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LPG FOR HOUSEHOLD USE IN GUATEMALA

FINAL REPORT

**For
The World Bank Group**

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List of Abbreviations

ANSI,	American National Standards Institute
API	American Petroleum Institute
ASME	American Society for Mechanical Engineers
ASTM	American Society for Testing and Materials
COGUANOR	Comisión Guatemalteca de Normas
DGH	Dirección General de Hidrocarburos
DL	Departamento de Licencias
DTD	Departamento de Transformación y Distribución
DWT	Deadweight Tonnes
HSE	Health, Safety and Environmental
IVA	Impuesto de valor agregado
LPG	Liquefied Petroleum Gas
MEM	Ministry of Energy and Mines
MBL	Thousands of barrels
MMBL	Millions of barrels
NFPA.	National Fire Protection Association
NGO	Obligatory Norms
NGR	Recommended, voluntary norms
Q.	Quetzal
SG	Sección Gas
TNRC	Texas National Resource Code

LPG FOR HOUSEHOLD USE IN GUATEMALA

EXECUTIVE SUMMARY

Introduction

LPG is a fuel of increasing importance in Guatemala. In addition to already being the cooking fuel of preference for urban households it is increasingly being looked to as the rural household fuel which could diminish, if not replace, the dominant fuel wood use in rural areas with the associated environmental benefits. However, because low cash income households find it difficult to purchase LPG on a regular basis, it is important to ensure that end-user LPG prices are as close as possible to “best practice” levels for comparable market environments elsewhere; economically inefficient higher prices would otherwise constrain the penetration of LPG use into household markets lower down the income scale.

This summary covers the main issues and attendant conclusions and recommendations.

Institutional and Regulatory Framework

The regulatory framework for the Guatemala’s hydrocarbon subsector was substantially reformed by the new Marketing of Hydrocarbons Law of 1997 and its General Regulation which include LPG as one of the petroleum products and subjects it to the general HSE rules and a few special provisions for the licensing of LPG storage, transport and distribution facilities and operations. Otherwise, a specific regulatory framework for LPG does not exist in Guatemala.

According to the applicable legislation, COGUANOR is the only government body in Guatemala authorized to prepare and issue norms and standards. However, in practice, confusion has been caused due to the fact that various other government entities, including the MEM, are adopting international standards or have put in effect other instruments which are called norms, but frequently are mixtures of technical standards, regulations and manuals of procedure. According to Art. 71 of the Marketing of Hydrocarbons Regulation No. 522 of 1999 the DGH, as the enforcement agency for the hydrocarbon subsector, is authorized to issue instructions, manuals and circulars relative to the publication and compliance with quality specifications, HSE rules, inspection procedures and other requirements as to the location, construction, operation, maintenance of petroleum installations. ***The relationship between those overlapping rule making authorities should be clarified by legislative action.***

The regulatory framework for the petroleum sector in general, and specifically for the LPG supply consists to a large extent of general references to international standards. In practical terms, the generality of those references makes it nearly impossible for the users as well as the enforcement agency to define the exact rules for each particular case. This creates a high degree of uncertainty for the operators and leaves too much discretion within the inspection and sanctioning process.

In highly developed jurisdictions, such as most of the US States and European countries as well as in a few developing countries, the successful approach has been to issue general regulations which define the institutional attributions, licensing

requirements and enforcement authorities with relatively few technical specifications. The latter are covered by the formal adoption of internationally accepted norms and standards under the respective general legislation. The adoptions are made by specific, rather than general, references to individual standards and codes of practice and include exceptions and other adaptations according to local requirements.

Market Structure and Competitiveness

The LPG market in Guatemala is dominated by the two Mexican Zaragoza family groups TOMZA (Tomás Zaragoza) and ZETA (Miguel Zaragoza). In the past 18 months ZETA has followed an aggressive business strategy incorporating logistics, pricing, vertical integration, acquisitions and market penetration. The logistics and market positions of the two dominant companies are so strong that it is difficult to envision the possibility of any new entrants to the market, particularly while ZETA is in the price-cutting mode. In view of those circumstances, the main issue of some concern to DGH officials was that of *excessive market concentration*, ***Although this market concentration has led to potential for market control and reduced competition, it has not as yet manifested itself in higher margins and prices. The caution to both DGH and anti-monopoly authorities, would be to remain vigilant to possible future moves to increase margins and prices to monopolistic market levels.***

Commercial Malpractice

Besides the critical issue of excessive market concentration, two additional issues were raised with DGH officials:

1. *Short selling of LPG.* The Sección Gas (SG) of DTD has responsibility for the supply/distribution chain up to and including the filling of cylinders, and had no record of any systematic malpractice. The Departamento de Licencias (DL) has the responsibility downstream of this and they had no records confirming any major problem at this level.
2. *Smuggling of new LPG cylinders out of Guatemala to neighboring countries.* This was not highlighted as a major problem by either DGH officials or the operators in relation to the overall problem of maintenance and renewal of the cylinder stock in general.

