

# Novel Spark Plugs Improve Energy Efficiency of Compressed Natural Gas Engines

May 2012

## Fact Sheet

### The Issue

California's growing population and economic demands have increased the reliance on imported petroleum for transportation use. In addition to energy security concerns, petroleum-based energy use affects climate change. Vehicles operating on compressed natural gas reduce petroleum fuel use by 99 percent and reduce greenhouse gas emissions by 29 percent relative to gasoline. In California, the vast majority of compressed natural gas (CNG) engines are used in transit buses serving the public. A need exists for light-duty vehicle natural gas engine technologies to increase market penetration of compressed natural gas vehicles. These technologies must be cost-effective and innovative while still complying with strict emission standards set up by the California Air Resources Board.

### Project Description

This research will establish the feasibility of using a novel star-shaped spark plug design in a compressed natural gas engine. It will also establish the performance and emission reduction benefits of its use. Multispark, LLC, will demonstrate a 5 percent to 20 percent fuel economy improvement and lower hydrocarbon, carbon monoxide, and nitrogen oxides emission levels by at least 5 percent with its innovative spark plug design. The multipoint star shape is superior over single-point ignition because a



PowerSTAR 5 Point Spark Plug  
Photo credit: <http://www.powerstarsparkplugs.com>

larger surface area results in a faster flame front and a more complete burn of the air-fuel ratio, resulting in less harmful emissions. Multispark, LLC, will demonstrate the effectiveness of these spark plugs by meeting these project objectives:

- Establish a specific heat range for compressed natural gas engines.
- Fabricate prototype star spark plug design for compressed natural gas engines.
- Compare horsepower, torque, and air-fuel ratio to original equipment manufacturer spark plugs.
- Compare carbon monoxide, nitrogen oxide, and hydrocarbon emissions from the star design to original equipment manufacturer single spark design.

- Demonstrate reliability with rigorous on-road testing.
- Report on fuel economy improvements gained over original equipment manufacturer spark plugs.

### Anticipated Benefits for California

This project supports the Public Interest Energy Research Program’s objectives to help bring to market advanced transportation technologies that reduce greenhouse gas emissions and air pollution beyond applicable standards, and that benefit natural gas ratepayers. This project is expected to improve the fuel economy and performance of compressed natural gas light-duty vehicles, thereby reducing harmful air emissions. The proposed innovation is expected to:

- Improve fuel economy for compressed natural gas light duty vehicles by 5 percent to 10 percent in city and 10 percent to 15 percent highway.
- Reduce harmful emissions such as carbon monoxide, hydrocarbon, nonmethane hydrocarbons, nitrogen oxide, and particulate matter.
- Increase torque and horsepower by 5 percent to 15 percent.

### Project Specifics

Energy Innovations Small Grant Agreement  
 Number: 500-98-014-06, Project 324  
 Recipient: Multispark, LLC  
 City/County: San Diego/ San Diego County  
 Application: Nationwide  
 Amount: \$94,700  
 Cost-share: \$16,983 (Multispark, LLC)  
 Term: October 2010 to October 2011

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