A Multi-physics Approach to Energy and Demonstration Facility

22 April 2016 – ME Lecture Hall – 1300

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Abstract:

A methodology to investigate the generation, transport, and storage of energy based on a multi-physics approach tied to the end use application, is presented. Often little or no consideration is given to the end use or desired product of the energy used. Current energy generation, transport, and storage are dominated heavily by a few large sectors, notably electricity and hydrocarbons. This is not surprising as they are incredibly effective, but rely on a centralized model. Small scale generation in microgrids tends to continue this model with energy storage being a mix of hydrocarbons and battery storage.

A paradigm shift in the thinking and design of energy systems based on the required end use or product is needed. The philosophy and motivation that lead to the consideration of this new approach are outlined in this lecture. Following this part of the lecture we present a summary of a methodical approach to developing the most energy and cost-effective solution to general processes by considering their end-use physics. Examples of innovative energy generation, storage, and transport solutions based on the multi-physics approach are then outlined. Finally, a brief description of NPS's Multi-physics Renewable Energy Lab (MPREL) is given. MPREL is a demonstration facility based on this approach and currently under construction.

Biography:

Dr. Gannon is an Assistant Professor in Mechanical and Aerospace Engineering Department at the Naval Postgraduate School. His area of research interest is in renewable energy, solar thermal cycles, heat transfer, gas turbines, and turbomachines. He earned his Bachelor's degree in Mechanical Engineering from the University of Natal, Durban, South Africa; he earned his Master's degree and PhD in Mechanical Engineering from the University of Stellenbosch, Western Cape, South Africa. He is a member of the American Society of Mechanical Engineers (ASME).

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