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April 29, 2014
UCITE
CWRU

Re: Nord grant application

Dear Nord Grant Committee Members,

In Spring 2013, I developed and taught the “Introduction to Smart Grid” course. The subject of Smart Grid encompasses a suite of communication, control and technologies that enable the electric power grid operation to be more efficient, reliable and environmentally sustainable. In 2013, the “Smart Grid” course enrolled 14 graduate and undergraduate students who showed serious learning interests and effort. The class went very well, and I was fortunately nominated for the Carl F. Wittke Award by students during that semester. I plan to offer this course again in Spring 2015, with some significant enhancement plans in mind based on the earlier teaching experience.

In 2013, most students who took my class did not have much power system background from before. However, many of them have strong electronic circuit knowledge. They demonstrated these capabilities in the course final projects, where they built electronic inverters for renewable generation and energy storage. The projects were low-power (less than 3 Watts and less than 5 Volts), small laboratory-scale ones. As the power and energy program at Case Western Reserve University (CWRU) become more established, we should set higher expectations and requirements that are comparable with those at our peer institutions. At the future course offering (next one in Spring of 2015), students will be organized in project teams to work on more sophisticated, scaled-up Smart Grid hardware and software experiments.

As Power System Analysis I (offered every fall) will be required for taking the smart grid course, students will also have become ready to perform power system computational simulations. I would like to install the academic versions of the software in our laboratory. Some of the academic licenses are free of charge. Some of them come at modest costs. These software will be used by students throughout the Smart Grid course, and also for performing final projects (by those who will choose to work on computational topics).

I have met with Mr. Larry Sears and Mr. Edwin Burwell of the Undergraduate Design Lab, and Mr. Ian Charnas of ThinkBox. They all have agreed to provide lab test equipment and tools support for the course projects. In particular, Mr. Larry Sears agrees to cover the costs for power electronics, other circuit parts, and Thinkbox lab materials. Mr. Larry Sears, Mr. Edwin Burwell, Mr. Ian Charnas and myself will be working together to develop the project requirements even before the course begins, so that the students can work on the projects all semester long with good productivity. We hope that we can work with the students to build a smart grid test bed in the Smart Grid laboratory (Olin 710). The test bed will involve renewable generation, energy storage, and the necessary control systems for power and the energy management. We realize that the entire test bed set will take more than one semester course offerings to complete. Even after the completion, future students can make new improvement on the existing components of the system, incorporating new innovative design and experiment strategies.