Chapter 2

Overview of the Phase 1 Study

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Chapter 2

Overview of the Phase 1 Study

1. Outcomes

Cofiring of agricultural waste and coal could significantly contribute to reducing CO_2 emissions compared with simple coal combustion for power generation. Since ASEAN countries are generally rich in biomass resources, the cofiring of biomass and coal could play an important role in combating climate change. For this study, we compared two cases with the endorsement of fuel resources. Case 1 focused on Indonesia as a biomass-rich and coal-producing country and case 2 focused on the Philippines as a biomass-rich and coal-importing country. The study also calculated the levelised cost of electricity to check whether the electricity cost produced from the cofiring of biomass and coal is economically feasible compared with the electricity cost produced from coal-fired power generation only.

The results showed that biomass and coal cofiring is not feasible under the current tariff situation. It will require putting in place the right incentives, such as a feed-in tariff (FIT) or other kinds of incentives.

Therefore, a further consideration shall be given to identifying tailor-made country-specific models with optimal capacity and technologies as well as envisaged incentives.

2. Policy Recommendations

2.1. The adaptability of biomass cofiring power development plan

Table 2.2-1 shows the current power situation and the biomass potential of each country. All countries can potentially expand the application of biomass and coal cofiring to mitigate against greenhouse gas (GHG). Biomass cofiring is also beneficial to mitigate regional environmental impacts such as sulphur oxide, nitrogen oxide, and suspended particulate matter (SPM) since biomass usually has less heteroatom and ash compared to coal.

Table 2.1. Current Power Situation and Biomass Potential

Country	Capacity (GW)	Renewable Capacity (%)	Biomass Resources	Biomass Potential (MWe)	Current Tariff Incentive, FIT
Cambodia	1.87				
Indonesia	60.79	0.1	Oil palm waste (incl. POME) Sugarcane residue (bagasse) Wood waste rice (hull, straw) Corn (cobs, stalks) Coconut (shell, husk, fronds), etc.	32,654	FIT is not applied. Using reference price for each system
Philippines[a]	23.81	7.2	Rice (hull, straw) Corn (cobs, stalks) Coconut (shell, husk, fronds) Sugarcane residue (bagasse) Hog and chicken manure	4,449.54	Php 6.5969/kWh (for approval) (FIT)
Thailand	43.07	15.28			4.00–5.50 ฿/kWh

[a] All data on the Philippines were provided by the WG member from the Department of Energy (DOE), Philippines.
FIT = feed-in tariff , POME = palm oil mill effluent.

Another advantage of biomass cofiring is the use of agricultural waste. As described in Section 2.2.3, a significant volume of agricultural waste to be applied for cofiring is expected in ASEAN countries.

2.2. The advantages and spillover effect of biomass cofiring

As an affordable and reliable energy source, coal could contribute to enhance universal access to electricity in the ASEAN region as long as environmental measures, such as flue gas control and GHG emission reduction, are taken appropriately. The advantages and spillover effects are as follows:

(1) Biomass in coal-fired power plants (CFPPs) is to be used as direct and effective mitigation measures of CO_2 in the power sector of countries that use coal as the main energy source, such as those in the ASEAN region. CO_2 emission is reduced proportionally by increasing the blend ratio of biomass with coal since biomass is recognised as a carbon-neutral substance.

(2) Agricultural waste, such as palm kernel shell (PKS), empty fruit bunch, sugar cane, rice husk, and food waste, in the ASEAN region is thought to be a potential domestic energy resource. It can also reduce underutilised waste. Biomass can be used in a wider type of boiler such as CFB, small pulverised boiler, and USC of larger capacity.

(3) The effectiveness of biomass as an alternative fuel in a CFPP is to mitigate CO_2 emissions and reduce plant operation costs if biomass is efficiently collected from the surrounding areas. Since one issue in using agricultural waste as biomass fuel is the seasonal volume change, i.e. supply stability, cofiring with coal can compensate for the plant's total energy input by optimising the coal–biomass ratio with seasonal variation.

(4) Although applicable biomass resources and the current utilisation situation are different in each country, biomass cofiring in a CFPP might increase regional employment through the collection, selection, and torrefaction processes in the surrounding areas.

Considering the above-mentioned, expediting the realisation of biomass and coal cofiring in CFPPs in the ASEAN region is deemed crucial in addressing both CO_2 mitigation and surging energy demand.

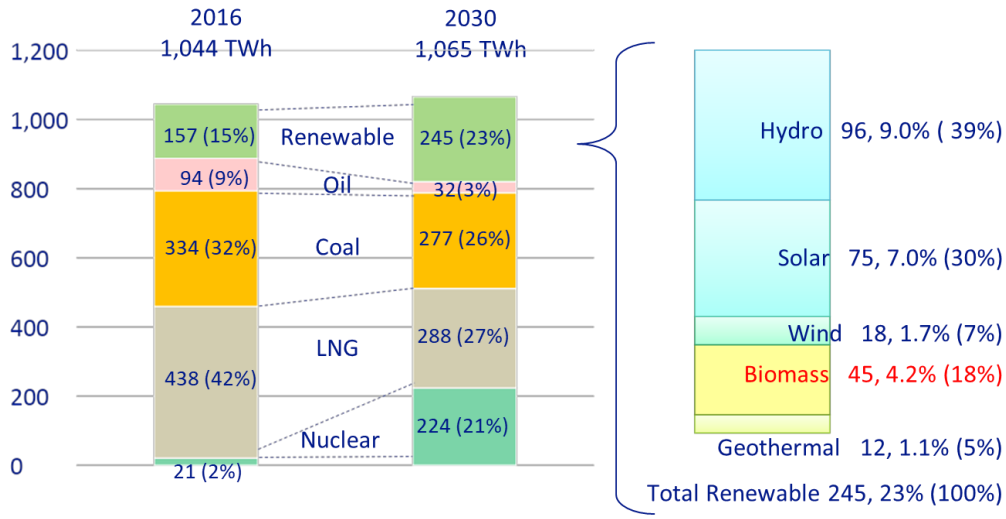
2.3. Policy recommendations to expedite biomass cofiring

