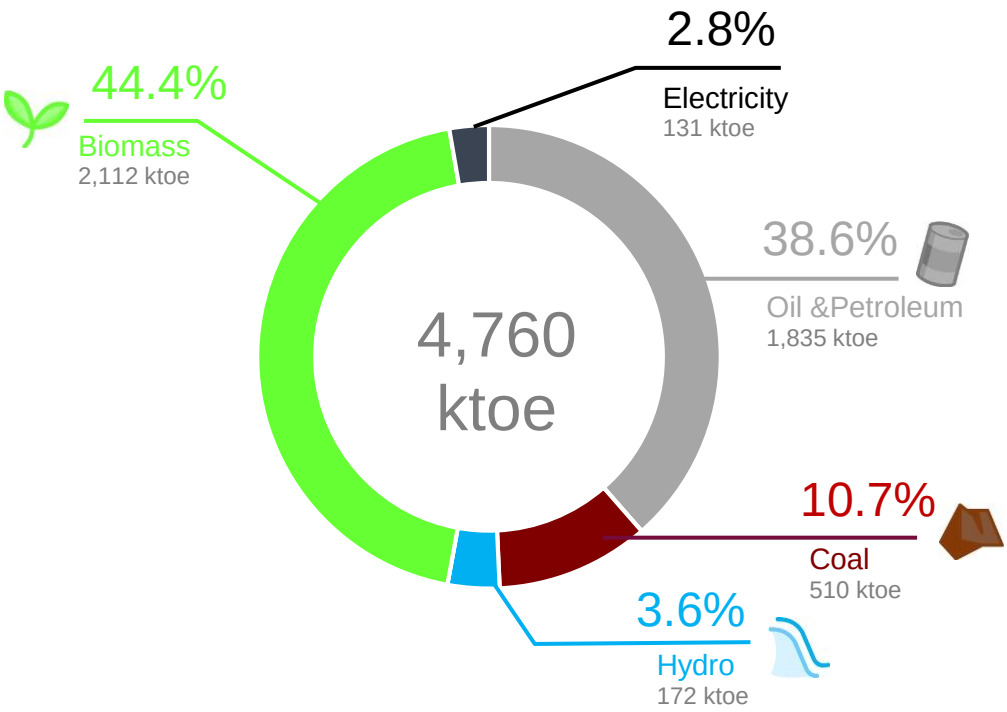

Figure 1: Share of energy sources in Cambodia's primary energy supply (2015)

Source: Ministry of Mines and Energy. Cambodia National Energy Statistics

The electricity generation in Cambodia is shown on **Figure 2** where coal is the dominant source for domestic power generation that contributes to 44.2% of total

electricity supply. Hydropower has the second largest share of 33.6%. Since Cambodia is unable to generate sufficient electricity to cover its demand, a moderate amount of electricity (17.8%) is imported from the neighbouring countries i.e. Lao PDR, Thailand, and Vietnam. A small amount of electricity is generated from biomass using gasification technology, but it is limited to small-scale applications only. In 2017, Cambodia has the very first time put solar power generation plan in operation with 10 MW capacity.

