

# A multipurpose problem-based learning platform for education and research under smart grid umbrella

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## Abstract

Developing user-friendly learning platform tailored to illustrating the integrative nature of specific subjects can be very effective in enhancing the involvement of students in the classroom. The focus of this paper is twofold; first, highlighting a specific project from a teaching perspective for the design and implementation of a multipurpose experimental test facility for plug-in electric vehicle, renewable energy and energy storage management in the smart grid context. Second, proposing the application of this project as an interactive tool to assist in demonstrating the system behaviour, when teaching the new emerging subjects in power engineering courses particularly, Smart Grid. Indeed, the scope of the test facility with the developed simulation tool is specially structured and oriented to education, training and research studies, where problem-based learning can be easily implemented. The electrical test hardware in this design can be operated independently as a multipurpose experimental setup for plug-in electric vehicle. In addition, it can also be interconnected with a small size wind or photovoltaic system to facilitate a complete hybrid integrated platform for testing and model verification. A variety of illustrative examples are presented to show the features of the test facility with its operation and how the components of this facility were selected. Additionally, several test scenarios are depicted using the developed simulation tool,

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