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Integrated model for energy and CO₂ emissions analysis from Thailand's long-term low carbon energy efficiency and renewable energy plan

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Abstract

This paper builds the energy demand and supply model from the bottom-up LEAP software and focus on evaluating and providing insights to the long-term energy and greenhouse gas impact from national energy efficiency and alternative energy plan focus from 2015 to 2036 under the 2010 base year. From the results, the energy demand would increase from 84.77 Mtoe in 2015 to 172.29 Mtoe, or 103.24% in 2036. The greenhouse gas emission would decrease from 503.34 MtCO₂ in 2036 by 161 and 116 Mt-CO₂ from energy efficiency and alternative energy development plan in 2036, respectively. We also found that this mitigation also impacts to the decrease of grid emission factor from 506 in the BAU to 339 and 140 kgCO₂-eq per MWh, respectively due to higher renewable energy sources and imported hydro energy. Policy recommendations to deploy both plans are also raised.

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1. Introduction

Thailand energy consumption growth rates in the industry and commercial building sectors are much higher than the GDP growth rate, i.e. 3.0 and 3.7 times respectively. This means that the energy efficiency level of the country was far behind the suitable level. Another reason that impact Thailand to developing the long term plan is the rapidly increase of the world crude oil price since 2004 which also impacted Thailand in many dimensions, e.g. rising in oil import, dependency, and oil subsidization.

From the above reasons, Thailand made policy response by developing her long-term national energy efficiency plan (EEP) [1] and alternative energy development plan (AEDP) [2], both covering the same period, as illustrates in figure 1.

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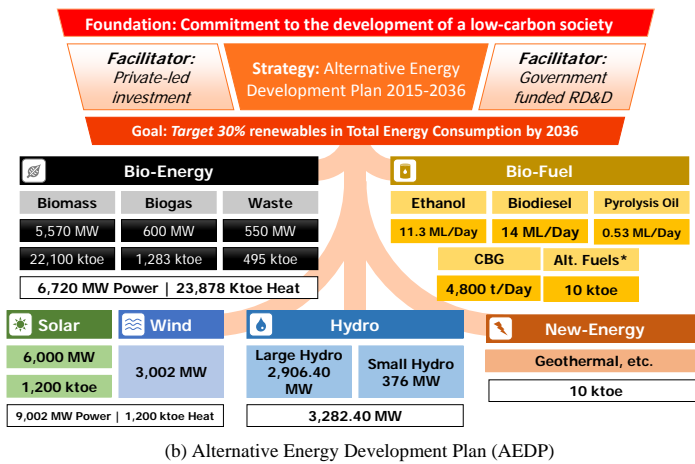
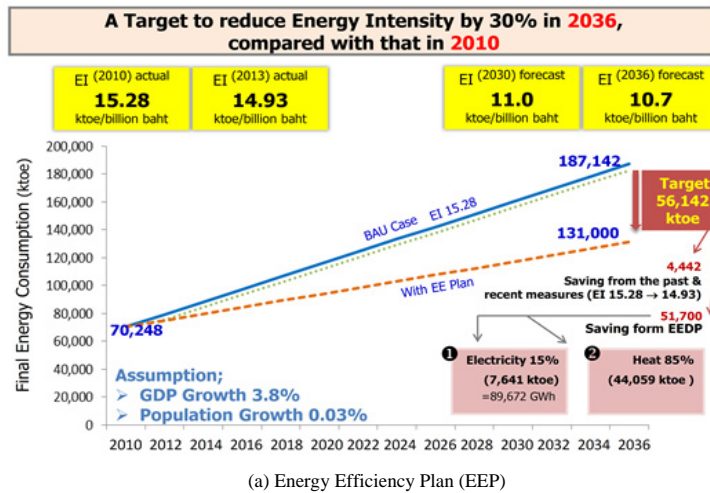


Fig. 1. Thailand long-term energy plan

2. Model assumption

In this paper, the Long Range Energy Alternatives Planning (LEAP) software, which is widely used for energy demand in Thailand [3], [4], [5], was applied to forecast the energy demand and supply for Thailand. The Business as usual (BAU) was first estimated based on the data from the GDP, population, past energy and electricity consumption, as in fig. 2, and energy intensity, then the energy efficiency scenarios, with successive level, from EEP have been internalized. GHG emission data also forecasted.

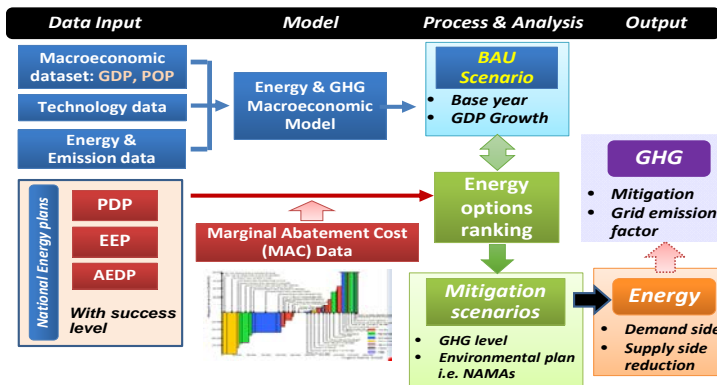


Fig.2. Model approach of this study

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