Glimpsing a greener future: Computer model foresees effects of alternative transportation fuels

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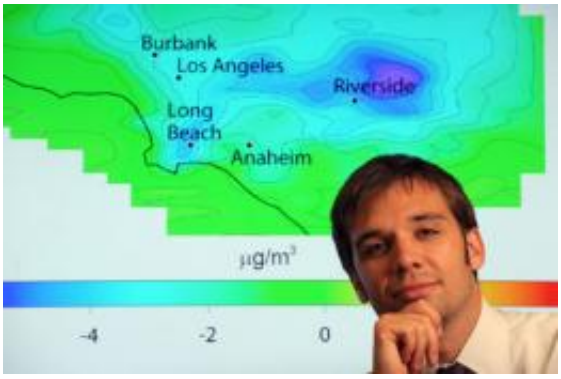

Shane Stephens-Romero built a computer model called STREET that foresees the effects of alternative transportation fuels. Image: Daniel A. Anderson / University Communications

(PhysOrg.com) -- It's the year 2060, and 75 percent of drivers in the Greater Los Angeles area have hydrogen fuel cell vehicles that emit only water vapor.

Look into Shane Stephens-Romero's crystal ball - a computer model called STREET - and find that air quality has significantly improved. Greenhouse gas emissions are more than 60 percent lower than in 2009, and levels of microscopic soot and ozone are about 15 percent and 10 percent lower, respectively.

"For the first time, we can look at these future fuel scenarios and say how they're going to impact things like ozone and particulate matter, which have severe effects on people's lungs and quality of life," said Stephens-Romero, a UC Irvine doctoral candidate in the Advanced Power & Energy Program.

His 2060 analysis appeared online recently in *Environmental Science & Technology*. It's the first peer-reviewed test of the computer model, which has caught the attention of California policymakers and auto industry leaders trying to integrate alternative fuels into the transportation system.

"We're transitioning to new technologies. How do we do this while maintaining our lifestyle and keeping our economy robust?" Stephens-Romero said. "We don't know how these changes could affect the future."

The Spatially & Temporally Resolved Energy & Environment Tool, he says, can help.

STREET considers variables in extreme detail - not just which fuel vehicles will use but how the fuel is made, where it comes from, how it's transported and along which routes, and where fueling stations might be located.

The computer model also can determine what changes must occur to achieve a desired result. For example, to bring pollution below federal limits, what percentage of the vehicle fleet would need to run on alternative fuel?

"California policymakers could use the tool in this way to improve air quality in the region," Stephens-Romero said.

Scott Samuelsen, director of the Advanced Power & Energy Program, says Stephens-Romero's work is getting high praise from leaders at Toyota, Honda, General Motors, Shell, Air Products, the California Air Resources Board and the California Energy Commission.

"The research is well positioned," Samuelsen said, "considering the development of a hydrogen infrastructure is at the crossroads of global climate change, the future of the automobile, the state economy, and California's leadership in addressing the conflict between energy and the environment."

Samuelsen led the development of UCI's hydrogen fueling station, the most technologically advanced, publicly accessible station in the world. It was the first of its kind in Orange County and is a key component of the California Hydrogen Highway Network.

In addition to Stephens-Romero and Samuelsen, UCI scientists Marc Carreras-Sospedra, Jack Brouwer and Donald Dabdub worked on the 2060 study, which was funded in part by the U.S. Department of Energy.

Source: University of California - Irvine