Abstract

A Study on the Utilization of Emergency Generators as a Backup Power System

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Korea has experienced nationwide power blackout in 2011. Citizens and stakeholders of factories have been making greater efforts to keep proper level of electric power reserve rate, it seems to be a painful process. If local level of power blackout occurs, it may cause the worst type of social disorder due to the failure of information instruments or security systems.

Emergency power generation systems have a high potential of electric power supply and power reserve rate. The total capacity of an emergency generator is 21GW in Korea. Its capacity is equivalent to 21 nuclear power plants. 15,000 emergency generators having the capacity of 4,690MW are installed in buildings and infrastructures in Seoul. There are 970 emergency generators of mega watt scale with a total capacity of 1,370MW in Seoul alone.

The result of questionnaire study shows that operation of a generator causes high costs and low benefit. This is because the price of electricity from an engine generator is higher than the price of electricity from a grid. In general, emergency generators use diesel, and the price per calorie of diesel is higher than that of city gas. If the fuel system of emergency generators could be changed to a gas-diesel mixture, the fuel cost could be reduced drastically. However, it is still not enough to overcome the high cost of electric power production. Further, it would need an engine system modification, which would also incur high costs.

The results of an economic feasibility analysis shows that 1.83 of B/C ratio and 8.1% of IRR are due to diverse benefits, for example, avoidance of power transmission, avoidance of power distribution, avoidance of power generation etc. Financial feasibility studies show that 1.23 of B/C ratio and 6.5% of IRR are due to power production and power cost reduction for peak-cut. However, a long pay-back period is an obstacle to investment on emergency generator modification.

Existing emergency generation systems with ATS(Automatic Transfer Switch) could not avoid momentary blackout. Emergency generators with ESS(Energy Storage System) and CTTS(Closed Transition Transfer Switch) have the potential of realization of an uninterruptible power system. Only a 5 minute power supply capacity of ESS is enough to prevent a blackout of fire-fighting facilities and emergency instruments while a power generator gets started and synchronized. Security enhancement of electric power supply is a very important issue. Emergency generators with ESS and CTTS can ensure the stability and safety of a power supply without having to worry about a blackout. Emergency generators with ESS and CTTS systems must be adopted as a standard of emergency power system for large buildings.

Contents