Incentive Design for Smart Charging: Utility-Customer Interactions and Distribution Systems Impact

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Abstract: With increasing environmental concerns, the penetration of electric vehicles (EVs) is expected to increase in the future. Such electrification of the transportation sector will impact the distribution grid adversely; however, EV smart charging strategies can help mitigate the impacts. In this presentation a mathematical model will be presented that represents the total charging load at an EV charging station (EVCS) in terms of controllable parameters. A queuing model is used to construct a data set of EV charging parameters which are input to a neural network (NN) to determine the controllable EVCS load model as a function of the number of EVs charging simultaneously, total charging current, arrival rate, and time; and various class of EVs. The load model is integrated within a distribution operations framework to determine the optimal operation and smart charging schedules of the EVCS. In the second part of the presentation, a smart charging approach is proposed where the charging loads are controlled and incentivized by the local distribution company (LDC) for every unit of energy controlled. A framework is proposed, that captures the relationship between EV customers' participation and incentives offered by LDC, to determine the optimal participation of EVs in smart charging program and optimal incentives paid by the LDC, such that both parties are economically benefited. The relationship between the expected investment deferral and hence the economic benefits from smart charging participation are considered as well.

Bio: Kankar Bhattacharya obtained his PhD from the Indian Institute of Technology, New Delhi, India in 1993. Currently, he is a Professor in the Department of Electrical & Computer Engineering, University of Waterloo. Prior to joining Waterloo in 2003, he was in the faculty of Chalmers University of Technology, Gothenburg, Sweden (1998-2002) and Indira Gandhi Institute of Development Research (IGIDR), Mumbai, India (1993-98). He has held visiting faculty assignments at Tampere University of Technology, Tampere, Finland, International Institute for Applied Systems Analysis (IIASA), Austria, and worked as a Planning Analyst (on sabbatical from Waterloo), with Ontario Power Authority, Toronto. Professor Bhattacharya's research interests include power system operations, planning and economics; electricity market operations and design; renewable energy resources and their economics; demand response and energy storage systems, and various emerging problems in the smart grid environment.

Thursday October 25 2018,
15h30-15h45: Come meet the speaker and other researchers over drinks and snacks
15h45-17h00: Presentation, Pavillon André-Aisenstadt, Université de Montréal, room 4488.

All are welcome   ●   Contact: osg@polymtl.ca   ●   Optimization for Smart Grids: http://osg.polymtl.ca