

Feasibility Study for Implementation of Natural Gas Vehicle Conversion Projects for the Mexico City Metropolitan Zone

This study was presented to the Mexico City Metropolitan Commission for Pollution Prevention and Control, the US Trade and Development Agency, and Power Design International, Inc., in September 1994.

Findings:

The Mexico City Metropolitan Zone (ZMCM) is the largest metropolitan area in the world with over 15 million inhabitants living in an area of only 1,292 square kilometers. Air pollution is a serious public health problem.

Air pollution in the ZMCM exceeds 5 million tons per year. Over 75 percent of total emissions are from vehicles. Vehicles contribute over 95 percent of all carbon monoxide emissions, over 80 percent of total hydrocarbon emissions, about 40 percent of nitrogen oxide emissions and a significant, but unquantified, fraction of the emissions of fine (less than 10 micron) particulate. The highest emissions are from older vehicles that often have no emission controls.

This implementation plan defines vehicles as the major cause of air pollution in the ZMCM. The Plan recommends a comprehensive, yet cost-effective air quality improvement program designed to reduce mobile source emissions by at least 1.3 million tons per year -- an estimated reduction in total emissions of more than 20 percent. Phased replacement of older fleet vehicles with clean, natural gas vehicles is extremely cost-effective since medium- and heavy-duty trucks and buses are either replaced or re-powered every 6 to 12 years.

Recommendation: A Five-Year Plan

The plan recommends a comprehensive program of incentives, mandates, regulations, technology transfer activities, and public education, training and fiscal stimuli to encourage and facilitate private and public investment in natural gas vehicles (NGV) and NGV fueling infrastructure. Over a five year period, the program is structured to stimulate investment of over \$550 million in vehicle conversions, over \$450 million in fueling infrastructure, and about \$11 million in market preparation and promotional activities.

Implementation Plan Details

The plan recommends an aggressive five year program to re-power or replace gasoline or diesel powered fleet vehicles with engines converted to use clean burning natural gas. About 140,000 medium- and heavy-duty trucks and buses and over 700 private and public access fuel stations would be converted to natural gas -- either through

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vehicle retrofits or purchase of original equipment from manufacturers (OEM). The program is structured to concentrate on three classes of vehicles:

- 1) Privately owned trucks using on-site fuel stations,
- 2) Private trucks using public access fueling stations, and
- 3) Passenger buses.

Investment in fueling stations is scheduled to match the growth in the NGV fleet.

The program recommends installation of 321 timed-fill NGV fuel stations and 397 fast-fill NGV fuel stations. During the first three years of the program, emphasis would be placed on construction of NGV fueling stations at private freight terminals and conversion of commercial trucks that operate exclusively in the ZMCM. Private, on-site stations constructed in the early years of the program would tend to serve only one fleet, would be smaller, and use less expensive timed-fill technology. As the vehicle conversion program ramps up, more investment would be channeled to the larger and more expensive, public access, fast-fill NGV fuel stations. Stations would be served by pipeline or liquefied natural gas (LNG), as appropriate.

The implementation plan provides an overview of the status of NGV programs in several countries and a detailed summary of the regulations, incentives and mandates associated with NGV programs in four countries -- the United States, Argentina, Italy and Canada. The plan recommends a schedule of activities to be implemented by government agencies and private entities to promote conversion to NGV's. Cost models, cost-benefit analysis and a proposed strategy for financing conversion are presented.

The plan provides a detailed overview of technical properties of compressed natural gas and LNG. Safety standards and regulations are presented. Summary specifications for fueling station equipment, fuel storage systems and engine conversions systems are provided.