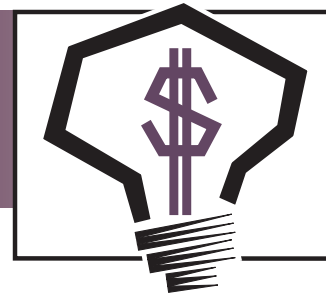


# INVENTIONS & INNOVATION

## Project Fact Sheet



## A DUAL FUEL CONVERSION SYSTEM FOR DIESEL ENGINES

### BENEFITS

- Replaces nearly 95 percent of the imported diesel fuel normally required for engine operation with clean-operating, domestically produced natural gas
- Potentially eliminates need to import more than 55 million barrels of crude oil per year for rail industry alone
- Maintains original engine power while reducing emissions, such as particulates and nitrogen oxides (NO<sub>x</sub>)
- Reduces maintenance costs by using cleaner fuels that leave less carbon build-up

### APPLICATIONS

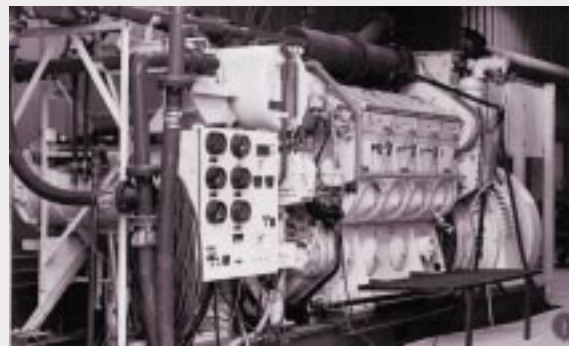
The invention has the potential to benefit industries that use diesel engines. Results are already being demonstrated in offshore drilling, military, and marine operations. This technology will also benefit the railroad industry by reducing the amount of diesel fuel necessary to run locomotive engines, by improving emissions, and by allowing less restricted operation.

## A NEW DUAL FUEL CONVERSION SYSTEM ALLOWS DIESEL FUEL SWITCHING WITH CLEAN BURNING NATURAL GAS

Diesel engines have been used for decades in industrial power, cogeneration power systems, locomotives, marine applications, and other engine markets. However, as tougher environmental standards are being enacted throughout industry, users of diesel engines are looking for ways to lower emissions without reducing engine power. Dual fuel systems, engines that operate on more than one fuel source, are gaining popularity because they reduce the amount of diesel fuel used. Until recently, adding a dual fuel system was impractical due to the cost of replacing the original engine and the loss of power traditionally associated with these replacement systems.

Energy Conversions, Inc. (ECI), has invented a dual fuel conversion system that easily converts diesel engines into diesel-natural gas engines, eliminating the need for companies to replace their diesel engines with natural gas engines. The system reduces emissions by allowing engines to operate cleanly on domestically produced natural gas while still maintaining the potential to operate on traditional diesel fuel as well. The ECI system is particularly effective in power stations for offshore drilling rigs because the gas is otherwise frequently flared.

### DUAL FUEL CONVERSION SYSTEM



**Energy Conversions' dual fuel conversion system provides natural gas power to engines that were previously powered only by diesel fuel.**



## Project Description

**Goal:** Scale the dual fuel conversion system to fit larger engines.

The invention contains all the necessary components for converting diesel engines to engines that can operate on either natural gas or diesel fuel. Ignition is reached through a pilot injection of diesel fuel that consists of approximately 5 percent of the normal amount of diesel fuel, saving up to 95 percent of the diesel fuel ordinarily used in these engines. And while the system can save fuel costs, it doesn't skimp on power. The ECI system permits converted engines to operate at the same power level as a diesel engine, unlike other conversion methods that require a power reduction of 20 percent or more.

The ECI system is particularly effective in power stations for offshore drilling rigs. Tapping methane directly from the wellhead and scrubbing the gas onboard provides an efficient source of fuel to power the ECI-equipped engines, greatly reducing fuel costs and making use of an often untapped resource. This practice also reduces the cost and potential for hazards associated with supplying and transporting diesel fuel refined on the mainland.

Stationary and agricultural power stations currently using diesel engines can also benefit from cleaner-burning, longer-lasting ECI engine systems. The generator owners benefit economically from potentially reduced fuel costs while simultaneously helping to improve air quality and allow for economically driven switching decisions.

Energy Conversions, Inc., developed this new technology with the help of a grant funded by the Inventions and Innovation Program through the Department of Energy's Office of Industrial Technologies.

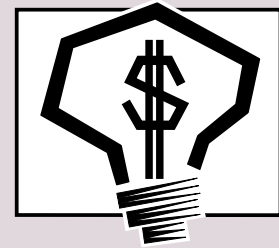
## Progress and Milestones

- The invention is being used to power engines on drilling platforms in the Gulf of Mexico and off the coasts of Trinidad and Brazil, saving each \$4000 per rig per day. A naval base is also using a system for its air quality advantage, peak-shaving and selling some power to the grid.
- ECI recently received American Bureau of Shipping (ABS) approval for use of its conversion systems in marine applications.
- Two conversion units have been tested successfully on a Burlington Northern railroad route, hauling 120 tons of coal over difficult terrain.
- Current efforts are focused on finding additional markets for this technology.
- Protected by U.S. patents 4,641,625 and 5,136,986.
- Completed a third-generation electronic control unit to enhance the flexibility and performance of the engine's previous computer controller.
- Developed an electronic knock-sensing diagnostic system to achieve improved combustion and performance.

## Economics and Commercial Potential

Industries using cogeneration power systems will benefit from the use of dual fuel systems. While the initial cost of adapting the engines may cause industries to be hesitant to convert, tightening air quality standards, significant fluctuations in fuel costs, and source reliability issues will likely influence the need for conversion. Engines fitted with conversion systems operate the same as traditional diesel engines and require no special operator training.

The invention shows promise for use in the offshore drilling industry. Currently, offshore drilling rigs fitted with the system are saving an estimated \$4000 in daily fuel costs. Applications in marine operations and in the railroad industry have also proven effective. The market has been estimated to be 90 units per year, yielding cost savings of \$131 million per year and saving approximately 15 million Btu per year.



The Inventions and Innovation Program works with inventors of energy-related technologies to establish technical performance and conduct early development. Ideas that have significant energy savings impact and market potential are chosen for financial assistance through a competitive solicitation process. Technical guidance and commercialization support are also extended to successful applicants.

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