**Trip Report**

Peru Reverse Trade Mission
December 9-13, 2001
Sponsored by the U.S. Department of Energy;
The Gas Technology Institute; and
The U.S. Trade and Development Agency

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## Overview

The U.S. Department of Energy (DOE) Clean Cities Program and the Gas Technology Institute (GTI) hosted a delegation from Peru, December 9-13, 2001 on a Reverse Trade Mission focused on alternative fuel vehicles (AFVs), specifically natural gas vehicles (NGVs). The Peru Reverse Trade Mission included participants hosted by the DOE Clean Cities Program, GTI and the U.S. Trade and Development Agency (TDA). The participants on the Peru Reverse Trade Mission included: Mr. Pedro Touzett, Mr. Anthony Laub, and Mr. Juan Cayo of the Peru Ministry of Energy and Mines; Ms. Elvira Moscoso, Urban Transportation Department of the Municipality of Lima; Mr. David Yamashiro, Mayor of Pucallpa; Mr. David Quintana, private sector representative for bus transportation; Mr. Dante LaGatta, Aguaytia Energy; Mr. Manuel Munoz, Transportation of Chama; and Mr. Luis Avalos, Peru Regulatory Agency. Accompanying the delegation were DOE representatives Marcy Rood, Deputy Director Clean Cities Program and Maria Reidpath, National Energy Technology Laboratory; Mark Perry, GTI; Marsha Hurtado, TDA; Julie Doherty, SAIC; Nancy Checklick, SAIC; and Tommy Foltz, Blue Energy.

The Clean Cities/GTI Peru Reverse Trade Mission was held to bring high-level industry decision makers and business representatives to the U.S. to connect with American companies offering AFV technologies that are efficient, cost-effective, environmentally sound and support principles of sustainable development. The Peruvian delegation represented organizations located in Lima and Pucallpa and have a specific interest in pollution abatement and energy source diversification in those areas.

## Background

Air pollution in Peru is mainly caused by motor vehicles concentrated in the urban areas, such as Lima, Arequipa, Chiclayo and Trujillo. Lima's air quality is extremely poor due to carbon and nitrous oxide contamination in vehicle gas emissions.[i] In 1997, the transportation sector

contributed an estimated 39 percent of carbon emissions.[ii] Contributing to this, Peru had one of the highest rates of regulated and marketed lead content in gasoline in Latin America.[iii]

The Peru National Council of Environment (CONAM) developed an emissions scenario in the study "Mitigation of Greenhouse Gas Emissions in Peru," that stated emissions from the energy and transportation sectors will grow from 27 percent in 1994 to 33 percent in 2010. The study goes on to include greenhouse gas mitigation options, such as conversion of taxis to propane (LPG), energy efficient new vehicles, and electric vehicles. In the CONAM 2002 National Agenda, some of the specific goals on the "brown front" are the renovation of the transportation fleet to retire the use of leaded gasoline, develop standard restrictions for combustion quality, and rearrange urban transport in Lima.[iv]

Due to the large supply of natural gas in Peru, the Peruvian government is looking to the U.S. to help build markets in the residential, commercial, industrial, and transportation sectors. Within the transport sector holding, the potential natural gas market holds 30.6% of the total market share. As of July 2001, U.S. investment in Peru's energy market has been $1.0 billon, including oil and gas exploration, wholesale and retail fuels sales, and electrical generation and distribution. Currently, there are three main areas for gas exploration in Peru: 1) Northwest: Talara; 2) Northeast: Aguaytia, under operation, 440 bcf proven reserves, with 55 Mmcf/day production since June 1998; and 3) Southeast: Camisea, under concession for operation, 11 tcf proven reserves. It is estimated that Camisea could produce up to 500 mcf/day of gas and eventually will provide natural gas to Lima. The pipeline is expected to be completed by 2003.