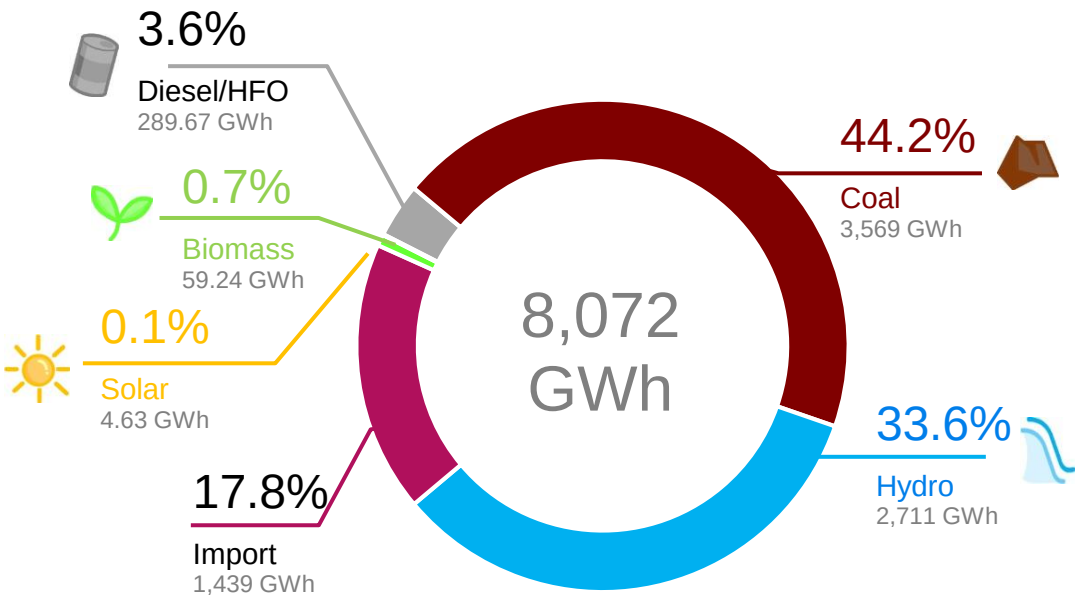

Figure 2: Electricity generation mix by source in Cambodia (2017)

Source: Electricity Authority Cambodia (EAC): Yearly Report on Power Sector (2018)

ELECTRICITY TARIFF & ELECTRIFICATION RATE

There is a large number of electricity generation licensees in Cambodia. The EAC partially regulates the tariff by implementing the Cost Adjustment Mechanism. However, licensees are meant to define the applicable tariff independently. As a result, there is no unified electricity tariff in Cambodia and the tariff ranges from 0.12 USD/kWh to as high as 0.92 USD/kWh in some remote areas.

According to National Bank of Cambodia, although Cambodia is a low-income country, the electricity tariff in Cambodia right now is the highest in ASEAN region. This condition makes the country struggles to be more competitive as manufacturing destination. However, the government is confident that within five to ten years the electricity tariff in Cambodia can be one of the lowest among ASEAN member states.

Since 2018, according to Electricity Authority of Cambodia, the electricity tariff is as following:

- Industrial and commercial customers:

- Purchase from grid substation : 0.13 USD/kWh
- Purchase from national grid : 0.17 USD/kWh
- Purchase from Provincial grid : 0.17 USD/kWh

- Residential Customers
  - Supplied by EDC : 0.19 USD/kWh
  - Supplied by Licensees (REEs) : 0.20 USD/kWh
- Subsidized tariff for poor households and agriculture
  - Urban consumers with use < 50kWh/Month : 0.15 USD/kWh
  - Rural consumers with use < 10kWh/Month : 0.12 USD/kWh
  - Pumping in Agriculture Sector : 0.12 USD/kWh

The rate of electrification in Cambodia is considerably low with an average of 65%. There is a significant difference between urban and rural areas (100% and 35% electrification rate respectively), which highlights the disparity between development in urban and rural area.

RENEWABLE ENERGY SECTOR

RENEWABLE ENERGY TARGETS

In comparison to the other AMS countries, the development of renewable energy in Cambodia is at an early stage. Cambodia still requires additional funds and comprehensive data analysis in this sector. So far, the country does not have any specific targets for renewable energy development except for large hydro plants. It is included in PDP 2018-2021 that 2,241 MW capacity of large hydropower plants will be built by 2020, which contributes to approximately 80% of the total installed capacity.

INSTALLED CAPACITY OF RENEWABLE ENERGY

According to the latest information released by Ministry of Mines and Energy in 2018, approximately 96.3% of renewable energy installed capacity comes from hydropower (**Figure 3**). The Cambodian hydropower energy report was prepared in 2003, by the minister of Mines and Energy. It is mentioned in the report that Cambodia has the total potential installed capacity at 10,000 MW, of which 50% is located on the mainstream Mekong, 40% on its tributaries and 10% in the southwest outside the Mekong basin. The first operated hydropower is Kamchay (193 MW) in Kampot, that has started operating in 2011.

