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Strengths (S), Weaknesses (W), Opportunities (O), and Threats (T) Analysis of Electric Vehicles

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Abstract

Transportation electrification is one of the most effective ways to reduce the emission pollution in metropolitans. For this reason, the government of many of countries defined an incentive based policies to increase the penetration of electric vehicles in the cities, especially in large cities. Although the electric vehicles can have a positive impact of emission reduction, their development have some strong challenges that should be considered in roadmap designing process. The electric vehicles have various strengths, weaknesses, opportunities, and threats (SWOT) that need to be analyzed. In this paper, the SWOT analysis of electric vehicles will be carried out from technical, economic, and environmental perspectives. The challenges of electric vehicles integration on electricity networks will be investigated and the practical solutions to address these challenges will be presented. Moreover, from the economic perspective, the market challenges from the buyers, manufactures, and governments points of view will be analyzed. Finally, the impact of electric vehicles on emission reduction will be studied and the practical ways to increase their positive impacts will be presented.

Keywords
SWOT analysis, electric vehicles, emission pollution, environment,

Biographies
Ali Ahmadian is a visiting professor with the Department of Chemical Engineering at the University of Waterloo, Canada, and he is an IEEE senior member. He holds a PhD in Electrical Engineering with a strong background in power and energy systems analysis. He has published more than 100 papers in journals and conference proceedings and received several national and international research awards. His research interests include transportation electrification, energy and environment, energy economics, and smart grid.

Ali Elkamel is a Professor of Chemical Engineering at the University of Waterloo, where he is also cross-appointed in Systems Design Engineering. Professor Elkamel holds a BSc in Chemical Engineering and BSc in Mathematics from Colorado School of Mines, an MS in Chemical Engineering from the University of Colorado Boulder, and a Ph.D. in Chemical Engineering from Purdue University. His specific research interests are in computer-aided modeling, optimization, and simulation with applications to energy production planning, carbon management,

sustainable operations, and product design. He is currently focusing on research projects related to gas production and processing, integration of renewable energy in oil and gas operations, and the utilization of data analytics (digitalization), machine learning, and artificial intelligence (AI) to improve the process and enterprise-wide efficiency and profitability. Professor Elkamel's activities include supervising post-doctorate and research associates, advising graduate and undergraduate students, and participating in both university and professional societal activities. He is also engaged in initiating and leading academic and industrial teams and establishing international and regional research collaboration programs with industrial partners, national laboratories, and international research institutes. Prof. Elkamel has supervised over 70 graduate students (of which 30 are PhDs) and more than 25 post-doctoral fellows/research. He has been funded for several research projects by the government and industry. He has more than 260 journal articles, 137 proceedings, and 30 book chapters, and has been an invited speaker on numerous occasions at academic institutions throughout the world and national and international conferences. He is a co-author of four books, including Planning of Refinery and Petrochemical Operations (Wiley-VCH, 2013) and Environmentally Conscious Fossil Energy Production (Wiley, 2010).