



Safeguarding Truck-Shipped Wholesale and Retail Fuels (STSWRF)

Revenues from motor fuel and other highway use taxes provide the primary source of funding for the United States' transportation system, and ensuring all of these taxes are collected, remitted, and credited to the Highway Trust Fund is a priority for the U.S. Department of Transportation (DOT) Federal Highway Administration (FHWA). In the past, loss of revenue due to tax evasion has been estimated to range from \$1 billion annually to as much as 25% of total revenues. After the point of taxation was changed for both gasoline (1988) and diesel fuel (1994), significant increases in tax revenue were realized which were assumed to be due to decreased evasion. For Federal tax purposes, the point of taxation for gasoline and diesel fuel is at the point of its removal from bulk storage at the terminal rack, the facility where fuel from bulk storage tanks is loaded into tanker trucks for delivery to retail stations or bulk users. Approximately half of the states in the United States have the same point of taxation for state-based taxes. However, the remaining states have a point of taxation at the wholesaler/distributor level or below. This presents additional challenges in tracking untaxed fuel after it leaves the bulk storage.

Diesel fuel that is to be used for off-road (non-taxable use) purposes is currently marked with a red dye, making it easier for enforcement personnel to identify it as a fuel that has not had on-road taxes paid. Only dyed diesel fuel may be removed from bulk storage without payment of the Federal diesel fuel excise tax, and the taxes in various states that have similar dyed diesel statutes. Dyed diesel is used by farmers, fishermen, and others for off-road purposes. There are no dyeing requirements for gasoline.

Even with the changes in the point of taxation and the addition of dye for fuel used for off-road applications, there are still a number of extensive and convoluted schemes to evade fuel taxes. Some examples of these are barge and pipeline schemes, false exporting of fuel, mixing of taxed and untaxed fuels, and cross-border transport. Therefore, the issue of fuel tax evasion cannot be addressed by a

single solution or at a single point in the supply chain.

Past Research — To explore the possibility of thwarting or mitigating some or all of these schemes, in 2009 the Oak Ridge National Laboratory (ORNL) was funded by the FHWA's Exploratory Advanced Research Program to conduct the *Supply Chain-Based Solution to Prevent Fuel Tax Evasion*. It was decided by ORNL and FHWA that a validation of the concept system could best be done by developing and testing working technology in a proof of concept (POC) test conducted at a closed test facility for safety. This allowed for better control over the testing itself and afforded maximum safety for the general public. This Phase I POC testing was successful, proving the feasibility of this FTE detection solution. In addition, this research provided valuable information regarding where future research efforts are needed to further develop such a system.

Current Research — In 2012, FHWA approved ORNL's plan to conduct a Phase II Pilot Test titled *Safeguarding Truck-Shipped Wholesale and Retail Fuels*.

The concept of operations for this proposed pilot test system is depicted in Figure 1. The trailer, equipped with hatch and valve monitoring switches, sends all opening and closing event data to the tractor cab via the tractor to trailer communications unit (T2TCU). The onboard telematics device, using the ORNL-developed Evidential Reasoning System (ERS) matches the vehicle's location with information from electronic documents, past history, and valve actuation and valve open dwell time and makes a determination of the legitimacy of the event. For an event deemed to be suspect for fuel tax evasion, the ERS reports evidential information to the fuel distribution auditing system (FDAS) via the telematics BOS (TBOS). The FDAS is used by regulators for auditing suspicious activity. For events deemed to be suspect for fuel theft, the ERS reports evidential information to the carrier via the telematics BOS. This information is provided to the carrier via the standard web-linked graphical user

Research Areas

Freight Flows

Passenger Flows

Supply Chain
Efficiency

Transportation:
Energy
Environment

Safety
Security

Vehicle
Technologies

Oak Ridge National Laboratory
managed by
UT-Battelle, LLC
for the
U.S. Department of Energy
under Contract number
DE-AC05-00OR22725

