



Renewable energy conversion and utilization in ASEAN countries

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Abstract

The world population has passed six billion people and the pressure on basic daily needs is particularly dominant in the developing countries, such as the ASEAN. As most of the natural resources, particularly that of fossil fuel is depleting rapidly, more efficient ways to produce daily necessity are becoming important issues. In addition, both the UNFCCC and the Kyoto Protocol require, that efforts should be directed to improve efficiency of energy conversion devices, effective use of the clean and environmentally friendly renewable source of energy, beside providing sink for the green house gas (GHG) emissions. INFORSE report to the UN Secretary General indicated that the total energy sources in the industrialized countries will diminish drastically, but by providing enough funding for R/D in renewable energy conversion, about 50% of the world energy could be supplied by the developing countries by the year 2050.

Despite the above limiting conditions, current data indicated growing energy demand in most of the developing countries, particularly in the ASEAN region. Consequently, these countries, should find out the best strategy in utilizing the available energy sources to maintain sustainable development. One of the reasonable option is to make use of the potential renewable energy resources within the countries and develop industries that complies with the unique characteristics of the energy, which is usually disperse, low density and mostly is still not yet competitive with power generation system using subsidized fuel price. Although some basic R/D on renewable energy technology is also being conducted in ASEAN, more effort, however, is directed to its immediate applications in providing basic energy need for rural house-hold, creating productive uses to process agricultural commodities, and to support general rural electrification programs. Such activity has been supported by relevant and operational government policies, international assistances, and gradual involvement of the private sectors.

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1. Introduction

While the Stockholm conference in June 1972, had brought the world's attention to environmental consequences for rapid industrialization, the Rio de Janeiro's Earth Summit in 1992 had brought other world issues on energy and climate change, the Kyoto Protocol in 1997, can provide opportunity to the developing countries, especially the ASEAN, to help avoiding green house gas (GHG) emissions by substituting fossil fuel, wherever possible with renewable energy and simultaneously helping the country to grow in a sustainable way.

The current IPCC study on climate change 2001, for example, predicted that the average global temperature due to GHG emission will rise by up to 5.8 °C by 2100. Such trend will give negative impact on water resources, ecosystems, agriculture, society and economics. INFORSE report to the UN Secretary General as input to the report on energy for CSD9 (UN Commission for Sustainable Development) provided a scenario that 50% world energy would be covered by renewable energy at the same time reducing the CO₂ emission [13]. According to their estimation, the energy services per capita in the developing countries will increase about 2.5 times (2000 kW h/capita) of that in the year 2000. During the same period the primary energy sources in renewable energy, excluding geothermal, will decrease slightly in comparison to that of the industrialized countries from 36,000 TW h to about 32,000 TW h. The primary energy sources in industrialized countries, on the other hand, were predicted to decrease from about 48,000 to 9000 TW h. Prof. Sørensen (1998) and his colleague [16] even predicted that 100% renewable energy share can be achieved in 2050 and following the scenario, the emission target of 225 Gt of carbon could be achieved within the 21st century. According to these predictions, the remaining total energy resources in the industrialized countries would become far less than those available in the developing countries. Therefore, in order to avoid another energy crisis, in the future, close cooperation among ASEAN countries, and diverting R/D funds toward renewable energy development will become an imperative choice.

Indonesia, although being as a member of OPEC in ASEAN, is predicted to become a net importer of oil in the next 10–20 years. Current findings indicated that total oil reserves in Indonesia comprised of 5.2 billion barrels of proven and 4.6 billion barrels of potential reserves. If the rate of production is maintained at 0.54 billion barrels per year, the ratio between reserve and production is 18, meaning that within 18 years, Indonesia's oil will be exhausted. Although the prediction is still debatable, the Indonesian government's policy on energy, for example, had given serious consideration on the importance of using other alternative sources of energy such as the renewable energy. The Indonesian Ministry of Energy and Mineral Resources, for example, had established a special task group to study and formulate action programs which could attract the private sectors in investing their capital to develop renewable energy industries.

Table 1 shows the data for energy resources and reserves in ASEAN. According to energy statistics reported by the ASEAN Center of Energy [2], in Brunei, Indonesia, Malaysia, Thailand and Vietnam of the ASEAN region, the potential energy resources is estimated to be 26.9–29 billion barrels of oil, 350.3 TCF of gas, 45711.5 million Mton of coal, 254.3 GW of hydro. The total energy production had been increased from 1995 before the economic crisis from 279.5 to 302.3 Mtoe in 1996. After 1997, the energy production has shown a gradual increase from 287.9 to 302.5 Mtoe in 1998. Some of these primary energy resources had been

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