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Abstract

The aim of this thesis is to propose the research policy on renewable energy for Thailand. Three sources of renewable energy are considered in this study-solar energy, wind power, and biomass energy. Based on potential sources, available technologies, and the local capability of doing research, we identified all the barriers and economic feasibility for using the renewable energy in Thailand, and then proposed the policy to target the areas of which the research on renewable energy should be implemented.

From thermal applications of solar energy such as solar water heater, solar dryer, solar still, solar refrigerators, it showed that only solar water heater is commercially available in the Thai's market. For solar cell, its low efficiency and high investment cost are the main barriers of widely use. To extend the application of solar energy, the main policy of supporting research and development should be emphasized on cost reduction and efficiency improvement. In addition, the other research policies should be set up such as, strategic promoting the use of solar water heater, more application of solar dryer and solar still, improving coefficient of performance of the solar refrigeration system, and developing of suitable material for solar cell production and auxiliary equipment of the solar power system.

The potential for wind power application in Thailand is relatively low since the country's average wind speed is rather low; and this is the main limitation of electricity generation with wind turbine. However, there are presently a few demonstration sites that generate electricity by using wind power. The commercial application of wind turbine, which is relatively low efficiency and investment cost, is for water pumping. Some areas, where the wind

speed is high enough to install wind turbines, are still waiting for exploit. For water pumping, the research policy should be proposed on strategic promoting the use of wind turbine especially in the farms. To support the plan of promoting and development of wind turbine industry in Thailand, the database of existing application should be developed. Addition research on wind power usage for mechanical application should be done. For electrical power application, the technical and economic potential should be evaluated at the specific site, where the wind speed is relatively high.

Four types of biomass applications, biomass fuel, bio-ethanol, biodiesel and biogas, were studied. The common limitation of using biomass is their resources availability, which showed seasonal variation especially those from agricultural industry. The technologies using biomass as fuel are continually developed and available in the commercial market. According to the government promotion, the bio-ethanol is going to be commercial in near future. The main barrier of biodiesel is the lack of suitable and low cost raw material. For biogas , animal waste and wastewater have been utilized to produce fuel gas in some farms and industries. To reduce the limitation of biomass available resource, the research policy on biomass resource menagement should be implemented. To extend the utilization of biomass, the research on strategic promoting should be done. Additional research on combustion efficiency improvement and the co-combustion system should be considered. For bio-ethanol and bio-diesel using, the long-term performance of the engine and the specification of the bio-fuel should be studied. The research policy on the auxiliary equipment and control system of the biogas application should be considered.