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ENEE 498R: Topics in Electrical Engineering: Special Topics in Renewable Energy

Proposed description on syllabus to include sustainability after participation in the “Chesapeake Project”

Currently, there is not any undergraduate course in the Electrical and Computer Engineering Department on Renewable Energy Systems. This course will be offered for the first time from Fall 2012. The main focus of this course is to provide an overview of the major aspects of renewable energy systems with emphasize on solar and wind energy conversion systems. The course will be structured to include the design of power electronic circuits as the enabling energy conversion systems to realize the stand-alone and grid-tied operation of these systems.

This course will cover various topics in solar energy conversion systems including characteristics of photovoltaic (PV) systems; equivalent circuit models, sun tracking systems, maximum power point tracking (MPPT) techniques, power electronic interfaces for PV systems, as well as optimal sizing the PV and energy storage systems. Furthermore, the wind section of this course will provide the fundamental operation of wind energy conversion systems (WECS). Wind turbines and principles of operation of electrical generators in wind systems will be outlined. The generator models, as well as control principles of variable speed and fixed speed WECS will be covered.

The “Chesapeake Project,” provided me with the opportunity to meet faculty with expertise in architecture, law, social science, mechanical engineering, material science, business, journalism, and many others. I used to think of sustainability as creating technology-based solutions to create an environmental pathway towards future. This workshop broadened my perspectives of sustainability by adding to other factors: Population and Affluence. Consequently, I decided to include a lecture on critical thinking to my course.

While the overall objectives and tools will remain the same, I will create a lecture, in which we will discuss various examples (i.e. greenhouse gas emissions and widespread adaptation of next generation of electric vehicles, etc.) and potential paths we can approach these issues by including the public factor. Students will be asked to think of coming up with a vision towards addressing the issue considering scientific knowledge, technological innovation, environmental priorities, as well as, societal and economic imperatives.