Price/Margins Benchmarking

Our comparison of LPG small cylinder prices ex-tax in several countries indicated that LPG prices in Guatemala in recent months have fallen sharply relative to other countries as a result of strong price-cutting practiced by ZETA who has set the objective of capturing 75 percent of the Guatemalan LPG market. As such, imputed margins for supply and distribution of the product to final consumers rank among the lowest in the region at present. If these low margins are sustained over a long period, LPG pricing in Guatemala can be said to represent “best practice”.

Safety and Environmental Protection

The existing legislation and regulations provide the DGH with wide ranging authority and sufficiently defined faculties for supervision, inspections and sanctions of the supply

chain of all products, including LPG. By adopting the principal international standards by specific reference, it could maintain a very efficient enforcement system, if it had the necessary political support, sufficient manpower and technical means. ***The present personnel and other resources of the DGH appear, however, to be insufficient to inspect and control the installations and operations of the LPG supply chain with appropriate frequency and rigor.***

Upgrading of Cylinders

The ownership of the cylinders in Guatemala has not been established by law or regulation or in any other fashion. Although the total stock of cylinders is estimated at about 4 million, nobody really knows with precision how many cylinders exist and how much repair and replacement is needed. Any cylinder may be filled at any filling plant, regardless of its color or markings. No rules exist for the exchange of cylinders or any related mechanism, and no formal exchanges between companies need to take place because cylinder ownership has not been defined. No rules exist concerning the painting or marking of cylinders for identification purposes. However, the distribution companies paint their cylinders in different colors in order to create their identity in the market place. In spite of regulations establishing quality and maintenance standards for LPG cylinders, the lack of ownership definition means that there is no legal responsibility defined to maintain and/or repair the cylinders and valves

In the worldwide LPG business there are two principal methods of cylinder ownership: LPG company owned and customer owned.

- a) *Company owned*: When the company owns the cylinder it either loans or leases it to the customer. The customer exchanges an empty cylinder for a full one paying only for the gas. The company is responsible for filling and supplying safely maintained cylinders. It is common to have the owner's investment secured through a system of *refundable deposits or guarantees in cash*.
- b) *Customer owned*: There are two modalities common here:
 - 1) Centralized cylinder filling and distribution system. Upon replenishment, the customer exchanges a legally owned cylinder for one of like kind. Since the customer does not have physical possession of the same cylinder brought to the exchange transaction, he is not responsible for replacement at the end of the cylinder's useful life. In this instance, the LPG supplier has the responsibility of maintenance and replacement, since the initial cylinder is somewhere in the inventory "float".
 - 2) Bulk distribution, "mini-filling plant" system. The customer has a personally identified cylinder and brings it to the local filling plant to be filled and then taken away. He retains the same cylinder through its life and is responsible for any maintenance or replacement. The key safety element here is the diligence of the mini-plant operator in rigorously inspecting and rejecting as necessary any sub-par cylinders. The customer with a sub-standard cylinder must be refused a filling, unless he acquires a new cylinder. In this case, the filling plant or its supplier would have the responsibility to recycle or dispose of the used cylinder in an appropriate manner.

Guatemala fits the case b) 1) since it has been the practice in Guatemala to sell LPG cylinders to final consumers. Looking at countries in the region, both Chile and Brazil have system a) – Company owned with refundable deposits. The two principal countries which have case b) 2) - the bulk distribution system with localized filling plants are USA and Canada.

Chile System: One of the positive features of the company-owned, refundable deposit system of Chile are clear rules and regulations on the interchangeability of cylinders of the different companies. This means that each operator is assured of retaining most of his cylinder stock for his own use, thus making it worthwhile for him to spend money from his margin on cylinder rehabilitation and replacement. ***It is strongly recommended that Guatemala investigate the possibility of converting its cylinder management system to something like that of system a) using the Chile regulatory framework as a model.***

Comparative Equipment Startup Costs

The current retail price of a 25 lb. cylinder and appurtenances is some \$ 32, while the same cylinder plus a basic 2 burner stove amounts to \$54. ***This compares well with prices for the same type of equipment in the developing world and is much lower than comparable equipment in North America.***

