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RECYCLING: REDUCE, REUSE & RECYCLE November 06-08, 2017 | Las Vegas, USA

Electric vehicles and battery energy storage as DER support for a smart grid

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The North American electric grid today is witnessing the fastest pace of change since its creation about one hundred years ago. States such as California have seen a substantial rise in the amount of energy generated from solar photovoltaics (PV) on rooftops. These renewable energy resources being intermittent can potentially destabilize the grid when scaled up to the level of the entire grid. Electric vehicles (EVs) are being added at a significant pace in California thereby increasing the load on the grid at various times of the day. While they may be considered as a load, their batteries may be exploited as battery energy storage system (BESS) devices thereby becoming an asset to compensate for the instability resulting from intermittency caused by renewables. The continuous decline in the cost of solar PV and lithium ion batteries for EVs is expected to further propel their growth resulting in further increase in complexity of balancing the demand and supply of electricity. Management and control of each of these distributed energy resources (DERs) – generation, storage and consumption–is a major area of research for the UCLA Smart Grid Energy Research Center (SMERC). The innovation necessary to address the above opportunities and challenges would achieve a modern grid that allows for higher penetration of renewables and number of electric vehicles, higher energy efficiency improved grid security and resiliency and reduced outages. In the context of the above issues, the talk will present two relevant research projects that UCLA's Smart Grid Energy Research Center (SMERC) has been involved with, first is SMERC has partnered with Los Angeles Department of Water and Power in the $120M DOE-funded Smart Grid Demonstration Project (SGRDP) and secondly, SMERC is working on a California Energy Commission funded research project in the City of Santa Monica to create a control system enabled microgrid.

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