SMART GRID CENTER
TEXAS A&M ENGINEERING EXPERIMENT STATION

WEBINAR

Coupled Infrastructure Modeling of Electric Grid and Transportation Networks

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Abstract:
The increasing proliferation of electric vehicles (EVs) is invariably increasing the coupling between two complex and critical infrastructure networks– the power grid and transportation systems. There has been a lot of research done in modeling EVs as loads in distribution grids, to evaluate their impacts and enable improved charging strategies, placing charging stations, and overall grid planning. However, scenarios of EVs at scale including fleet and freight are projected to substantially affect the bulk power grid. This talk presents methodologies of modeling EV charging in large scale, realistic power grids. The charging load from on-road EV operation is developed based on a regional-level transportation simulation and charging behavior simulation, considering different EV penetration levels, congestion levels, and charging strategies. This hourly load is then included in power transmission system studies to assess various system impacts. Case studies will be discussed using a synthetic Texas grid, with EV operations considered in major metro areas such as Austin and Houston. A key application of this modeling so far has been in quantifying the environmental impact of EV adoption on both on-road and power generating unit emission sources at the regional level. The results demonstrate the range of emission impact under a combination of factors. The interaction of factors accentuates the need for the integrated simulation approach in achieving air quality goals. Using the integrated simulation approach, system planners, and operators from the transportation and electricity sectors can gain a comprehensive view of the impact of transportation electrification.

May 5, 2021 at 3:00 P.M. CDT

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Presenters:

Dr. Xu is Research Scientist at TTI and Assistant Director of Technology at the Center for Advancing Research in Transportation Emissions, Energy, and Health (CARTEEH), a University Transportation Center funded by the U.S. Department of Transportation. She is a data visionary with deep domain expertise in the intersection of transportation and energy systems. She regularly applies her expertise in data science and IT architecture to transportation electrification research and development. She led the development of a regional electric vehicle charging demand simulator and founded ElectroTempo, Inc., a spin-off to commercialize this technology. Prior to TTI, Dr. Xu was Senior Technical Advisor for Impact and Assessment at the U.S. Department of Energy's Advanced Research Projects Agency-Energy (ARPA-E). In this role, she reviewed projects and programs in ARPA-E's entire portfolio and gained unparalled understanding of zero emission technologies such as vehicle and grid batteries, hydrogen, renewable power generation, electric grid operations, and electric powertrains. She established ARPA-E's Indicators Measuring Progress and Change Tracking System (IMPACTS), a data science platform to streamline and optimize the agency's portfolio management. She also acted as Program Director of a $15M program in transportation and energy efficiency, namely, Traveler Response Architecture using Novel Signaling for Network Efficiency in Transportation (TRANSNET). Before ARPA-E, Dr. Xu focused on data management and statistical modeling to transportation network, energy, and emissions research at Georgia Institute of Technology.

Komal Shetye is the Assistant Director of Research of the TEES Smart Grid Center at Texas A&M University. Previously, she was working as a Senior Research Engineer at the Information Trust Institute at the University of Illinois at Urbana-Champaign (UIUC), where she also earned an MSEE in specializing in power systems. She has collaborated with several major US utilities and has served as co-PI on projects funded by NSF, DOE, and ARPA-E in areas such as power system dynamics, large-scale grids, and modeling geomagnetic disturbances (GMDs) in the power grid. She is a Senior Member of IEEE.