

M.Sc Thesis Title: Analysis and Design of Bi-directional Power Converter and Supercapacitor-based Energy Storage System for Metro Network

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M.Sc Thesis Abstract:

In this project, stationary super-capacitor bank is used to store the metro network regenerative braking energy. A new approach was proposed to design an optimal ESS to store the regenerative energy of the metro trains. Considering both peak and off-peak periods, an appropriate cost function for optimal ESS components sizing was proposed. This approach was applied to the station five of line three of Tehran metro network. Based on the proposed method, an optimal ESS was designed for this station. The optimum size of the super-capacitor bank was assigned to be 3.7 KWh. Moreover, optimal current reference of the ESS was derived. The daily energy saving is 23 percent. Moreover, \$95000 is required for initial investment of super-capacitors and \$8000 for the converter. The total net profit for this station during its lifetime of 8 year is approximated to be \$500000. Finally a dc-dc converter is designed for charge and discharge of super-capacitors.