Environmental & Energy Management

SCHOOL OF ENGINEERING & APPLIED SCIENCE

Graduate Students Defend Research

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Three EEM graduate theses and proposals were successfully defended during the Fall 2016 semester. Here is a summary of these important research projects.

Mohammed Qaradaghi defends his doctoral proposal.

Doctoral candidate Mohammed Qaradaghi defended his doctoral dissertation proposal entitled "Investigation of Multi-Criteria Decision Consistency: A Triplex Approach to Optimal Oilfield Portfolio Investment Decisions" on November 25, 2016.

Mohammed is investigating the complexity of capital intensive oil and gas portfolio investments that is continuously growing. Factors may include subsurface complexity, water supply, transportation and other needed infrastructure in addition to other issues of strategic concern, such as socio-economic, environmental and fiscal policies, particularly when the decision making involves governments or national oil companies. It is imperative to employ decision aiding tools that not only address these factors, but also incorporate the decision makers' preferences clearly and accurately.

However, tools commonly used in project portfolio selection and optimization, including intuitive approaches, vary in their focus and strength in addressing the different criteria involved in such decision problems. They are also disadvantaged by a number of drawbacks, which may include lacking the capacity to address multiple and interrelated criteria, uncertainty and risk, project relationship with ill regard to value contribution and optimum resource utilization, non-monetary attributes, decision maker's knowledge and expertise, in addition to varying levels of ease of use and other practical and theoretical drawbacks. These drawbacks have motivated researchers to investigate other tools and techniques that can provide more flexibility and inclusiveness in the decision making process, such as Multi-Criteria Decision Making (MCDM) methods.

Mohammed's research proposal aims at addressing MCDM drawbacks through combining three MCDM methods (i.e. AHP, PROMETHEE and TOPSIS) into a single decision making tool that can support optimal oilfield portfolio investment decisions. In addition, his study proposes a two-dimensional consistency test to verify the output coherence or prioritization stability of the MCDM methods in comparison with an intuitive approach. The proposed methodology will be applied to a case study of six major oilfields in Iraq to generate percentile shares of each oilfield of a plateau production target that is in line with Iraq's aspiration to increase oil production. The proposed methodology is intended to be applicable to other E&P portfolio investment optimization scenarios by taking the specific contextual characteristics into consideration.

Mohammed's research advisor is EEM Lead Professor Jonathan P. Deason.

On September, 25, 2016, Mark D. Lessans defended his Master of Science thesis on “An Evaluation of the Consumer Costs and Benefits of Energy Efficiency Resource Standards.”

Mark Lessans defends his thesis to the Examining Committee.

Mark’s research study evaluates residential demand-side management (DSM) programs offered by Pepco, a utility in Maryland, for cost-effectiveness. Unlike most literature on the topic, Mark’s analysis focused on the costs-benefit from the perspective of the consumer, and not the utility. The results of his study are encouraging: the majority of programs analyzed show that the cost of electricity saved, or levelized cost of saved energy (LCSE), is cheaper than the current retail cost of electricity cost in Maryland.

Of the modern-day policies designed to encourage energy efficiency, one with a significant potential for impact is that of Energy Efficiency Resource Standards (EERS). EERS policies place the responsibility for meeting an efficiency target on the electric and gas utilities, typically setting requirements for annual reductions in electricity generation or gas distribution to customers as a percentage of sales. To meet these requirements, utilities typically implement DSM programs, which encourage energy efficiency at the customer level through incentives and educational initiatives. In Maryland, a statewide EERS has provided for programs which save a significant amount of energy, but is ultimately falling short in meeting the targets established by the policy.

A key goal of Mark’s study was to establish a metric for evaluating the consumer cost-effectiveness of participation in energy efficiency programs made available by EERS. In doing so, the benefits of these programs can be effectively marketed to customers, with the hope that participation will increase. By increasing consumer awareness and buy-in, the original goals set out through EERS can be realized and the policies can continue to receive support.

Mark’s research advisor was EEM Assistant Professor Royce Francis.

Master of Arts student Michelle Graff recently defended her Master’s thesis on “An Evaluation of Stakeholder Influence on EPA’s Chemical Risk Values.”

The objective of Michelle’s research was to understand the extent to which external peer reviews and interagency comments impact EPA’s final toxicological reviews of chemicals in the IRIS database. Her study reviewed the

external peer review and interagency comments for nine chemical assessments that have disclosed such documents.

Her research identified patterns that emerge among external peer reviews and interagency comments. Using this information, the study promoted understanding of how responsive EPA is to external peer reviews and interagency comments and if there are any patterns in the Agency's responses. Using these analyses, she created a mental model to explain how external peer reviews and interagency comments impact the EPA's final human health risk assessment, creating a framework that other scholars in the community can apply when reviewing stakeholder comments in other regulatory processes.

Michelle's research advisor was EEM Assistant Professor Royce Francis.

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