New tool simulates real-world vehicle traffic to predict large-scale energy impact

August 6 2024, by Evonne Acevedo

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From a city's rush-hour commute to the operations of a cross-country transport fleet, a new tool from the U.S. Department of Energy's Argonne National Laboratory can paint a picture of how vehicles are

using energy on a large scale.

The tool, called Autonomie Express, is designed to help transport and mobility companies, researchers, city planners and others estimate their vehicles' energy consumption and greenhouse gas emissions. The tool—free to all users—assesses energy consumption for a wide range of vehicles, both current and future.

"You can ask, what if 50% of these vehicles were battery electric—what impact would that have on traffic flow?" says Phillip Sharer, manager of Argonne's model-based systems engineering group. "Over the last 20 years, transportation has become more complex with the onset of new technologies, both at the powertrain level and the vehicle level, as well as the intelligence that's being added to vehicles and roadways. We have a mix of conventional vehicles, hybrid vehicles and electric vehicles of varying sizes on the road today, and we anticipate more in the years to come."

To account for this new complexity, Autonomie Express is equipped with a vast library of vehicle types, from light-duty passenger cars to heavy-duty trucks. It models their individual powertrains, fuel economy and battery usage.

Autonomie Express even includes models that aren't yet available to the public. With the help of manufacturer specifications, its library includes new vehicles projected through the year 2050.

"The vehicle simulations in Autonomie Express encompass all modern vehicles that are currently on the road, as well as those that are expected to be on the road in the next two decades," said Ram Vijayagopal, manager of the vehicle and technology assessment group. "By being able to select from more than 5,000 full vehicle models, transportation engineers can develop realistic simulations of present and future fleets."

Autonomie Express can make it easier for stakeholders to see the impact of their current practices and vehicle fleets, as well as show how they're improving. For example, it can estimate how much a transport company can save by switching to electric vehicles, or how much rush-hour traffic contributes to a city's energy consumption.

The tool is designed to work in conjunction with small- and large-scale traffic flow simulation tools such as Aimsun, PTV Vissim, Eclipse SUMO, or Argonne's POLARIS to model the impact of new technologies such as electrification, connectivity and automation when deployed at scale.

The Autonomie Express development team is led by Aymeric Rousseau, director of the vehicle and mobility systems department.

"Express has been designed to be easy to use," Rousseau said. "Vehicle selection and connection with micro- and meso-simulation tools has been streamlined through a graphical user interface. Pre-defined fleets for multiple scenarios provide ready-to-go solutions for researchers to accurately estimate energy impacts of technologies."

The team recently announced Autonomie Express's availability, free of cost with a license. They hope it will incentivize users to embrace more energy-efficient, environmentally responsible transportation options by showing them where to start.

  More information: Request a government- or non-government usage license from Argonne National Laboratory.

Provided by Argonne National Laboratory