

U.S. DEPARTMENT OF ENERGY  
NATIONAL ENERGY TECHNOLOGY LABORATORY

## **INFRASTRUCTURE RELIABILITY AND PRODUCT INTEGRITY**

### *FY2002 New Activity*

The U.S. Department of Energy's (DOE) Office of Fossil Energy (FE) has developed a Clean Liquid Fuels Program whose overall goal is to promote the development and deployment of technologies that will produce clean, high performance fuels from a variety of secure energy resources. The program addresses key technical and policy issues that span the production, processing, delivery, and end-use of these fuels. The Clean Liquid Fuels Program has five major elements: Exploration, Production and Transport of Petroleum Crude; Petroleum Environmental Solutions; Ultra-Clean Fuels; Future Fuels; and Infrastructure Reliability and Product Integrity. The Infrastructure Reliability and Product Integrity program element (a proposed New Activity for FY2002) is discussed below.

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### **Background**

The U.S. liquid fuels product distribution system is a complex set of facilities that supplies light petroleum products to meet the demands of the American consumer. The system includes a network of geographically dispersed pipelines, marine vessels, and railcars that move products from refineries to product terminals. From the terminals, tanker trucks take products to retail outlets or directly to consumers. Product pipelines carry the bulk of long-distance fuel products from one part of the country to another.

Operating this complex network of common carriers will become even more complicated as the number of product types and variations increase, and as individual product specifications diverge. Today, over 50 grades of gasoline are required nationwide and there will be increasing numbers of these so-called designer or boutique fuels in the future as fuel specifications become more stringent to meet proposed federal, state and local air pollution standards.

As these fuels of differing specifications enter the marketplace, the problems of transporting, handling and storage dramatically increase. Ultra-clean fuels will become susceptible to contamination by many mechanisms including mixing in tanks and inadequately flushed lines and the dissolution of deposits in improperly cleaned tanks. This has the potential to further contaminate all infrastructures downstream of the event and could have permanent adverse effects on both legacy and advanced engine-emission systems.

The potential impact of inadequate infrastructure may, therefore, be enormous. At a minimum, the potential exists for regional shortages of required fuels similar to the recent home heating oil supply disruptions in the northeast, with more widespread and persistent shortages of certain essential fuels occurring throughout the U.S.



# INFRASTRUCTURE RELIABILITY AND PRODUCT INTEGRITY

## *FY2002 New Activity*

### Description

The infrastructure element of the Clean Liquid Fuels Program is concerned with the adequacy, safety, and practicability of the existing, as well as new infrastructures that will have to be developed as new fuels, both liquid and gaseous become an integral part of our supply and distribution system. The purpose is to ensure that proper and adequate facilities are available, regardless of the fuels, to adequately supply our Nation's growing demands for clean energy. The existing fuels distribution infrastructure may well lack the ability to deliver the entire suite of anticipated products reliably and efficiently after 2005. This is when the ultra clean, low sulfur fuels, specified in EPA's Tier 2 regulations, will begin to enter the fuels distribution infrastructure.

This program element will consist of policy studies, life-cycle fuel distribution analyses and research that will address near-, mid-, and long-term delivery system reliability issues related to the ability of the existing and future infrastructures to handle an increasingly complex and divergent suite of product specifications. Research will cover a broad spectrum of topics, including the development of:

- computer simulations of the present fuels infrastructure and proposed new systems;
- methods to deliver multiple, ultra low sulfur specification fuels via the current transportation fuel delivery system;
- new methods of handling and segregation to prevent contamination as the number of fuel specifications increases;
- on-line analysis and analytical measurement tools to ensure proper product distribution, advanced diagnostics and risk assessment technologies focused on preventing releases into the air, ground, and water; and
- technologies that enable in-situ monitoring of pipelines, tanks, and transfer points.

### Benefits

This program element will ensure that the fuels delivery infrastructure:

- provides for an uninterrupted supply of liquid (and gaseous) fuels;
- ensures product integrity by eliminating contamination;
- meets environmental goals and standards by reducing the potential for fugitive emissions to the air, ground and water; and
- satisfies the most restrictive health and safety requirements.

