Asia-Pacific Environmental Innovation Strategies (APEIS)
Research on Innovative and Strategic Policy Options (RISPO)
Good Practices Inventory

Introduction of alternative fuel vehicles in Shanghai

Summary of the Practice

Keywords: Alternative fuel vehicles (AFVs), Compressed natural gas vehicles (CNGVs), dedicated fuel vehicles, bi-fuel vehicles
Strategy: Development of environmentally sustainable transport systems in urban areas
Environmental areas: Climate change, Air pollution, Urban environment
Critical instruments: Design, planning and management, Organisational arrangements, Technologies
Country: China
Location: Shanghai
Participants: Government, research and urban planning institution, public transportation corporation, Taxi Corporation
Duration: 1995—ongoing
Funding: Shanghai government, public transportation corporation, Taxi Corporation

Background:

Shanghai is one of the most important industrial and financial metropolises in China. Besides holding a unique economic and geographic position and enjoying rapid economic development, it also has to put up with serious air pollution from coal-burning activities and motor vehicles. In past decades, the major sources of pollution were sulfur dioxide (SO_2) emissions from the burning of coal. In recent years, however, nitrogen oxide (NOx) emissions from motor vehicles have become the primary pollutant.

As a growing city seeking its place in the world of global cooperation, Shanghai is being threatened by air pollution from motor vehicles, negatively affecting its international image. In view of this, Shanghai's Municipal government has decided to develop clean fuel vehicles to replace the traditional gasoline vehicles in the city. As early as 1995, after investigating in other countries the of liquefied petroleum gas (LPG) vehicles, the Shanghai Government authorized its Public Utility Administration to organize the conversion to LPG vehicles for Shanghai's public transportation system.

Objectives:

- Long-range target: to meet the ecological requirements of an international metropolis.
- Medium-range target: to meet the full requirements of National Environmental Quality Standards by 2010 (for air quality, to meet the second level standards).
- Short-term target: to optimize the types of energy used in the transportation sector and lower the concentration of air pollutants in Shanghai city.

Description of the activity:

- In 1997, Shanghai implemented the LPG vehicles Promotion Program and brought in 10,000 LPG/Gasoline bi-fuel Santana Cars built by mass production. Exhaust emission indexes for these kinds of cars were much lower than the national standard of that time.
- In 1998, Shanghai continued with more initiatives in developing LPG vehicles, but another opportunity was already on the way. The "West to East Gas Pipeline," slated to be completed and operational by 2004. It will be a natural gas pipeline from Xingjiang to Shanghai (more than 4,000 km in length) with a capacity of 12 billion cubic meters per year. In anticipation of this development, the Shanghai Government organized a research program to study the development of CNG vehicles in other countries, and began addressing the key technical problems of dedicated CNG vehicles, CNG bi-fuel vehicles and their engines.
- In order to improve the air quality of the downtown areas, Shanghai Government decided to push for the development of green public transportation. In 2000, 70 LPG service stations were built and

about 1000 existing public buses were reconstructed as LPG or CNG fuelled vehicles. The aim is to rebuild all the public buses and taxies in the same way.

- Besides converting existing vehicles, Shanghai Volkswagen Co. Ltd. is cooperating with Shanghai Tongji University in the research of manufacturing technologies for LPG vehicles. This research now becomes part of standard production and service systems, which will provide technical support for the promotion of LPG vehicles.

Critical Instruments

Overview

After studying the experience of other countries regarding AFV development, Shanghai's government implemented a series of development policies in line with market rules to promote the development of clean fuel vehicles. Government has promulgated a series of industrial policies such as preferential benefits involving investments and loans, taxes, pollution fees etc along with an appropriate set of supervisory mechanisms to guide and stimulate private enterprises to develop AFVs. The guideline is that AFVs should be developed according to the rules of a market economy with no monopoly or vicious competition.

Design, planning and management

Medium-term development planning

A medium-term development planning program for AFVs was adopted by the government. So far, there are 70 LPG stations in Shanghai. It is planned that eventually all the buses and taxis will use LPG or CNG.

Organisational arrangements

Establishing LPG Vehicle Promotion Coordination Group

In order to promote the adoption of LPG vehicles in Shanghai, a LPG Vehicle Promotion Coordination Group was established. High-level officials from the Shanghai government provide leadership to the group in order to help coordinate planning, decision-making, and design within the parameters of a transportation system.

Technologies

Technical Regulation

Technical regulations for LPG station were announced dealing with actual situations in Shanghai to ensure maximum safety. At the same time, standard management systems for LPG stations and vehicle retrofit factories were also designed.

Vehicle Development

Shanghai Waltswagen Lmt. Company worked with Tongji University for new LPG vehicle designs and regulations and a study of battery to be used for these vehicles was also conducted.

Impacts

Compared with gasoline and diesel buses, alternative fuel buses have much lower emissions. Of all the liquid or gaseous fuels currently available for commercial transportation, CNG has the lowest level of emissions compared to gasoline, as follows: approximately 19 percent less carbon dioxide emission while producing the same amount of heat; 65 to 90 percent less carbon monoxide; up to 97 percent less non-methane hydrocarbons (NMHC); particulates are virtually eliminated and ozone reactivity from NGVs is up to 80 to 90 percent better than for gasoline emissions. Adoption of alternative fuel buses could definitely contribute to improvement of local air quality.

Lessons Learned

- For cities with a plentiful supply of natural gas, CNGV is a good choice for the reduction of NOx, CO and PM when compared with gasoline vehicles.
- The quality of the clean fuels greatly affects the environmental performances of AFVs. For CNG, the supply sector can usually guarantee the quality of its product. As for LPG, its quality is very changing and unreliable because it comes from many different suppliers. Government should establish quality standards for the clean fuels to guarantee the efficiency of AFVs.
- Advanced Alternative Fuel Vehicles should be adopted rather than the older type technology. The quality of third generation AFVs has advanced considerably. Most of these are now dedicated fuel vehicles characterized by electronic oil-injection, closed loop control and dedicated three-way catalysts.

Potential for Application

Clean fuel vehicles are environmentally sound vehicles that replace traditional gasoline with clean fuels, thus providing a new approach for reducing air pollution from transportation systems. The AFVs development strategy in Shanghai might be applied in similar megalopolis cities wherever a plentiful supply of clean fuels is available around the world.

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