

# Chapter **1**

## Introduction

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# Chapter 1

## Introduction

### 1. Background and Objectives of the Project

#### 1.1. Project Background

Electricity demand in the region of the Association of Southeast Asian Nations (ASEAN) is rising as its economy grows steadily. To address the surging demand, the development of power plants is expected to proceed towards a well-balanced optimal generation mix with coal, gas, and renewables.

As the Joint Ministerial Statement of the 36th ASEAN Ministers on Energy Meeting<sup>1</sup> held on 29 October 2018 in Singapore puts it, ASEAN member states (AMSs) share the view that coal is strategically important, having advantages over gas in terms of generation cost and abundant availability in the East Asia Summit region. Accordingly, most ASEAN governments foresee that coal will remain as a major generation source in the long run, even if they are also committed to reduce emissions to address climate change issues by introducing renewable energy and by facilitating the cleanest-possible use of coal, for which, as the Declaration says, the use of clean coal technology is vitally important.

During the development period in the ASEAN region, regardless of the generation source, the development of large power plants to supply electricity to urban and/or industrial areas was initiated to bolster overall national development. Now that the fruits of national development are to be shared broadly with all the people in each member state and the region, the respective governments are pressed to facilitate the development of smaller-scale power plants – from 100 MW or less – in the areas that are yet to enjoy the benefits of electricity. However, the high-efficiency ultra-supercritical (USC) boiler that is deemed to be the most environmentally compliant among the broadly available technologies may not be applicable to such smaller-scale power generation. Circulating fluidised bed (CFB) combustion technology at small scale enables appropriate combustion even on low rank coals. To stress a point, the CFB is more advantageous than the USC in small-scale power generation.

Full-fledged biomass utilisation is one important issue for the AMSs, in which agriculture and forest remain the crucial industrial sectors. Most of the residue is treated as waste either through incineration or landfill, which may cause environmental degradation into the future if continued. Shedding light on the other aspect, these wastes vary in terms of types, grades, and characteristics and are sufficient in quantity. In summary, such biomass resources are ready for utilisation and are expected to be a most promising renewable fuel for small-scale power generation in addressing the issues of carbon dioxide (CO<sub>2</sub>) emissions reduction and rural electrification that are crucial to rural development. That being said, biomass resources

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<sup>1</sup> <https://asean.org/storage/2018/10/JMS-of-the-36th-AMEM-Final.pdf>

are intermittent just like the rest of the renewable resources since they are basically seasonal.

Coal, a generation source that is easily available, may be complementary with biomass resources and vice versa as biomass resources may significantly reduce CO<sub>2</sub> emissions that may not be achieved if a smaller-scale power plant is operated on coal only.

## **1.2. Objectives**

The Study on Biomass and Coal Co-combustion in the ASEAN Region ('the Study') was conducted to finally provide a proposal to reduce CO<sub>2</sub> emissions and to better secure energy through coal and biomass co-combustion on CFB boiler in the ASEAN region. For this reason, two models from the member states – one coal producer and the other coal importer, both of which have high demand for coal and have abundant biomass resources – were selected.

Said proposal shall comprise the optimal combination of coal and biomass resources in terms of type, volume, and the most suitable technology for identified AMSs considering fuel availability, environmental performance, and economy.

## **2. Methodologies of the Project**

### **2.1. Case selection**

The AMSs are generally rich in biomass resources. There are two types of member states that are clear on coal utilisation for power generation in parallel with renewables and other resources: (i) a biomass-rich and coal-producing country, and (ii) a biomass-rich and coal-importing country.

Accordingly, the Study focuses on the following two cases in pursuit of the optimal proposal of biomass and coal co-combustion on CFB boiler.

Case 1: Indonesia as a biomass-rich and coal-producing country

Case 2: The Philippines as a biomass-rich and coal-importing country

In the meantime, proposals will be made for the eight target member states: Cambodia, Indonesia, Lao PDR, Malaysia, Myanmar, Philippines, Thailand, and Viet Nam, which maintain coal use in their respective national energy policies.

### **2.2. Survey on the overall situation of power generation, coal and biomass utilisation in the power sector in the ASEAN region**

A literature survey through the Internet and/or direct interviews/communication on the following topics A) to C) were conducted for relevant information and data from international organisations, such as the International Energy Agency, ASEAN Centre for Energy, ASEAN governments' authorities, etc.

Also conducted is a techno-economic study on coal and biomass co-combustion in order to identify the optimal option each target member state is recommended to choose.

- a) Energy and power demand and supply situation and position of coal in the national energy policy
  - Analyse the statistical data of the International Energy Agency and others to quantitatively understand the energy/power demand and supply situation in the target member states.
- b) Advantages and importance of coal and biomass resources
  - Identify the quantitative advantages of coal in the context of energy self-sufficiency and energy prices in the ASEAN region.
  - In identifying optimal biomass resources and quantitative analysis, comprehensively study available agricultural and forestry waste types, amount and method of procurement, cost, etc., in view of the diversity in agricultural and forestry products as well as part of such biomass products that are available in the market since the rest are being treated as waste.
  - Study and assess coal and biomass co-combustion technology and individual applicability to each AMS and requisites to be considered.
- c) Importance of coal and biomass co-utilisation in the context of energy security in the ASEAN region
  - Justify under-utilised agricultural and forestry wastes that have potential as biomass generation sources. Also, coal and biomass co-utilisation for power generation will be conducive to the energy security of the AMSs and the region, based on the foregoing analytical work.

### **2.3. Extent of direct and indirect effects of biomass and coal combustion on each target member state for environmental compliance and other relevant aspects**

- a) Effects expected from biomass and coal co-combustion
  - Efficient use of generation resources in the target AMS and the ASEAN region
  - Expected extent of CO<sub>2</sub> emissions reduction that would have a positive environmental impact
  - Analytical review of a proposed case of biomass and coal co-combustion as an alternative to full coal power generation and its possible impact on the existing energy policy of the target member state
- b) Economic advantages of biomass and coal co-combustion in the ASEAN region
  - Identify economic advantages and other effects of biomass and coal co-combustion in the ASEAN region based on the techno-economic study.

### **2.4. Working Group meeting in Jakarta**

To discuss the applicability of biomass and coal co-combustion and gather relevant information and data from each member state concerned, a Working Group meeting was held in Jakarta. Policymakers and business experts in electricity utilities from the AMSs were invited and the directions of the study were confirmed.