

GREET: THE GREENHOUSE GASES, REGULATED EMISSIONS, AND ENERGY USE IN TECHNOLOGIES MODEL

The gold standard for life-cycle analysis of technologies and energy systems



GREET is a suite of models that examine the life-cycle impacts of efficiency technologies and energy systems for energy and technology producers, researchers, and regulators.

GREET has Excel and .net modeling platforms. In the .net platform, this easy-to-use tool comes with a fast algorithm for processing GREET model data, and an interactive interface that enables users to perform simulations in just a few clicks. Continually updated by world-class researchers at Argonne National Laboratory, GREET provides reliable calculations of life-cycle energy and emissions related to transportation and other sectors, and accounts for a wide range of conventional and emerging energy systems and technologies.

ADVANTAGES

GREET has become the go-to tool to guide decision-making, research and development, and regulations related to transportation because it can assess a range of life-cycle energy, emissions, and environmental impact challenges. For any given energy and vehicle system, GREET can calculate:

- Total energy consumption (non-renewable and renewable)
- Fossil fuel energy use (petroleum, natural gas, coal)
- Greenhouse gas emissions (CO₂, CH₄, N₂O, black carbon, organic carbon, albedo)
- Air pollutant emissions (VOCs, CO, NO_x, SO_x, PM₁₀, PM_{2.5})
- Water consumption

GREET is the premiere tool for evaluating the energy and environmental impacts of energy systems and advanced vehicles. This one-of-a-kind software holistically evaluates:

- More than 100 energy pathways
- More than 80 vehicle technology options
- More than 65 materials for vehicle production
- Applications to road, rail, aviation, and marine transportation
- Extensive electric generation technologies
- Building components and technologies

GREET INCLUDES ALL TRANSPORTATION SUBSECTORS AND THE BUILDINGS SECTOR

ROAD

- Light-duty, medium-duty, and heavy-duty vehicles
- Various powertrains, including internal combustion engines, electrics, and fuel cells



AIR

- Passenger and freight transportation
- Various alternative fuels blended with petroleum jet fuels



RAIL

- Freight and passenger rails
- Baseline diesel and electric, and alternative locomotive fuels like natural gas



MARINE

- Ocean and inland water transportation
- Baseline diesel and alternative marine fuels



APPLICATIONS

Today, GREET has attracted more than 40,000 registered users worldwide, including industry, academic, and government institutions. In the automotive industry, GREET has been used to pinpoint vehicle and energy system combinations for further research and development. Among universities and research institutions, GREET serves as a research and educational tool for vehicle and energy studies. And within energy sectors, GREET has helped producers and suppliers assess the sustainability of research and development investments. Users who have benefited from using GREET include:

- The California Air Resources Board, which used GREET to help assess compliance with the state's Low-Carbon Fuel Standard
- The U.S. Environmental Protection Agency (EPA), which used GREET to help evaluate standards for renewable fuel and vehicle greenhouse gases
- The International Civil Aviation Organization, which used GREET to develop the carbon intensities of aviation fuel production pathways

ACCESS

Available in both Excel and .net forms, the suite of GREET models and associated documentation are available at greet.es.anl.gov.

DATA SOURCES

GREET relies on a variety of sources for its data, including:

- The EPA eGrid, for data on electric systems and emissions inventories
- The Energy Information Administration, for current and future energy projections
- Simulation programs such as ASPEN Plus, EPA's MOVES (Motor Vehicle Emission Simulator) and Argonne's Autonomie tool, for predicting the energy use, emissions, and resource use of future technologies
- Peer-reviewed publications
- Data from industries and government agencies

SPONSORS

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