



香港城市大學
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Novel Extended Vision for Undergraduate Education on Energy Engineering: New Breed

Applications of Wireless Power Conversion

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Abstract:

In recent years, wireless power transfer (WPT) has been becoming popular due to its electrocution-free, better convenience, and higher flexibility. Based on these definite advantages, the WPT technology has been widely developed for many applications such as biomedical implants and electric drones. In particular, the wireless charging of electric vehicles has been actively investigated, with emphasis on its dynamic performance and security consideration. Almost all WPT applications are essentially based on electrochemical power conversion. Namely, after retrieving the wireless power from the transmitter, the receiver charges the batteries by converting the electrical power into chemical processes; consequently, these batteries will be discharged to reproduce electrical power from chemical processes for various applications, such as powering other electric devices, electromechanical motion, electric lighting and electric heating. Such traditional WPT technique has been well acknowledged by our undergraduate (UG) students, who are engaging in the UG Electrical Engineering courses named EE3124-Electric Machines & Drives and EE3123- Electric Power Systems (both taught by the PI). However, the UG students have very few chances to learn more about the advanced and novel research ideas on the new breed applications of WPT technique to further extend their visions innovatively. Hence, this proposal aims to provide a new vision and an in-depth learning probability for the UG students to physically touch and experience the new breed of WPT applications: wireless



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drives, wireless ballastless lighting, and wireless heating. This new direct WPT becomes highly desirable to get rid of the batteries at the energy receiver side and then achieve battery-free. On top of being battery-free, the electronic controller should also be avoided at the receiver side so that the device can be operated remotely in an isolated environment and is totally maintenance free. Thus, the direct control can be fully handled at the transmitter side. Specifically, this novel idea will help to inspire our UG students to think differently and dream big on solving some technical problems. In addition, this proposal will create lab teaching and learning modules for the UG students and even bridge the interested and aspired students to participate in the relevant projects. The key is to provide three modules for students' learning and practicing, including wireless drives for wireless energy generation, conversion, transmission, and utilization; wireless lighting for ballastless and smart remote control; wireless heating for flexible all-metal cooking.