

The road to

Sustainable Transportation

Sandia, industry partner to transform transportation to meet future demand

The U.S. faces significant challenges in transportation energy based on our reliance on foreign oil and an economy strongly dependent on the cost of energy. It has become clear that one magic solution won't solve all these problems; rather, we must pursue a suite of approaches and solutions to transportation energy availability and demand.

Sandia National Laboratories is working to understand the science and engineering required for sustainable transportation, conduct cutting edge research and development and partner with industry to deploy viable technologies in the marketplace.

Improving Combustion Performance

Sandia's Combustion Research Facility (CRF) has been working closely with U.S. engine manufacturers for more than 30 years to increase scientific understanding of internal combustion engine processes affecting efficiency and emissions. The design of essentially every modern vehicle on the road today has benefitted from that collaboration. Today, most of Sandia's engine research is directed toward building the science base for advanced combustion strategies needed by industry to develop a new generation of high-efficiency, clean engines. These strategies



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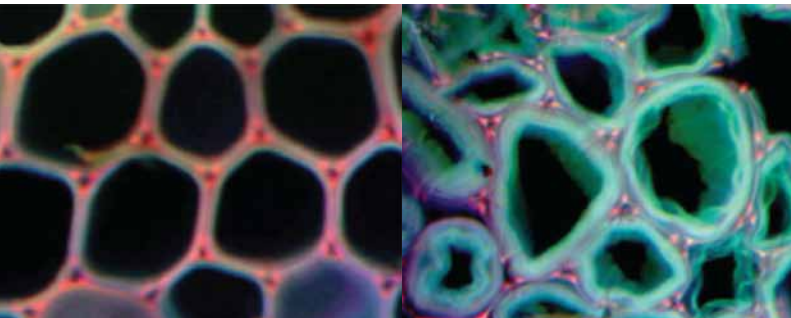
include: ultra-low-emission, low-temperature combustion; stratified-charge, spark-ignition combustion; and advanced diesel combustion approaches.

Battery Technology

As electric vehicles come on the market, demand for improved car batteries is growing. Sandia's Battery Abuse Testing Laboratory is a world leader in battery testing. Sandia also is researching new materials that will enable batteries to charge more rapidly and permit vehicles to run farther on a single charge.

Biofuel Research

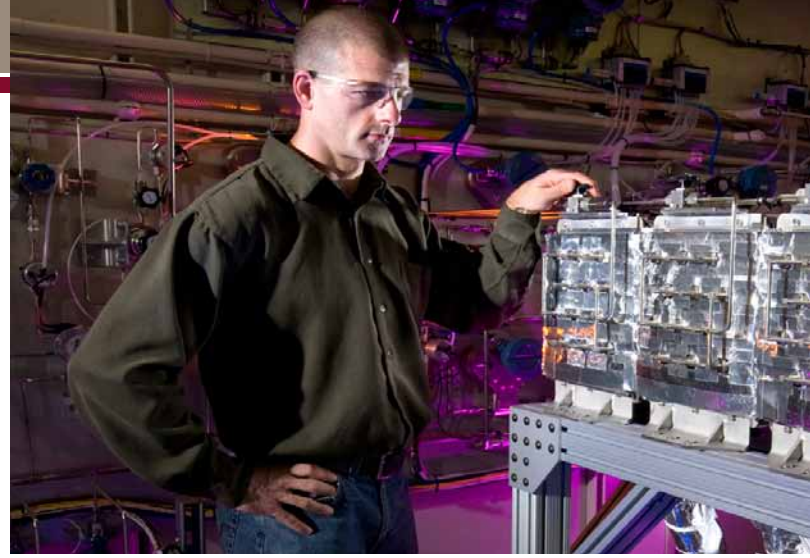
Biofuels comprise another set of solutions necessary for sustainable transportation. Sandia is pursuing chemical and biochemical methods to



make biofuels from such non-crop biomass as switch grass. Researchers also are investigating fungi called endophytes as potential fuel producers, cultivating specialized algae strains and working to reduce the cost of algal fuel production. As part of the Joint BioEnergy Institute, Sandia's microfluidics researchers are finding ways to screen potential biofuel candidates faster and more economically. Current engines must also be redesigned to get the most out of biofuels to meet national oil-reduction goals.

Sunshine to Petrol

Sandia has developed a prototype thermochemical process that uses heat from solar power to drive chemical reactions



that convert either carbon dioxide or water into two products, oxygen and carbon monoxide or oxygen and hydrogen, respectively. Sandia is working to solve complex chemical, materials science and engineering problems that will facilitate using these products as building blocks to form synthetic fuels as a potential replacement for petroleum.

Hydrogen Fuel Cells

From fundamental research on hydrogen properties to comprehensive systems engineering of hydrogen technologies, Sandia is advancing hydrogen as an energy carrier, improving fuel cells and hydrogen storage, as well as safety, codes and standards.

Sandia manages the DOE's Metal Hydride Center of Excellence, a consortium of national laboratories, universities and companies searching for efficient, small and light-weight hydrogen storage mechanisms that don't take up space or add significant weight to vehicles. Sandia is modeling and experimenting with different metal hydrides and new ways to separate hydrogen from water with advanced electrolytic fuel cell membranes.

Sandia's transportation research will help the U.S. decrease dependence on fossil fuels, reduce carbon dioxide emissions and improve energy security.