

Development of an Economic and Environmental  
Evaluation Model for Household Energy System  
with PV, EV and Battery

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## SUMMARY OF MASTER'S DISSERTATION

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Title			
Development of an Economic and Environmental Evaluation Model for Household Energy System with PV, EV and Battery			
Abstract			
<p>In Japan there has been a growing interest in the renewable energy Photovoltaic (PV) to prevent global warming and to improve energy self-sufficiency. It is especially expected to diffuse as distributor generation. When PV is implemented in a household, surplus electricity will be generated. It is necessary to make a countermeasure for surplus electricity by a backup power supply when surplus electricity flows to the grid of an electric power company. However the effectiveness of introducing PV is reduced because of fossil fuel based backup power supplies that generate CO<sub>2</sub>.</p> <p>There are other measures that do not require a backup power supply. For example, substitution surplus electricity for hydrogen, building smart grids, and introducing electric storage facilities. The possibility of realizing the third measure is the highest. It is important to investigate introducing electric storage facilities to a household considering that PV can be used to generate and distribute power.</p> <p>The main stakeholders in introducing PV are households, government, and electric power companies. Both merits and demerits of the stakeholders are depending on whether the surplus electricity is sold or saved. This decision is considered with strong effects of technological advancements on PV and power storage.</p> <p>For PV and power storage, the technology vision is clearly defined, however, the operational result under this new technology is not mentioned. It is important to show the operational result to diffuse PV.</p> <p>This study presents an economic and environmental evaluation model for household with PV and power storage. The model considers three stakeholders' requirements, and several methods for the power storage including electrical vehicles and batteries, which are not considered in previous studies. This study clarifies future PV operational results and analyzes effects on multiple stakeholders by applying this model.</p> <p>The simulation shows the reduction of CO<sub>2</sub> emission and electric cost in a household with PV, batteries and electrical vehicles.</p>			