Institute for Sustainable Energy and the Environment

OHIO UNIVERSITY

CE3 Consortium for Energy, Economics and the Environment

RUSS COLLEGE of Engineering and Technology

Energy Engineering Education

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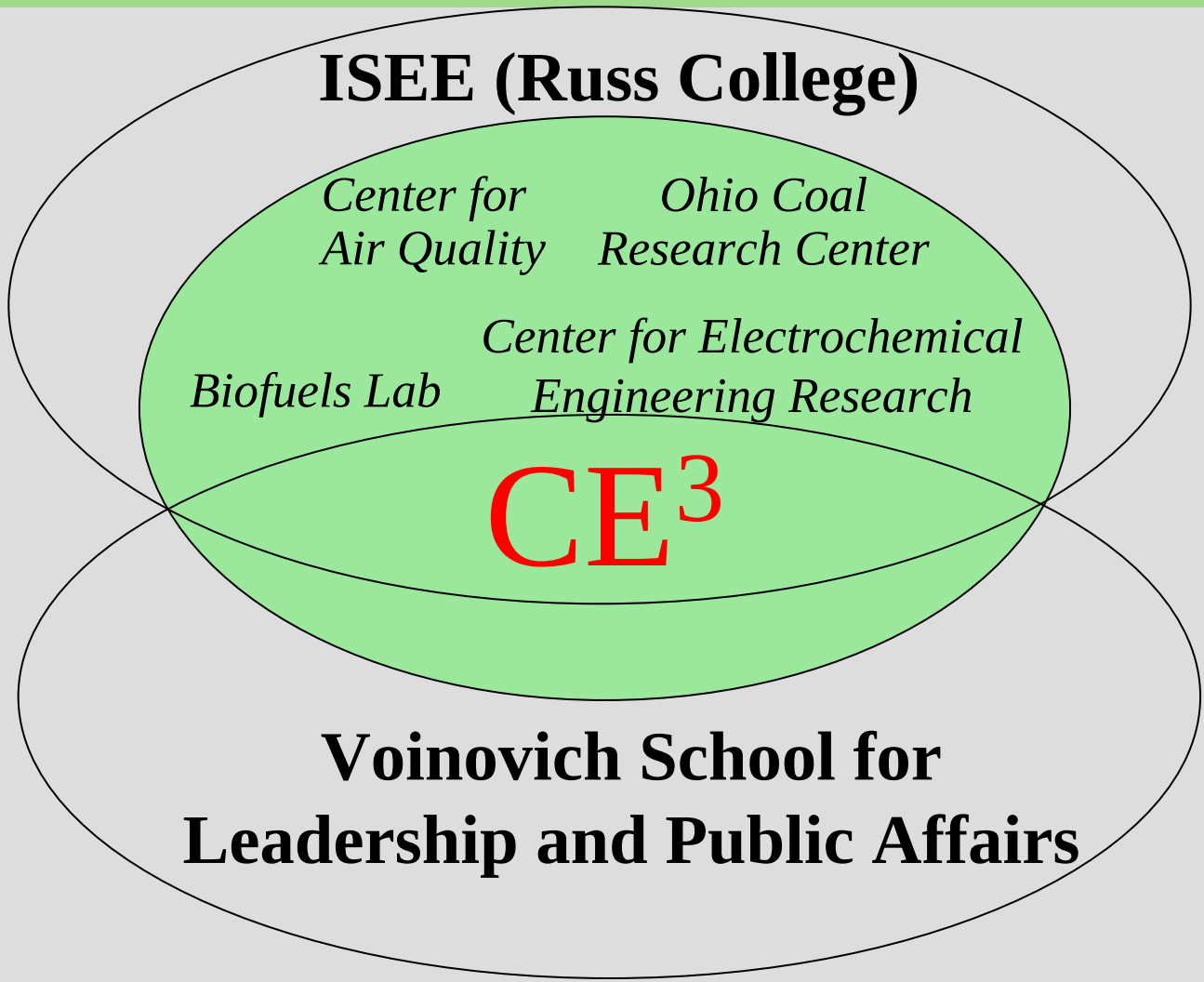
Ohio University

