IEA-Advanced Motor Fuels
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CHILE

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Introduction

Chile has considerable potential for implementing energy efficiency measures that would improve the safety of the country's energy supply and achieve significant economic, social, and environmental impacts.

The transport sector represents almost one-third of Chile's final energy consumption, of which 82.6% is due to land transport. Of this energy, 99% is derived from oil, resulting in a high dependence on this energy source, which is mostly imported. Chile produces only 2% of the oil it consumes.

Currently, the Ministry of Energy is working with the Ministry of Transport and Telecommunications to improve energy efficiency gradually in the transport sector. Evidence of this can be seen at the beginning of 2015, when a collaboration agreement between the Ministry of Energy and the Ministry of Transport and Telecommunications was established. The main objective of the work involving the two ministries is to advance legislation, policies, and programs to improve the energy efficiency of the country's vehicle fleet. Together, they will address labelling to show fuel consumption and carbon dioxide (CO_2) values in light-duty and medium-duty vehicles, and buses. They will establish energy consumption standards for light-duty and medium-duty vehicles as a key action to reach the national target of 20% energy savings by 2025.

During 2015, the Secretary of Energy of Chile joined the IEA-AMF, which will allow Chile to work on projects for energy efficiency in the transport sector with international support.

Policies and Legislation: Progress in Transport Regulation

Advances in the development of new energy efficiency regulations during 2015 focused on the followings areas:

- Extension for other vehicle categories of the labeling of vehicular energy efficiency.

The current regulation of energy consumption (Supreme Decree No. 61 of June 2012) includes only light-duty, diesel, and gasoline vehicles up to 2,700 kilograms (kg) to be used for passenger transport. For this reason, during 2015, a regulation for the expansion of vehicular labeling was established, in agreement with the industry. This new regulation will include all light-duty and medium-duty vehicles carrying cargo and passengers

using diesel fuel, gasoline, or hybrid or electric, weighing less than 3,860 kg. This regulation is undergoing revisions and is expected to be issued and published during 2016.

- Advances in obtaining better energy efficiency in Trans-Santiago buses.

Currently undergoing public consultation are regulations updating the plan to reduce pollution gas emissions in the metropolitan area, which will require public transportation buses operating in Santiago to have technology to meet Euro 6 standards in early September 2017.

In order to validate a specific drive cycle for measuring fuel consumption of the new buses that will be in the passenger transport system in Santiago, "Trans-Santiago Buses," the Ministry of Energy and the Ministry of Transport and Telecommunications, and the Mario Molina Center of Chile have been working on obtaining parameters to develop a drive cycle dynamometer chassis to measure these buses, now with the support of the VTT Technical Research Centre of Finland and AMF programs through Annex 53, Sustainable Bus Systems. The main objective is to develop a methodology for setting requirements for clean and energy-efficient buses for use in the tendering process (a process by which the government invites bids for large projects that must be submitted within a finite deadline) for public transport operators in Santiago.

- Draft Energy Efficiency Act

This is currently under development. It is expected that the Act will be delivered to Congress to initiate official proceedings for approval in the second half of 2016. The main target in the transport sector is to improve the energy efficiency of Chile's vehicle fleet in a gradual way.

- Emission and fuel consumption tax for the vehicle market in Chile.

The "green tax" law has been in effect since January 1, 2015, for new purchases of light-duty and medium-duty vehicles. The tax is calculated based on a vehicle's efficiency and emissions of nitrogen oxides (NOx), and it complements the labelling system. Exemptions from this tax include purchases of light-duty trucks and vans for commercial and working purposes. The tax for fuel economy is relatively small for vehicles with a fuel economy of more than approximately 15 kilometers per liter (15 km/L); however, it becomes more significant as fuel economy goes below 15 km/L. The tax is showing impacts on diesel vehicles sales, with a 45% drop in January of 2015 in comparison with the same month in 2014.

Implementation: Use of Advanced Motor Fuels

Electric Taxis in Santiago

Chile is making a great effort to introduce electric mobility to Santiago. In 2014, the Ministry of Transport and Telecommunications started a new tendering process for taxis in the metropolitan area. To encourage the purchase, the government subsidizes one-fifth of the electric car's value. Since December 2015, the first electric taxis (3) are being driven through the streets of Santiago. These cars are from green tech company BYD's factory. They can accommodate five people, have a range of 250 km, and are 100% electric. Total charge takes around 4 hours. It is expected that there will be 68 electric taxis in Santiago in the next 3 to 4 years.

Government-Provided Incentives for Taxis That Comply with Energy Efficiency Requirements

In June 2015, the Ministry of Transport and Telecommunications established a special program to subsidize collective taxis. Collective taxis, or group taxis, are shared by four persons. Owners of collective taxis can apply for this program if their vehicle is at least 4 years old. In addition, the vehicle must have technology improvements in fuel economy, safety, and emissions.

Research

Study of Health and Environmental Impacts of Exhaust from Biofuels

During 2014 and 2015, the Ministry of Transport and Telecommunications, through the Center for Vehicle Control and Certification (3CV Center), together with Centro Mario Molina Chile and the Harvard School of Public Health, developed a study to advance the current understanding of the health and environmental impacts of biofuels compared with traditional petroleum fuels. The study was funded with a grant from Interamerican Developing Bank as part of the development of its new Climate Change Strategy. The Bank has identified sustainable biofuels as a priority area.

The study examined the health effects of exposure to ambient vehicular exhaust and systematically investigates the biological outcomes of exposure to exhaust fumes from vehicles burning different fuels. An objective of the study was to determine the toxicity on the pulmonary and cardiovascular system resulting from exposure to primary and secondary particles formed from vehicular combustion of various formulations of biofuels.

Main activities were as follows:

- Testing of each of the specific hypotheses by generating fresh and photochemically aged vehicle exhaust from a variety of different fuels. Using the chassis dynamometer and emissions testing equipment, 3CV Center generated fresh exhaust from vehicles fuelled with different blends of gasoline and biofuels. Exhaust emission was irradiated in a photochemical chamber to simulate atmospheric aging of vehicle emissions and the formation of secondary organic aerosol (Figure 1).
- Characterization of the physicochemical properties of primary and secondary particles. Particle exposures were characterized using integrated measurement of particulate matter (PM), trace elements, elemental carbon/organic carbon (EC/OC), water soluble OC, and some specific organic species (polycyclic aromatic hydrocarbons [PAHs], hopanes, and stearanes).
- Exposure of an animal model to well-characterized PM. A toxicity test was performed in Boston. Particulates of the various formulations collected on filters in Chile were extracted, dispersed, and insufflated in rats.
- Assessment of biological effects. In vivo chemiluminescence was performed on the rats. The lung and the heart were analyzed in order to assess the response of PM exposure.

Fig. 1 Chamber for Photochemical Aging of Vehicle Primary Emission

The most important findings of the Health and Environmental Impacts of Gasoline/Biofuels blends are the following:

- All gasoline-ethanol formulations generate particles that are harmful to health.
- Toxicity for primary and secondary particles is similar. This is an important finding, because until now the focus of regulation has been on primary emissions.
- Brazilian BR22 blend generates more ozone and secondary particles, in number and mass.
- U.S. E85 and E10 blends generate secondary particles with higher toxicity.
- E10 and BR22 blends generate primary particles with higher toxicity.