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Preparation of charging infrastructure for popularization EV in Japan

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Abstract

Electric vehicle (EV) is a key technology to reduce CO_2 emission and consumption of fossil energy against global warming. EV can drive with less CO_2 emission than internal combustion engine vehicle. But the amount of CO_2 emission from EV is much dependent of that from the bulk power system. Against globe warming, both the factor of the bulk electric power system and popularization of EVs are much important. For acceleration of commercialization of EVs, the charging infrastructure should be prepared on roads at towns and cities because of so short driving mileage per a charge of EVs. The ministry of Economic, trade and industry of Japanese government unveiled "the strategic plan of next generation vehicle 2010" to accelerate popularization of EV and normal/quick charging infrastructures. The plan has the targets of preparation of 5,000 quick charging stations and to increase the number of selling EVs to 80% of new vehicles until 2020. We have been studying optimization method to locate normal and quick charging infrastructures in cities in Japan. The guidebook was proposed and published to preparation of normal charging equipment of plugs and circuit breakers for EV. On the other hand, we have developed the EV traffic simulator to estimate the effects of location of charging infrastructures. EVs are driving in cities on the real driving patterns on our simulator. Our simulator can estimate the effects of traffic congestion, the air-conditioner operation, the amount of battery capacity mounted on EV. Normal charging equipments can decrease the numbers of EVs, which stop because of empty of battery capacity. And business hours & days on week of quick charging is important. In Japan, most of quick charging is served at public offices and motor shops. The public offices are closed on Saturday, Sunday and holiday, and open only from eight o'clock AM to five o'clock PM on weekday. And motor shops are closed on Tuesday and during midnight. Business hours and days are important to extend EV driving mileage.