The increasing penetration of Electric Vehicles (EVs) and their charging systems is representing new highpower consumption loads for the distribution system operators (DSOs). To solve the problem of the EV range in terms of driving kilometers, the car manufacturers have invested resources on new EV models by increasing the size of the batteries. To satisfy EV load demand of the new EV models in urban areas the public DC Fast-Charging Station (DCFCS) is indispensable to recharge EVs rapidly. The introduction of the Battery Energy Storage within the DCFCSs is considered in this paper an alternative solution to reduce the operational costs of the charging stations as well as the ability to mitigate negative impacts during the congestion on the power grids. An accurate description of the DCFCS and its design system, which is able to decouple the peak load demand caused by EVs on the main grid and decrease the connection fees. Finally, an economic evaluation is done to evaluate the feasibility and the cost-benefit analysis (CBA) of the DCFCSs. The proposed approach considers various technical and economic issues, such as cost of installation, connection fees and life cycle cost of the batteries. The proposed cost-benefit analysis can be used to verify the effectiveness and applicability of DCFCS in large scale.