Over the last decade, the vehicle population of Lima has risen by 71-precent, and the average age of a vehicle is 16-years old. An analysis of Peruvian fuel price differentials and comparison with other countries suggests the most-short-term opportunities for AFVs are for liquefied petroleum gas (LPG, propane) and compressed natural gas (CNG) vehicles. Of Peru's 936,000 vehicles in 1996, 68 percent were located in Lima. Gasoline-fueled vehicles in Lima represent the primary potential market for conversion and/or retrofitting for use with propane and CNG. There were 61,000 registered taxis in Lima in January 1999. Conversions of taxis that are more than 20 years old are not very likely; however, the 31,000 taxis that are less than 20 years old and use gasoline are the prime targets for conversion to alternative fuels. The increase in availability of propane supply stations in Lima and the availability of propane from the developing Camisea gas reservoir will enhance prospects for propane use. Most of the current propane vehicles were imported with the propane fuel use capability already installed. Most current installations are dual fuel, but this could change for vehicles that travel exclusively in Lima, as more propane service stations become available.[v]

As companies including Volvo and Mercedes Benz receive European Government subsidies to market and deploy NGV technology, the Clean Cities International/GTI sponsored Reverse Trade Mission gave fleet operators/purchasers the opportunity to learn more about U.S. NGV technology and potential applications in Peru. Representatives from the Clean Cities Santiago Program also informed DOE Clean Cities representatives that the Municipal Government of the City of Lima purchases used metrobuses from the city of Santiago; they could be using U.S. NGV technology in Lima. Clean Cities Santiago representatives recommended that the DOE Clean Cities International Program host a delegation from Peru in order to increase knowledge in Peru about natural gas buses.

At present, there are two to three LPG refueling stations in Lima. A fleet of mototaxis have been converted to LPG. Lima has a fleet of 10,000 buses, ready for conversion to LPG or CNG once the fuel is available. To assist the growth of AFVs, the Ministry of Energy and Mines (MEM)

recently waived taxes on imported clean vehicles. In addition to the MEM, the U.S.-owned firm Aguaytia Energy is pushing the use of NGVs; first in the city of Pucallpa with the conversion of 20,000 mototaxis.

**Peruvian Interest in DOE Clean Cities**

The U.S. Department of Energy (DOE) and the Peru Ministry of Energy and Mines (MEM) signed a Memorandum of Understanding (MOU) on July 3, 2001 to establish a framework for collaborating on energy issues, with a particular priority placed on natural gas and other clean transportation fuels. To launch to MOU, the DOE Clean Cities International Program participated in the MEM's Clean Cities Peru workshop held on July 12-13, 2001 in Lima Peru. As a result of this workshop, the MEM has formed a committee for "Clean Cities Peru." Clean Cities International would like to continue to develop this relationship with Peru with a Reverse Trade Mission.

Even prior to the Peru Workshop, representatives from Lima expressed interest to DOE in early 2001 regarding possible participation in a Reverse Trade Mission to view U.S. AFV technologies. In response to this request, the DOE Clean Cities International Program issued a grant to the GTI to invite five representatives to the U.S. to view U.S. AFV technology. There were additional requests from the Ministry of Energy and Mines of Peru to increase the size of the delegation. Support from TDA provided travel funding for an additional five representatives to participate on the Reverse Trade Mission, which allowed participation of more fleet operators/representatives with the ability to purchase U.S. AFV technology in the short term.

**Peruvian Participation in the Reverse Trade Mission**

The Peru Reverse Trade Mission was held in Los Angeles and Palm Springs, California. The delegation visited sites of vehicle parts and equipment manufacturers, conversion companies, refueling stations, natural gas distributors, an AFV training facility, and a 100% alternative fuel operated public transit authority. The Mission also included strategic meetings scheduled with industry representatives, other U.S. government agencies, and international organizations such as the Export-Import Bank.

The delegation first visited the Cerritos location of IMPCO, a leading designer, manufacturer and supplier of advanced fuel storage, fuel delivery and electronic control systems that allow internal combustion engines to operate using clean burning gaseous fuels such as hydrogen, propane, and natural gas. IMPCO is a major supplier to original equipment manufacturers in the automotive, material handling industrial and power generation industries. Roberto Sucliff, Director of Americas Southern Region, gave a presentation, in Spanish, to explain IMPCO's products and services, the international markets it serves – including Latin America, and the economics of conversion of vehicles and fleets. While Mr. Sucliff supported the use propane as a fuel, many of the delegates disagreed with its appropriateness in Peru. Mr. Sucliff offered to go to Peru, to learn about the specific needs to convert vehicles to clean-burning fuels, and help apply IMPCO's expertise to Peru's particular situation. The delegates received a hands-on tour of the IMPCO production plant and facilities, led by unit manager, Arnie Santoyo. Mr. Santoyo also spoke fluent Spanish and was able to explain in detail the different parts being manufactured right on the production line, answer technical questions from the Peruvian engineers, and demonstrate some of the parts being constructed and allow the delegates to see, touch, and test the parts.

