Study to forecast side-effects of pollution policy

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The University of Michigan will lead a four-university team in a large-scale project to develop software to help analysts craft greenhouse gas reduction policies in the transportation industry.

The study will focus on the transportation industry, where emissions reduction policies have significant consequences on the economy and materials use, and can fail due to unintended results that can offset environmental gains, said Steven Skerlos, associate professor of mechanical engineering at U-M.

Skerlos and James Winebrake, chair of the public policy department at Rochester Institute of Technology, are co-directors of the $1.9 million, five-year project funded by the National Science Foundation. Other universities include the University of California at Berkeley and Northeastern University.

The premise for the research is the fact that significant greenhouse gas emissions in the United States will not decrease unless environmental costs are captured in the marketplace and new government policies are implemented. The U.S. transportation industry produces more greenhouse gas emissions than any other country's entire economy, so any serious reduction in emissions must include the transportation sector.

"Specifically, we want to know if proposed policies would have unintended and undesirable consequences on the function of the automotive market, on the industry's life cycle environmental impact, or

on the industry's demand for materials," Skerlos said.

The researchers will look at how the effectiveness of government policies is constrained by producer incentives, consumer preferences and technological constraints. For instance, if the best economic choice for producers to respond to greenhouse gas policies is to increase their use of lighter-weight aluminum rather than steel, that could offset emissions reductions because aluminum production requires more electricity. This electricity can come from either highly intensive CO2 sources such as coal generation or less intensive sources such as hydroelectric generation.

To predict these unintended consequences, researchers must integrate models of market decisions and technological performance with life cycle assessment and materials flow analysis, a process that marries public policy, engineering, natural resources and behavioral research. The project will culminate with the development of an analytical tool called CAPA (the computational automotive policy analysis software program).

The project arose by chance, beginning when RIT's Winebrake happened to be in the audience for a talk by Skerlos on government policy and sustainable design. Winebrake, an expert in public policy with experience in modeling and an interest in technology systems, approached Skerlos, an expert in environmental technology with experience in modeling and an interest in public policy.

"Our strengths and interests were perfectly complementary and synergistic with respect to this project," Skerlos said. "We (as engineers) can build quantitative models…but we need input from policy experts, life cycle analysts and behavioral scientists to fully evaluate the effectiveness and side-effects of environmental regulations in the marketplace."

To help account for these issues, Skerlos and Winebrake are joined by Walter McManus, director of the automotive analysis division of the U-M Transportation Research Institute, and Gregory Keoleian, associate professor at the U-M School of Natural Resources and the Environment, in addition to six other contributing faculty from the four universities.

Source: University of Michigan