Title: "Power Electronics and Power Quality - Problems, Analysis, Solutions and Opportunities"

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Abstract - This presentation attempts to give an overview of the impact of power electronic loads on power quality through a snap shot of relevant research activities at the Center for Power Electronics Systems (CPES) and elsewhere. It is well known that power electronic loads can cause various power qualities issues, such as harmonics, inrush, imbalance, and high frequency noise. Examples will be presented to illustrate these phenomena associated with power electronic loads. Analysis tools used to study power quality issues with power electronics will be described with emphasis on CPES research of the average modeling techniques and EMI modeling. Selected solutions to the power quality problems will be presented, including multi-pulsing techniques, noise controlling techniques through packaging and dv/dt control, common mode voltage elimination, and increasing switching frequencies. Power electronics also offer some exciting opportunities for improving system power qualities. Power converters can be used for filtering, dynamic voltage/current compensator, and interface for UPS and other types of energy sources including distributed energy resources. CPES researches on modular plug and play power electronics building blocks will be introduced for these applications.