

Investigating Government Subsidy and Policy to Encourage the Adoption of the Energy Storage System and Electric Vehicle: A System Dynamics Model Approach

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Abstract. Carbon dioxide is essential to the climate system and is crucial in increasing global greenhouse gas emissions. In several countries, one of the highest contributors to carbon emissions comes from burning fossil fuels for energy, supported by electricity consumption in industrial activities. Thus, using renewable energy and the rapid development of emerging technologies, such as energy storage systems (ESS) and electric vehicles (EVs), are promising strategies to reduce fossil fuel consumption, emit less carbon and GHG emissions, and be environmentally friendly. However, the adoption transition of ESS and EVs requires government support and other incentives to succeed in the goals to reduce emissions by 23% - 25% in 2030 and the ban on the sale of fossil fuel vehicles by 2040 in Taiwan. Therefore, this study investigates the impact of government policies and subsidies on promoting the adoption of energy storage systems (ESS) and electric vehicles (EVs). Then, using a system dynamics approach, a validated model is developed to capture the dynamic interaction among electricity generation, ESS, EVs, infrastructure, government subsidies, and consumer behavior. The findings emphasize the significance of purchase subsidies, research and development subsidies, and tax incentives in driving the adoption and private investment in ESS and EVs, thus contributing to the advancement of the industry.

Keywords. Electric Vehicle, Energy Storage System, Socio-Economic, System Dynamic, Government subsidy

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