

## Impact of Combined Heat and Power (CHP) Generation Technology on Distribution Network Development

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**Abstract :** In the absence of considerable investment in electricity generation, transmission and distribution network (DN) capacity, the demand for electrical energy will quickly strain the capacity of the existing electrical power network. With anticipated growth and proliferation of Electric vehicles (EVs) and Heat pump (HPs) identified the likelihood that the additional load from EV changing and the HPs operation will require capital investment in the DN. While an area-wide implementation of EVs and HPs will contribute to the decarbonization of the energy system, they represent new challenges for the existing low-voltage (LV) network. Distributed energy resources (DER), operating both as part of the DN and in the off-network mode, have been offered as a means to meet growing electricity demand while maintaining and ever-improving DN reliability, resiliency and power quality. DN planning has traditionally been done by forecasting future growth in demand and estimating peak load that the network should meet. However, new problems are arising. These problems are associated with a high degree of proliferation of EVs and HPs as load imposes on DN. In addition to that, the promotion of electricity generation from renewable energy sources (RES). High distributed generation (DG) penetration and a large increase in load proliferation at low-voltage DNs may have numerous impacts on DNs that create issues that include energy losses, voltage control, fault levels, reliability, resiliency and power quality. To mitigate negative impacts and at a same time enhance positive impacts regarding the new operational state of DN, CHP system integration can be seen as best action to postpone/reduce capital investment needed to facilitate promotion and maximize benefits of EVs, HPs and RES integration in low-voltage DN. The aim of this paper is to generate an algorithm by using an analytical approach. Algorithm implementation will provide a way for optimal placement of the CHP system in the DN in order to maximize the integration of RES and increase in proliferation of EVs and HPs.

**Keywords :** combined heat & power (CHP), distribution networks, EVs, HPs, RES

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