

SUMMARY OF MASTER'S DISSERTATION

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Title: Portfolio Optimization for Clean Energy Vehicle in Japan			
Abstract <p>A high expectation is placed on the introduction of Clean Energy Vehicle (CEV) to reduce CO2 emissions and energy consumption in the automotive sector. Hybrid Vehicle (HEV), Diesel Hybrid Vehicle (DHV), Electric Vehicle (EV), and Natural Gas Vehicle (NGV) are examples of Clean Energy Vehicle. All of these CEVs have different prices, energy sources, fuel economies, as well as CO2 emissions. CEVs all have their pros and cons, which suggest that we should not rely on a particular type of CEV. Therefore, the optimal CEV portfolio, the type and the number of CEV, needs to be considered before considering the way of introducing CEV.</p> <p>Many studies have been done on this topic, but their portfolios leave trucks and buses out of consideration. The number of trucks and buses are fewer than passenger cars but they consume more energy and higher average travel, which makes their energy consumption comparable with passenger cars. Therefore, it might be cost effective to introduce CEVs in trucks and bus sectors but previous studies have not considered this introduction. Also, past studies took energy security and infrastructure cost out of consideration. This study presents a new optimization model which obtains optimal CEV portfolio of passenger car, truck, and bus in Japan, in order to assist the introduction of CEV in our country.</p> <p>In this study, I constructed the optimization model which made “the number of new cars sales” as the design variable, “oil dependency rate” and ”CO2 emission reduction rate” as the constraint, “CEV system cost (the cost of the vehicle + fuel cost + infrastructure cost)” as the objective function, and calculated the optimal CEV portfolio with this model and various preconditions.</p> <p>As a result of simulation, HEV, NGV, EV in passenger car and NGV, DHV in truck should be introduced. Although the introduction of NGV has not attracted a great attention, it was suggested that the government needs to give further support to the R&D and the construction of infrastructure, not only for the EV and HEV but also for the NGV.</p> <p>Key Words : Clean Energy Vehicle, Optimization, Vehicle Mix, Energy Security</p>			