A visit to Los Angeles-based Southern California Gas Company (SoCal Gas) provided the delegation with a foundation of understanding for how Southern California created an

infrastructure to support a NGV fleet. Steve Anthony and Tony Prietto, NGV Account Managers, explained SoCal Gas is the largest gas utility in the U.S. and has the largest NGV program. They explained how SoCal Gas is regulated by the government and public utility commission. They described the billing system for refueling stations and presented a SoCal gas card for example. In conclusion they provided some "lessons learned" in their experiences in building a NGV fleet and infrastructure and advised the delegation on how they could apply it to their situation.

Mr. Anthony and Mr. Prietto followed this meeting with a visit to a CNG Los Angeles city bus refueling station. This station is one year old and has bays to service four buses. The three compressors have the latest technology and can produce 16,000 pounds of CNG per minute. The delegation received a tour of this facility including the control room and compressors, and watched a bus be refueled in less than five minutes.

The delegation stopped at a public CNG refueling station and watched airport personnel refuel a service van. The van operators spoke fluent Spanish and explained how to refuel the van, demonstrated using the gas card for billing, and answered questions about the van fuel capacity and general operation.

Marsha Hurtado of TDA and Sandra Donzella of the Export-Import Bank gave presentations to the delegation on how their organizations either provide funding or assist in arranging financing for projects.

NGV Ecotrans Group in Los Angeles provided the delegation with a detailed guided tour of the facility. In a single warehouse, a cross-section of NGVs was shown: a refuse hauler, school bus, city bus, passenger cars and trucks. The delegates saw technicians working on each vehicle and were able to ask specific questions about engine conversions and dedicated engines.

A trip to Palm Springs offered the delegation a visit to the College of the Desert. The delegation arrived in a hythane-power bus, courtesy of Sunline Transit Authority. Jack Dempsey, Director of the Energy Technology training Center, gave a presentation describing the school's mission and activities in providing education and training on servicing AFVs. The delegates had a discussion comparing the Peruvian and the U.S. education systems to adjust how similar training could be developed in Peru. Larry Schiell provided a tour of the training facility, demonstrated some of the special training equipment they have set up, such as a "glass engine" where one can actually see the combustion taking place, also a computer program that runs tests on a natural gas engine to see whether it is operating correctly.

Sunline Transit brought the delegation back to its state-of-the-art facility for a presentation on their transit system. The delegation was interested in learning about how the system funds its clean transportation, research and development, and arranges subsidies. Sunline explained cost savings in maintenance, "road calls," and fuel costs (based on an average over the past seven years). A tour of the Sunline facilities showed many different types of alternative fuels and their varied applications in transportation, including CNG, LNG, hythane, and fuel cells.

**Conclusions**

Julie Doherty and Nancy Checklick of SAIC spoke with the Peruvian Delegation throughout the Reverse Trade Mission to discuss next steps for partnering with the Clean Cities Program. The delegation expressed a desire to work with the DOE Clean Cities Program in the following areas:

1) Formation of a training partnership with Clean Cities technical experts for drivers and mechanics of LPG and natural gas vehicles in Peru;

2) Establishing a Clean Cities Peru program;

3) Sharing of information on future Clean Cities events and AFV related events in Peru;

4) Follow-up by Clean Cities International with a phone survey of recommendations.

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[ii] U.S. Energy Information Administration, Country Analysis Brief, Peru, February 2000. http://www.eia.doe.gov/emeu/cabs/peru.html

[iii] World Bank Technical Paper No. 373, *Vehicular Air Pollution: Experiences from Seven Latin American Urban Centers*, September 1997, pg. 77. http://www-wds.worldbank.org/pdf_content/000009265397111014145O/multi_page.pdf

[iv] Consejo Nacional Del Ambiente, Comision Nacional de Cambio Climatico, La Estrategia Peruana de Cambio Climatico. http://www.conam.gob.pe/AEcodi99/CC04.htm#CC04_2

[v] *An Assessment of the Market for LPG and CNG in Peru's Transport Sector*, Boykiw & Company Ltd., Calgary Canada , March 1999. Prepared for the Canadian Industry of Petroleum Development, Comite Especial de Alto Nivel del Proyecto Camisea. http://www.cadvision.com/boykiwa/90726cng.htm