STSWRF Concept of Operations

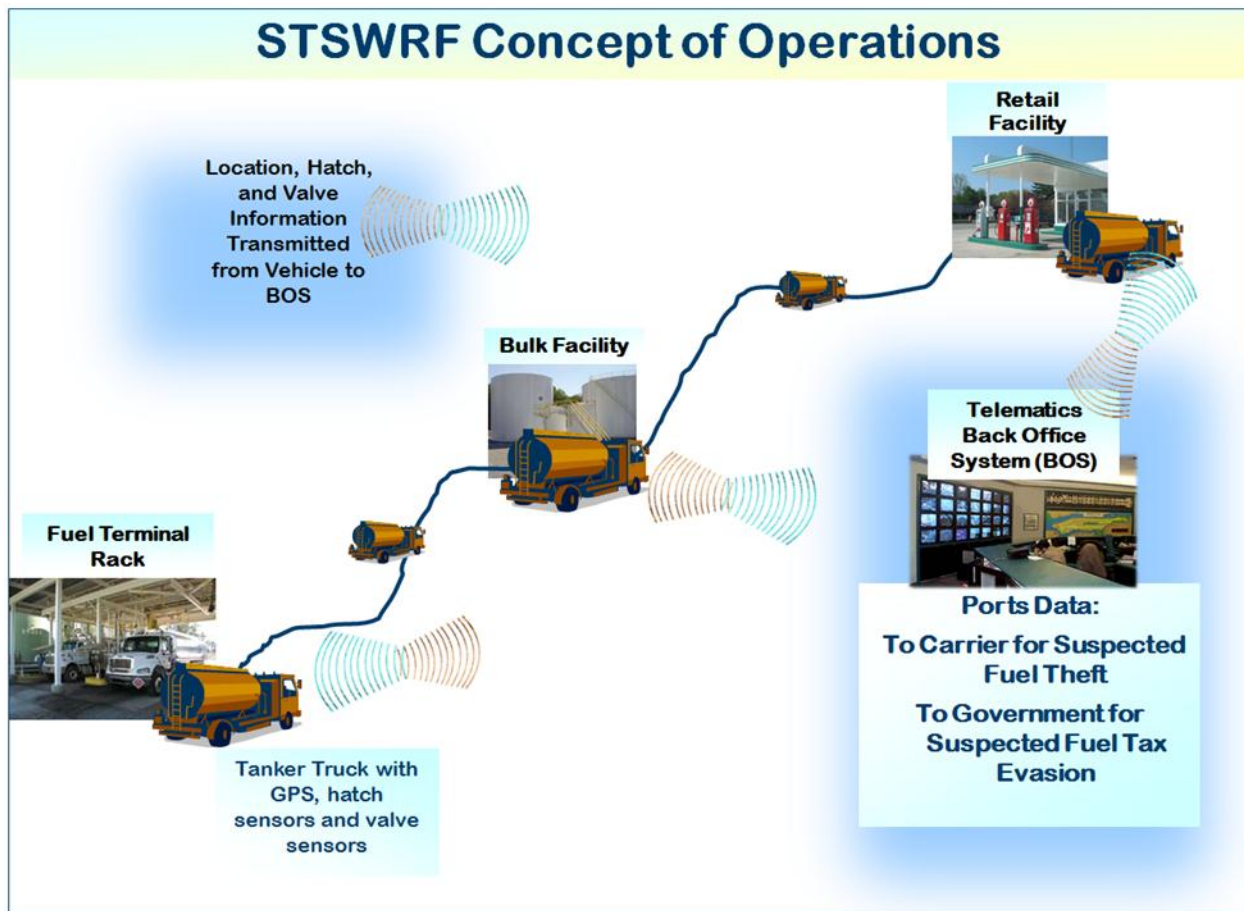


Figure 1 - STSWRF Concept of Operations

Goals and Objectives —The goal of the STSWRF pilot test is to develop a sufficiently robust hardware and software system to allow collection and statistically meaningful evaluation of data to:

- Validate evidential reasoning,
- Validate ERS to GS and carrier communications,
- Validate cost model for vehicle-borne equipment and end-to-end system,
- Explore trailer and tractor integration issues, and
- Inform the next phase of the effort.

The pilot test goals will be met by:

- Partnering with private industry to assure that the system design and concept of operation are practical;
- Developing a system fully leveraging commercially available systems and technology;

- Developing a system that does local processing of data and exports exceptions to the TBOS for further processing and dissemination;
- Working with a tanker manufacturer to integrate the STSWRF onto the tankers used in the pilot test;
- Demonstrating fuel monitoring, decision making, and reporting on three or more vehicles simultaneously, in a real-world setting, and with minimal additional cost to carriers and government.
- Demonstrating the capabilities of the system to provide useful fuel-tax auditing information;
- Demonstrating the capabilities of the system to provide useful fuel theft information, and
- Collecting and analyzing data to inform decisions for follow-on efforts.

The STSWRF Pilot Test is expected to be complete in 2015.

For more information please contact:
Gary Capps
(865) 946-1285
cappsgj@ornl.gov

Center for Transportation Analysis
2360 Cherahala Boulevard
Knoxville, TN 37932
865-946-1311
Website: cta.ornl.gov