Cambodian first large-scale solar power plant was in full operation in 2017. The 10 MWp Solar farm is located in Bavet City, Svay Rieng Province, near the border with Viet Nam. The Project is therefore expected to unlock Cambodia underutilized renewable energy resources and set an important precedent in the renewable energy sector in the country.

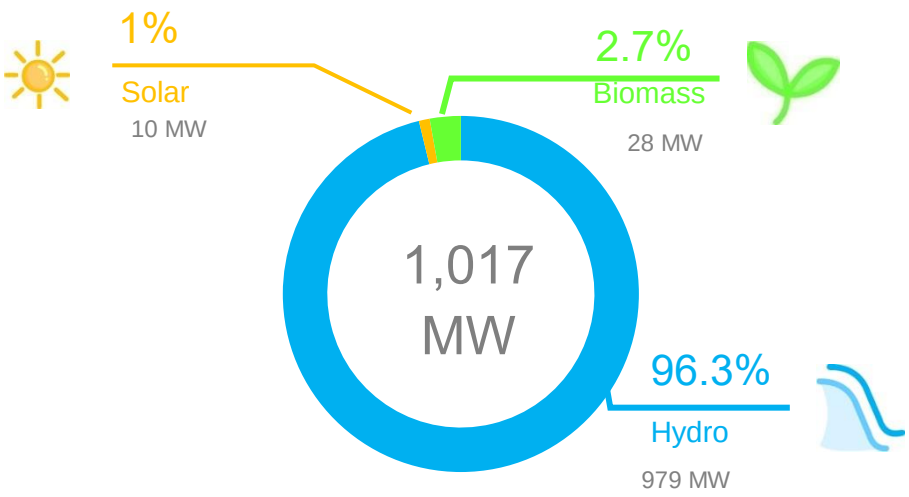

Figure 3: RE Installed Capacity (2017)

Source: Electricity Authority Cambodia (EAC): Yearly Report on Power Sector (2018)

RENEWABLE ENERGY GENERATION

In 2017, around 2,775.4 GWh of electricity was generated from RE sources, where the majority of domestic electricity generation comes from hydropower (97.7%). The remaining share is from biomass with 2.1% and solar (PV) 0.2%.

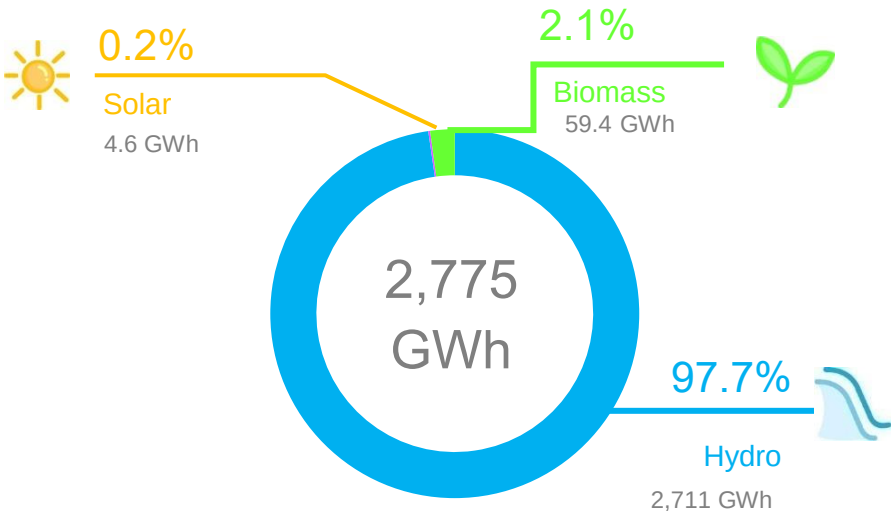

Figure 4: RE Generation (2017)

Source: Electricity Authority Cambodia (EAC): Yearly Report on Power Sector (2018)

RENEWABLE ENERGY MARKET

The development of renewable energy in Cambodia is limited to the investment from utility and establishment of demonstration project. The financial incentives for RE are not yet in place. However, development of renewable energy projects can be classified into either general investment in physical infrastructure or energy

investment. Some incentives can be obtained in this sector, according to Investment Law (1994). These include, but are not limited to tax holiday, tax exemption, and import duty exemption.

