Researchers define challenging carbon-emissions targets for U.S. auto industry

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(PhysOrg.com) -- U.S. automakers must achieve an eightfold reduction in automobile-related carbon emissions to help stabilize the amount of heat-trapping carbon dioxide gas in the atmosphere by 2050, according to University of Michigan researchers.

A research team from the U-M Center for Sustainable Systems looked at what it would take for U.S. automakers to reduce passenger car-related carbon emissions to help stabilize carbon dioxide levels at a concentration of 450 parts per million by 2050, thereby averting many of the most serious consequences of human-caused climate change.

Currently, U.S. passenger vehicles emit about 160 grams of carbon for every mile driven, when tailpipe emissions and emissions associated with

fuel production are included. To help stabilize emissions by 2050, that number must be reduce eightfold, to 20 grams per mile, according to center co-director Greg Keoleian of the U-M School of Natural Resources and Environment.

The U-M study appears in the Feb. 1 edition of the journal Environmental Science & Technology, an American Chemical Society publication. Keoleian said the study is the first to define specific targets needed to achieve sustainable U.S. passenger-vehicle transportation.

Reaching those carbon-reductions targets will require an aggressive combination of strategies, according to Keoleian and his co-authors, Hilary Grimes-Casey and Blair Willcox of the Center for Sustainable Systems.

Improving vehicle fuel efficiency, the widespread use of low-carbon fuel, and a change in U.S. driving habits have all been suggested as ways to reduce carbon emissions. But no single approach will suffice, Keoleian said.

Attempting to reach the emissions-reduction targets by adopting just one of these approaches would require: automobiles with an average fuel economy of 136 miles per gallon, an 83 percent market share for low-carbon ethanol, or a reduction in U.S. travel demand of 53 percent by 2050, according to computer-model simulations conducted by the U-M researchers.

"Any individual vehicle carbon-reduction strategy is not likely to be successful in the long term," Keoleian said. "To meet these targets, we need a combination approach that tackles all these factors simultaneously.

"Most importantly, we need a transformed energy system," he said.

"Basically, we have to shift our emphasis on fossil-based fuels to renewable and, in the interim, there might be more of a role for nuclear. At the same time, we need to dramatically ramp up our fuel economy and reign in vehicle miles traveled."

In the United States, transportation accounts for about a third of all greenhouse-gas emissions, and automobiles are responsible for two-thirds of transportation-sector emissions.

Several automobile manufacturers have announced plans to build plug-in hybrid cars that can recharge at the nearest wall socket. Clearly, vehicles powered mainly by batteries produce fewer emissions than cars that rely solely on internal-combustion engines.

But if the wall-outlet electricity is generated at a coal-fired power plant, then plug-in hybrids merely shift a portion of the carbon emissions from the vehicle to the power plant. Achieving significant overall reductions in transportation-related carbon emissions will require big reductions in the use of fossil fuels for power generation, as well as for liquid vehicle fuels.

That means an increased reliance on wind, solar and other renewable energy sources, as well as nuclear power.

"If we don't transform our system for generating electricity, the plug-in hybrid electric vehicle will result in some reduction in emissions, but it's not going to be at the level which is needed to solve this problem," Keoleian said.

Provided by University of Michigan