Accelerating the popularization of electric and plug-in hybrid vehicles for realizing a low-carbon society in Japan

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Abstract

Carbon dioxide (CO_2) emissions from power supply systems and energy demand must both be reduced to mitigate global warming. Combining highly efficient equipment and low-carbon electric power generation is expected to reduce CO_2 emissions substantially. Low-carbon electric power generation systems have been improved to increase renewable energy generation, and electric vehicles (EV) are highly efficient with no CO_2 emissions. In Japan, 20% of CO_2 emissions are from the transport sector. The Japanese government established a reduction target in each sector in Japan to meet the Paris agreement at COP21 in November, 2015. The transport sector must reduce CO_2 emissions by 40%, and the achievement of this target has been greatly accelerated by the commercialization of EVs with secondary battery systems that are charged by low-carbon electric power generation. The charging infrastructure is being prepared before the expansion of EVs. The Japanese Ministry of Economy, Trade and Industry (METI) is accelerating the uptake of EVs to reduce CO_2 emissions and stimulate industrial growth. METI has developed a charging station model plan to provide domestic charging infrastructure, and the policy for charging stations in Japan includes subsidy budgets, so that local self-governing bodies will be able to maintain the charging infrastructure. The Central Research Institute of Electric Power Industry (CRIEPI) developed the traffic simulator EV-OLYENTOR to determine the optimum arrangement of quick charge stations in each Japanese prefecture to support the charging infrastructure plan for each prefecture. The METI published “An EV and a PHV road map” in March, 2016. This road map sets a target to make 700,000 to 1 million commercial vehicles by 2020, and it proposes that charging infrastructure should be installed at offices and apartment complexes to allow EV users to commute. In addition, EVs and plug-in hybrid vehicles (PHVs) can be used for distributed electricity storage. Virtual power plants (VPPs) perform peak-cutting and load-leveling and prevent black-outs at factories and buildings by using many small-capacity battery energy storage systems. An office could use their employee’s EVs and PHVs as VPP battery energy storage systems.