11 SUSTAINABLE CITIES AND COMMUNITIES

LPG is used for a variety of applications in both large cities and in small communities.

In urban centres, LPG is used as Autogas, the third most common automotive fuel globally. Because of its efficiency and emissions profile, use of LPG helps to address environmental air quality issues in cities. Worldwide, around 25 million vehicles are refueled with Autogas at over 70,000 refueling sites.[13] By 2016, according to the WLPGA, there were around 155,000 LPG vehicles in the USA. Some 13,045 new LPG vehicles and fuel systems were sold in 2017 alone, 40% of which were medium or heavy-duty trucks, helping to replace higher emitting diesel trucks.

Autogas - Refueling with LPG

The environmental benefits are clear - LPG is a lower NO_x and greenhouse gas (GHG) alternative to diesel. LPG is also used in vehicles such as street sweepers which are used to help clean the urban environment.

LPG use for cooking is widespread in urban areas in many developing countries, which contributes not only to cleaner household air, but also reduces ambient air pollution, contributing to healthier cities. Many developing countries where LPG is not yet used nationwide are embarking on national programmes to enable and encourage its expanded use for cooking and other purposes in both urban and rural areas.

An LPG-fueled street sweeper to help keep cities clean

LPG is also widely used for heating in both developed and developing countries. Indeed, some of the recent penetration of bio-LPG in the UK by the SHV subsidiary company, Calor Gas, is from its use for home heating purposes. Bio-LPG can be used as a substitute for conventional LPG in existing heating systems, consistent with the UK's emissions reductions goals[14].

LPG-ELECTRIC HYBRID TAXIS – CONVENIENT TRANSPORT FOR CLEANER CITIES

Autogas is a common alternative fuel in the transport sector. Vehicles running on LPG produce far fewer harmful emissions such as NO_x and particulates that contribute to environmental and health problems. The hybridisation of Autogas vehicles combines the benefits of electricity together with a longer range provided by a cleaner fuel. This technology is particularly suitable for taxis in urban areas, contributing to cleaner, more sustainable public transportation in cities.

13CABS in Melbourne, Australia, has equipped its Toyota Camry Hybrid taxis with state-of-the- art sequential vapor injection LPG systems. Both passenger and driver friendly, the Toyota Camry Hybrid integrates the high torque of a battery-powered electric motor with the power of a combustion engine. Results have included payback on conversion of six months, fuel cost savings of up to 45% compared to the gasoline-powered Camry Hybrid, and CO_2 emission reductions by approximately 3.45 tonnes per vehicle. Said Greg Hardeman, Fleet Operations Manager for 13CABS, "While the Toyota Camry Hybrid with its petro-electric drive is already one of the most economical cars in the market, with a tri-fuel system using LPG, the vehicle delivers even more environmental and cost benefits."

In Tokyo, Japan, the JPN taxi was launched in October 2017. This LPG-electric hybrid taxi was designed to provide usability and comfort to a people across all age groups, as well as wheelchair users. In terms of environmental and power performance, the Toyota JPN taxi offers an LPG hybrid system with 19.4 km/liter fuel economy and sharply reduced CO_2 emissions. The city of Tokyo plans to use the JPN Taxi to greet visitors from around the world in 2020, when Tokyo hosts the Olympic and Paralympic Games.

LPG vehicles produce three times fewer NO_x emissions than cars run on gasoline, and 93 times fewer than diesel cars. The South Korean government expects nearly US$317 million to be saved in environmental costs by 2030 through the reduction in emissions, given the expected increase in LPG vehicles[15].

LPG taxis are widespread in South Korea

CONVERTING SCHOOL BUSES TO LPG IN THE USA

LPG school buses reduce children's exposure to harmful air pollution

Given the health risks conventional diesel school buses pose, using LPG buses to transport children to school reduces their exposure to harmful air pollution, offering environmental benefits to their communities. Improving health outcomes for children and young people in turn improves their ability to succeed in education and in life. Some studies have reported links between long-term exposure to ambient levels of particulate matter and NO_x and illness-related school absenteeism. LPG school buses are also quieter, reducing noise pollution.

LPG school buses also save money. There are currently 15,600 LPG school buses in operation across the United States. There are numerous reasons why LPG can be a lower overall cost option than diesel on a total cost of ownership basis - including federal and state incentives which make the fuel cost very competitive, lower maintenance costs, and a lower likelihood of downtime for repairs given the absence of complex after-treatment systems required with diesel engines.

In the state of Nevada, USA, the 48 LPG buses in operation transport 18,400 students daily, saving the state around US$80,000 a year, compared to diesel counterparts. In the Alvin ISD school district, a large suburban area located just outside Houston, Texas which operates more than 100 Autogas school buses, drivers reported a strong preference for using LPG buses, stating improved performance and reduced maintenance times as key factors. In this district, where LPG buses comprise half of the school bus fleet and cover nearly a million miles each year, 50% is saved on fuel costs annually, refueling time has been halved and extended motor oil changes only occur every 10,000 miles, in contrast to every 6,000 miles with diesel-fueled buses.

According to the WLPGA, if the USA's 459,000 school buses currently fueled by diesel are converted to LPG, not only would the children breathe healthier air, but also – based on savings achieved in Nevada through switching school buses to operate on LPG – over a billion dollars per year could be saved.

The city of Tokyo plans to use the JPN Taxi to greet visitors from around the world in 2020, when Tokyo hosts the Olympic and Paralympic Games.