UTSA Geological Sciences

And

Institute of Water Research, Sustainability and Policy (IWRSP)

Seminar Presentation
By

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"Evolution of the United States Energy System and Related Emissions under Varying Social and Technological Development Paradigms"

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Abstract

The energy system is the primary source of air pollution. Thus, evolution of the energy system into the future will affect society's ability to maintain air quality. Anticipating this evolution is difficult because of inherent uncertainty in predicting future energy demand, fuel use, and technology adoption. Scenario planning is used to address this uncertainty, developing four very different visions of the future. Stakeholder engagement suggested that technological progress and social attitudes toward the environment are critical and uncertain factors for determining future emissions. These factors are also tied to geologic resources and policy changes. Combining transformative and static assumptions about these factors yields a matrix of four scenarios that encompass a wide range of outcomes. We implement these scenarios in the U.S. Environmental Protection Agency MARKet ALlocation (MARKAL) model. Results suggest that both shifting attitudes and technology transformation may lead to emission reductions relative to the present, even without additional policies. Emission caps, such as the Cross-State Air-Pollution Rule, are most effective at protecting against future emission increases. An important outcome of this work is the scenario-implementation approach, which uses technology-specific discount rates to encourage scenario-specific technology and fuel choices. End-use energy demands are modified to approximate societal changes. This implementation allows the model to respond to perturbations in manners consistent with each scenario.

Kristen Brown, Ph.D., an assistant professor in the Department of Civil and Environmental Engineering at UTSA, has a research focus in the area of energy and air quality modeling. She spent four years as an Environmental Engineer in the Office of Research and Development at the US Environmental Protection Agency (EPA) where she completed emission and atmospheric modeling. While at EPA, she modeled the effect that changes to the US transportation system would have on air quality, particularly ozone and particulate matter concentrations. Dr. Brown also completed scenario analysis work for decision making under uncertainty. She has experience using the MARKAL-TIMES and CMAQ models to determine emissions values and air quality concentrations under a variety of assumptions. She teaches courses on Environmental Chemistry and Air Pollution.