Computing Tools
for the Automotive Industry

Argonne National Laboratory's convenient suite of computing tools is making life a little easier for those in the auto industry. Instead of spending considerable time and money building and testing prototypes, researchers and engineers are using Argonne's innovative spreadsheets and simulation software to get quick, inexpensive, and accurate results. Whether used for estimating emissions or evaluating performance, these tools are helping streamline the development of advanced vehicle technologies.

GREET

What is it? The Greenhouse Gases, Regulated Emissions, and Energy Use in Transportation (GREET) model is a multidimensional spreadsheet used to evaluate various engine and fuel combinations on a consistent fuel-cycle basis. GREET has more than 10,000 users registered worldwide. The public domain model is available free of charge for anyone to use.

How it helps. GREET can answer just about any question about greenhouse gas emissions and energy consumption of vehicles powered by everything from Brazilian sugarcane to hydrogen fuel cells. For any given vehicle technology and fuel system, GREET separately calculates the energy consumption by energy type; the emissions of greenhouse gases, including carbon dioxide, methane and nitrous oxide; and the outputs of six critical pollutants, including nitrogen oxides and soot.

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PSAT/PSAT-PRO

What is it? The Powertrain Systems Analysis Toolkit (PSAT) is a forward-looking model that simulates fuel economy and performance of advanced vehicles. It can simulate an unrivaled number of vehicle configurations (conventional, electric, fuel cell, series hybrid, parallel hybrid, and power split hybrid). The simulations are done in a realistic manner, taking into account transient behavior and control system characteristics. PSAT is the primary vehicle simulation tool to support FreedomCAR and Fuels Partnership as well as 21st Century Truck Partnership activities. PSAT is currently used by more than 120 companies worldwide. PSAT-PRO, its companion prototyping software, is designed to perform Hardware-in-the-Loop and Rapid Control Prototyping of advanced vehicles.

How it helps. Time and cost constraints prevent automakers from building and testing every possible powertrain configuration. But with PSAT, engineers can quickly and efficiently evaluate different powertrains, component technologies, and control strategy options.

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GCtool

What is it? The General Computational toolkit (GCtool) is a versatile simulation software package that allows for the designing, analyzing, and comparing of different fuel cell configurations. The software uses a modular approach to integrate many of the detailed thermodynamic and component models developed during decades of fuel cell and power system research. It's flexible and easy-to-use, allowing researchers to modify all the system inputs such as fuel, feed rates, and component performance.

How it helps. GCtool lets automobile and truck designers try out different system configurations without the expense and delay of actually building numerous prototypes.

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VISION

What is it? The VISION model consists of two Excel workbooks that help provide estimates of the potential energy use, oil use, and carbon emission impacts of advanced vehicle technologies and alternative fuels used in highway vehicles (light and heavy) through the year 2100. Argonne updates the model annually to be consistent with and include the latest Annual Energy Outlook published by the Energy Information Administration. The model's development and update is supported by DOE.

How it helps. VISION is a "what-if" model. It gives users a quick and easy way to estimate the impact of future transportation technologies and scenarios on oil use and greenhouse gas (GHG) emissions. For example, VISION can calculate what the oil savings and GHG emission reductions would be by 2050 if the federal Corporate Average Fuel Economy (CAFE) is raised 50 percent by 2030.

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