Policy recommendations are summarised below. The respective countries should consider the realisation of the following measures. External support through bilateral or multilateral collaboration would expedite the possibility of the realisation.

(1) Authorisation by the government to use biomass as renewable energy in the energy development plan of each country

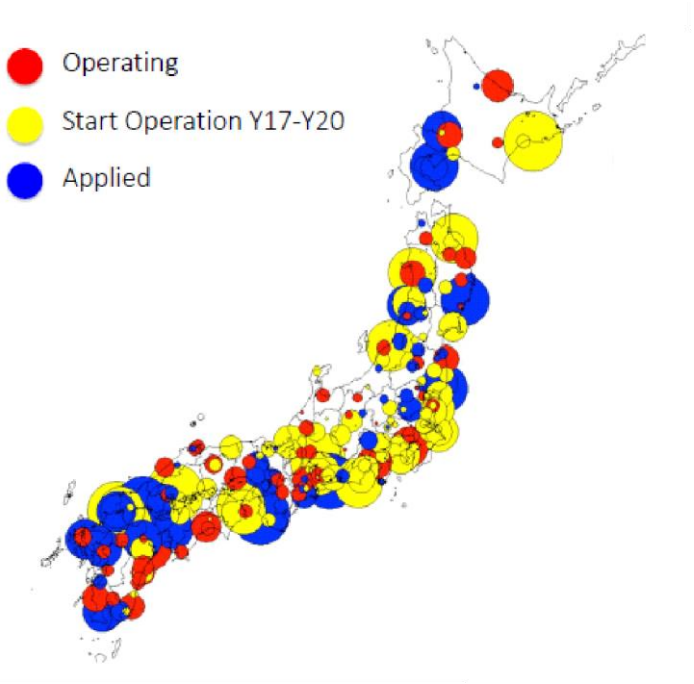
In Japan, the target of biomass utilisation is clearly shown by the government (Figure 2.2-1). Expected in 2030 is 45 TW of biomass generation out of total renewables of 245 TWh. Most of the biomass generation will be accomplished by cofiring with coal. Along with the government's target, many plants are commissioning or are being planned by the major electric power companies and new joint venture companies (Figure 2.1).

Figure 2.1. Generation Forecast in Japan, by Source



Source: METI (2015).

Figure 2.2. Biomass Power Plant in Japan



The diameter of the circle shows the capacity.

Source: Fuji Biomass Energy Sdn Bhd (2018).

(2) Tariff and other financial incentives for biomass cofiring

Tariff incentives for biomass cofiring, such as FIT, should be considered in accelerating investments in biomass cofiring. If FIT has been introduced, its rate for each renewable source should be optimised according to the renewable target and energy mix. In this study, US ¢ 13–16/kWh is recommended as a FIT for further dissemination of biomass use in the ASEAN region.

Also recommended is the establishment of a special purpose financial scheme solely for the biomass utilisation project.

(3) Development of biomass collection scheme

A continuous and stable agricultural waste collection process is essential in establishing biomass cofiring in a coal-fired plant. For example, the PKS is already treated commercially as an energy source depending on the agricultural waste resources. Most of the waste from cereal crops is thought to apply to biomass energy. An integrated collection function should be located at the centre of the collection area and transportation system to utilise such biomass sources. If local farmers, business owners, and related organisations were allowed to handle the collection and transport of biomass in the region, the efficiency of biomass delivery can be improved.

The establishment of a cooperative association is also beneficial. A cooperative association is exempt from taxation, while a corporation is not. Also, activities conducted by such a cooperative association contribute to the local economy and

create jobs. Furthermore, these will be regarded as the corporate social responsibility activities of the operator.

In this connection, authorisation by the government of a plant for biomass cofiring and capacity of the collection function is considered to expedite the realisation of the biomass utilisation project by public or private participators.

(4) *Support by the regional government for jobs related to the collection of biomass waste*

Since the collection of agricultural waste is labour intensive, hiring enough workers to collect, transport, and pelletise it, if required, is extremely important. Initiatives by the regional government for securing jobs are recommended. This also has the advantage of using labour in the agriculture sector during off season.

Several financial support schemes, such as subsidy for the number of employees, a discount interest rate for investment, etc., can be considered. Support for the establishment of a cooperative association might also be effective in securing the required workers.

(5) *Collaboration to realise biomass cofiring projects*

Technical collaboration, as bilateral and/or multilateral cooperation between ASEAN countries and a country with the experience and applicable technologies, is recommended to materialise the biomass cofiring project.

This kind of collaboration is effective, especially for introducing applicable technologies such as CFB boiler for combustion of agricultural waste with coal. Public-based cooperation with a country with technology is highly recommended.