Currently, the financial resources for development of renewable energy are mainly from foreign countries. These are in the form of donation or grant. However, a subsidy of US$100 per system is being provided by the Government of Cambodia in order to reduce investment capital for the purchase and installation of the renewable energy systems. In 2014, EDC has provided the fund of US$6 million for the operation of Renewable Energy Fund and implementation of three rural electrification development programme consisting of Power to the Poor, Solar Home System, and Assistance to Develop Electricity Infrastructure in rural areas. Access to financial source is considered as one of the main barriers for implementation of renewable energy in Cambodia.

ENERGY EFFICIENCY AND CONSERVATION (EE&C) SECTOR

EE&C TARGET

Cambodia Energy Efficiency Plan, the Ministry of Mines and Energy has defined energy reduction target to reduce total final energy consumption by 20% until 2035, compared to business as usual (BAU) projections and reduce National CO_2 emissions in 2035 by 3 million tons of CO_2 based on 2005 levels.

EE&C POLICY

The government of Cambodia released a statement requesting all ministries and public institutions to participate in a national program on electricity saving consumption in 2008. most recommendations were aimed at convincing users to turn off equipment when not being used or under particular circumstances (e.g. air conditioners to be turned off when temperatures are below 25 °C). This program was largely focused on raising awareness on EE&C and operated on a voluntary basis and was the first official intervention on EE&C matters in the country

In 2013, the National Policy, Strategy and Action Plan on Energy Efficiency of Cambodia was established with specific activities and investment plans as well as budget estimation for five sectors which are industry, buildings, rural electricity generation and distribution, biomass resources, and end user products. The main purpose of the policy is to reduce energy consumption as an effort to provide reliable and affordable energy services to all economic sectors. To achieve targets in the plan relating to building industry, various strategic measures and action have been formulated, such as energy efficiency building code, Energy Manager Certification program, green standard for public buildings, and increasing awareness on building energy efficiency for the public and building professionals.

In 2016, the Ministry of Mines and Energy (MME) of Cambodia published the first official energy statistics in Cambodia to contribute to the formulation of appropriate energy policies related to energy efficiency and building energy code, and green building rating tool for the ministry. The energy statistics identifies and explores areas for energy efficiency improvements such as industries and equipment and buildings

that cover benchmarking of EE of buildings, strategies to develop EE in Cambodia among others. The energy statistics also presents and forecasts the primary energy supply, final energy consumption by sector and energy balance until year 2035 among other

EE&C POTENTIAL

Potentials reduction on energy consumption which have been defined in the national energy policy on energy savings, as following:

- **Industry:** saving potential up to 20% in garment factories and 70% in ice factories, depending mainly on changes in behavior and on the replacement of inefficient equipment.
- **Rural Electrification Energy:** saving potential up to 80%, by reduction in the very large generation and distribution losses.
- **Replacement of biomass:** saving potential up to 30-50%, through the introduction of improved cook stoves and more efficient charcoal kilns and char briquettes.
- **End user product in the residential sector**: saving potential of up to 50% was assumed according to international experiences by introducing energy efficiency labeling schemes for household appliances.

In addition to this, Cambodia's distribution loses was nearly at 14% in 2015[2], which is far above than world average (8.16%) and ASEAN average (10%) The government has agreed that making the transmission grid more efficient would transform Cambodia's ability providing reliable and affordable energy to the people with potentially huge cost savings.

The potential monetary value of the savings depends on the future structure of the energy consumption in each sector, on the development of the world market prices of imported petroleum products and on the value to be attached to biomass fuels. Based on IEA report, considering actual crude oil price, the very first estimate results in annual savings of approximately USD 319 Million in the year 2035.