Consortium for Energy, Economics and the Environment (CE^3)

Consortium Overview



Energy Engineering

Background

- Nuclear trained officer – U.S. Navy (1986-1991)
- Ph.D. in M.E. @ University of Illinois (Urbana-Champaign)
  - Advisors: Late James E. Peters and Richard Buckius (now Vice President for Research at Purdue University)
- Director of “Project Probe” for American Electric Power (1996-1998)
- Loehr Professor of Mechanical Engineering at Ohio University
- Director of the Ohio Coal Research Center
- Director of the Robe Leadership Institute
- Principal Investigator – Ohio University Center of Excellence in Energy and the Environment
- Fellow of the American Society of Mechanical Engineering

Need for Energy Engineers

Economic and Technical Requirements

- Emerging (and reemerging) fields of power generation
  - Wind
  - Photovoltaic
  - Electrochemical (fuel cells)
  - Biofuels
  - Energy storage
- Aging and inadequate transmission system
- Aging engineering workforce in utilities and supporting OEMs
- Aging nuclear and coal generation fleets
- Potential electrification of the transportation sector
- Lack of integration and systems knowledge
- Lack of innovation in the field

Energy Engineering Status Quo

Engineering Disciplines Based on Anything but Energy

- Traditional engineering disciplines evolved around industries
  - Chemical processing
  - Civil and construction
  - Mining and extraction
  - Industrial and manufacturing
  - Machines and mechanics
  - Electrical and circuits
- All fields claim some ownership of “energy”
- Therefore, no one field owns energy engineering
- Vertically integrated utilities and energy (oil) companies have done very well with this model
- Small companies cannot survive with this model
- Innovation suffers

Energy Engineering Education

Challenges to starting an “Energy Engineering” Discipline

- All engineering disciplines claim some ownership of “energy,” so none want to relinquish it
- No existing ABET accredited programs means a long wait for ***possible*** accreditation and lack of licensed professionals
- No professional society is taking ownership of an energy engineering discipline, thus slowing ABET interest
- Limited funding for engineering schools to start new programs that would mostly “poach” from existing programs to start

Energy Engineering Education

Vision

- Objectives for Energy Engineering
  - Formulate, collect data, analyze and solve problems related energy conversion, delivery, related environmental consequences and economic ramifications using fundamental principles
  - Develop leadership skills, including effective communication and teamwork dynamics for application to the energy industry and government regulation of energy systems
  - Perform preliminary design of an energy conversion, power generation, or power savings system, by narrowing the focus of the design problem, making the appropriate assumptions, utilizing the right tools and analyses, and making design choices that work for the client within political, economic, legal, environmental, and ethical contexts
  - Develop tools and initiatives for lifelong learning in the field

Energy Engineering Education

What is next for Ohio University?

- Designated a Center of Excellence in Energy and the Environment
- Penn State and Wyoming are blazing the trail
  - Operating programs
  - Will seek ABET accreditation
- Formation of a board of advisers
- Formal development of objectives and outcomes
- Development of a semester-based curriculum
- Formal approval
- Student recruitment

Energy Engineering Education

Vision

- Possible Outcomes for Energy Engineering
  - Create technology leaders in energy conversion and delivery systems
  - Develop leadership skills for application to the energy industry and government regulators of energy systems
  - Understand the cause and formulate options for mitigation of pollution caused by the production and delivery of energy
  - Calculate the costs and benefits of energy-based capital investment
  - Integrate design and operational concerns starting from fuel supply, conversion, delivery, and use of energy
  - Describe basic operation of energy conversion processes, including but not limited to photovoltaic, wind, electrochemical, thermovoltaic, combustion (Otto, Diesel, Brayton, and Rankine), refrigeration, biomass, and nuclear – both direct and indirect conversions
  - Perform preliminary design of an energy conversion, power generation, or power savings system, by narrowing the focus of the design problem, making the appropriate assumptions

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Further questions?

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