Improved SRFT controller based Power Quality Improvement in EV integrated distribution system

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The increasing penetration of EVs in the transportation sector has led to their integration with the power grid. However, the charging of EVs can cause power quality issues such as voltage fluctuations, harmonics, and power factor problems. DSTATCOM is a device that can mitigate these issues by compensating for reactive power and harmonic distortions in the distribution system. The proposed system integrates the DSTATCOM with the EV charging station and controls the power flow between the two devices. The DSTATCOM is designed to regulate the voltage at the charging station and compensate for any reactive power or harmonic distortions caused by the charging load. DSTATCOM is controlled by new Improved SRFT controller. The proposed system is simulated in MATLAB/Simulink and tested under different loading conditions. The simulation results demonstrate that the proposed system effectively improves power quality in the distribution system by regulating the voltage, reducing harmonics, and improving the power factor.

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Contents

The integration of Electric Vehicles (EVs) in distribution systems has become an emerging trend in recent years due to their potential to reduce greenhouse gas emissions and dependency on fossil fuels. However, the integration of EV s in distribution systems has a significant impact on the system's operation and infrastructure. This article explores the effects of EV integration in distribution systems. One of the primary effects of EV integration in distribution systems is the increase in peak load demand. As EV s require charging, the additional load can result in higher peak loads and increased energy consumption. This increase in demand can lead to overloading of the distribution system's equipment and components, resulting in voltage fluctuations, power outages, and other power quality issues. Another effect of EV integration in distribution systems is the increased need for infrastructure and grid modernization. EV charging requires additional charging stations and infrastructure, which requires additional investment and planning. The charging infrastructure should be placed strategically to avoid overloading the distribution system and ensure reliable and stable power supply to the EVs. Moreover, EV integration in distribution systems can create opportunities for renewable energy integration. The charging of EV s can be coordinated with renewable energy sources, such as solar and wind power, to increase the renewable energy utilization and reduce carbon emissions [1]. The integration of renewable energy sources and EV s can help to balance the distribution system's load and reduce the dependency on non-renewable energy sources. In conclusion, the integration of EV s in distribution systems has significant effects on the system's operation and infrastructure. The increase in peak load demand, the need for infrastructure and grid modernization, and opportunities for renewable energy integration are some of the primary effects of EV integration in distribution systems [2]. Understanding these effects and addressing them through appropriate planning and investment is crucial for successful integration and efficient operation of EV s in distribution systems. The concept of EV follows the technique of vehicle to grid and grid to vehicle strategy.it would implies the process of feeding the electricity contained in an electric cars battery stores the energy when was it parked. this technology forms part of smart grid, an electrical network system that uses information technology to manage energy consumption. In the V2G concepts smart charging technique follows. The EV uses high capacity batteries these are not only charge the battery but also power back to grid.in the D STATCOM supplied by connecting a PV array it is maintenance free to gives power to feed the controller. The efficient control possible due to PV array. The primary function of DSTATCOM in distribution systems is voltage regulation. Voltage fluctuations and drops can occur due to various reasons such as load variation, reactive power flow, and disturbances in the power system [3]. DSTATCOM monitors the voltage levels and injects reactive power to regulate the voltage and maintain it at the desired level. This ensures the efficient operation of equipment and devices connected to the distribution system and reduces the risk of equipment damage and failure due to voltage fluctuations. Another critical function of DSTATCOM in distribution systems is reactive power compensation. Reactive power is required for the operation of inductive loads such as motors and transformers. However, the presence of reactive power can lead to voltage drops and other power quality issues in the distribution system. DSTATCOM can inject or absorb reactive power to compensate for the reactive power demand of the loads and maintain power quality. DSTATCOM also plays a vital role in harmonic filtering. Non-linear loads such as computers, electronic devices, and variable frequency drives can cause harmonic distortion in the distribution system. Harmonics can lead to equipment failure and can also affect power quality [4]. DSTATCOM can filter out the harmonics and improve the power quality of the distribution system.

Keywords

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