EE&C ACTIVITIES AND INVESTMENT

Energy saving activities and investments in Cambodia are mostly coming from International supports such as development agencies and development bank. The energy saving focuses on power generation, rural electrification, and transmission grid expansion sectors. Supply-side energy efficiency improvements are normally part of transmission line strengthening and expansion projects. However, according to Asian Development Bank about 80% of Cambodians live in the rural areas, where electricity coverage is sparse.

Based on the Cambodia National Policy, the Strategy and Action Plan on Energy Efficiency in Cambodia, with the assistances on funding and implementation by international entities, the specific activities and investment plans for five sectors

[2] Electricity Authority of Cambodia

namely, industry, buildings, rural, biomass, and end user have been defined in **Table 1** below:

Table 1: Strategy and Action Plan on Energy Efficiency in Cambodia

Source: Ministry of Industry, Mines and Energy

Objective		Budget Estimation
Industry	The Energy Efficiency of the industrial sector is improved	1,510,000 USD
	Capacity building in the field of EE&C in industry is strengthened	1,370,000 USD
	Attention of factory owners/managers about EE is raised	2,700,000 USD
End User or Household	Energy efficiency of end-user or household products has increased and residential electricity consumption is reduced	1,180,000 USD
	The market share of energy efficient residential appliances has increased	30,000 USD
	End user of residential appliances are aware of the concept of energy efficiency	50,000 USD
Buildings	Energy efficiency of new buildings is improved	175,000 USD
	Energy efficiency in public buildings is improved	110,000 USD
	Education and awareness of energy efficiency in buildings has increased	83,000 USD
Rural Electrification	Rural energy entrepreneurs (REEs) operate more efficient businesses	375,000 USD
	Increase knowledge around rural electrification efficiency	550,000 USD
Biomass	The National forest resources are protected by the sustainable and efficient use of biomass	370,000 USD
	Combustible solid biomass residues are utilized optimally to substitute firewood and/or charcoal	100,000 USD

In addition, as reported by ERIA on sectorial analysis of the energy consumption in Cambodia that more than half of savings (about 680 ktoe) will be biomass based, about 330 ktoe are electricity savings generated from heavy fuel oil, and 180 ktoe are diesel savings.

REFERENCE SOURCES

1 Institute of Technology Cambodia, n.d. *Renewable Energy Development in Cambodia.*

2 Ministry of Mines and Energy Cambodia. 2016. *Cambodia's Energy Development*. The 4th ASEAN RE Week 2016. Iloilo, Philippines. 7 April 2016.

3 Electricity Authority of Cambodia. 2018*. Report on power sector of the Kingdom of Cambodia: 2018 edition*.

4 Reegle, n.d. *Energy Profile Cambodia*. [online] Reegle. Available at <http://www.reegle.info/countries/cambodia-energy-profile/KH [Accessed November 2017]

5 World Bank. 2015. *Cambodia Data*. [online] World Bank. Available at <http://data.worldbank.org/country/cambodia> [Accessed November 2017]

6 ADB. *Cambodia Energy Sector Overview*. [Online].. Available at <https://www.adb.org/sites/default/files/linked-documents/50248-001-so.pdf> [Accessed November 2017]

7 ADB. *Energy Efficiency Developments And Potential Energy Savings In The Greater Mekong Sub-region* [Online].. Available at <https://www.adb.org/sites/default/files/publication/161894/energy-efficiency-savings-gms.pdf> [Accessed November 2017]

8 EUEI. *National Policy, Strategy and Action Plan on Energy Efficiency in Cam*bodia. [Online].. Available at <http://www.euei-pdf.org/sites/default/files/field_publication_file/EUEI_PDF_Cambodia_Energy_Efficiency_May2013_EN.pdf> [Accessed November 2017]

9 ASEAN Centre for Energy. 2016. *ASEAN Renewable Energy Policies*

10 ASEAN Centre for Energy. 2018. *Financing Energy Efficiency in the ASEAN Region*

11 ASEAN Centre for Energy. 2018. *Green Building and Energy Efficiency & Conservation Codes in ASEAN*