Ways to Enable the Poor to Take Up LPG

There are several determinants of the propensity of a consumer to take up LPG as a household fuel vs. other traditional biomass. Household income is the single most important determinant. Even within the “higher” rural income brackets, a marketing campaign would probably have to include mechanisms such as micro-credit programs and promotional discounts to ease the financing of the start-up equipment package. As for the bottom half of rural households, it is difficult to see how people in this income bracket, largely outside the cash economy, could be considered as serious targets for an LPG marketing campaign, since they wouldn’t have sufficient sustainable cash income to buy the commodity on a continuous basis. ***For this segment of the population, the goals of poverty alleviation and reducing indoor air pollution may have to be pursued through a program of development and propagation of economical, more efficient, less-polluting fuel wood stoves.***

A typical informal arrangement by the appliance retailer in Guatemala would divide the price into 3 monthly payments of US\$ 23 for the basic US\$ 54 package. Such a startup cost outlay should be manageable by the highest 20% rural income bracket, but may require some additional support for the lower brackets. The LPG supplier himself could develop financing mechanisms to have the consumer pay an additional sum in his cylinder re-fill purchases over a more extended period, say 12 months. ***There also may be micro-credit financing mechanisms which could be developed through existing rural organizations such as co-operatives. Large promotional discounts on the startup equipment package could also be considered. It is not recommended, however, to consider any subsidies to the commodity itself.*** The LPG suppliers themselves could possibly justify giving a grant to the consumer as part of a medium to long term market development business plan. Assuming the LPG supplier reaps the benefits of additional market share through enhanced economies of

scale and attendant reduced unit costs in his logistics infrastructure, the initial promotional discount on the equipment could prove to be an “investment” to be recouped over time. It would be amortized through profit on sales and reduced unit costs over a certain project life cycle.

GLP PARA USO DOMESTICO EN GUATEMALA

RESUMEN EJECUTIVO

Introducción

El GLP es un combustible de importancia creciente en Guatemala. Además de ser el combustible preferido para la cocción en domicilios urbanos, lo están considerando también en más domicilios rurales, reemplazando o, por lo menos, reduciendo el uso dominante de leña con los beneficios ambientales asociados. Sin embargo, porque los domicilios de ingresos bajos (en efectivo) lo encuentran difícil comprar el GPL en forma regular, es importante asegurar que los precios del GPL del consumidor final estén tan cerca posible a los niveles de “mejores prácticas” para mercados comparables, porque precios económicamente ineficientes y elevados restringirían la penetración del uso del GPL en los mercados domiciliarios de ingresos bajos.

El siguiente resumen refleja las materias principales del estudio y las respectivas conclusiones y recomendaciones.

Marco Institucional y Regulatorio

El marco regulatorio del subsector de hidrocarburos de Guatemala fue reformado sustancialmente por la nueva Ley de Comercialización de 1997 y su Reglamento General que incluyen el GLP como uno de los productos petroleros y lo sujetan a las reglas general de protección de salud, seguridad y medio ambiente así como a algunas disposiciones especiales para las licencias de instalaciones y operaciones de almacenamiento, transporte y distribución del GLP. Además de esto, no existe un marco regulatorio especial para el GLP en el país.

Según la legislación aplicable, COGUANOR es el único organismo gubernamental en Guatemala autorizado a elaborar y promulgar normas y estándares. Sin embargo, en la práctica se ha causado confusión debido al hecho de que varias otras entidades del gobierno, incluyendo el Ministerio de Energía y Minas, están adoptando estándares internacionales o han promulgado otros instrumentos que se llaman normas, pero frecuentemente son mezclas de estándares técnicos, reglamentos y manuales de procedimientos. Según artículo 71 del Acuerdo No. 522-99, Reglamento de la Ley de Comercialización de Hidrocarburos, la Dirección General de Hidrocarburos (DGH) está autorizada a emitir instructivos, manuales y circulares relativas al conocimiento y al cumplimiento de las disposiciones de seguridad, calidad, y los procedimientos de inspección física sobre la ubicación, la infraestructura y la operación técnica de las diversas instalaciones petroleras. ***La relación entre estas autorizaciones regulatorias conflictivas deberá ser clarificada por un acto legislativo.***

El marco regulatorio para el subsector de hidrocarburos en general y para el suministro de GLP en particular consiste a gran medida de referencias generales a estándares internacionales. En términos prácticos, la generalidad de éstas referencias lo hace casi imposible para el usuario igual como para el fiscalizador definir las reglas exactas para cada caso particular. Esto crea un alto grado de incertidumbre para los operadores y deja demasiado discreción dentro del proceso de inspección y sanción.

En jurisdicciones altamente desarrolladas, como la mayoría de los Estados Americanos

y los países Europeos, así como en algunos países en vías de desarrollo, la solución más exitosa ha sido la promulgación de reglamentos generales que definen las atribuciones institucionales, requisitos de licencias y autoridades de fiscalización con relativamente pocas especificaciones técnicas. Las últimas se cubren por medio de la adopción formal, según la legislación general, de normas y estándares aceptadas a nivel internacional. La adopción no se efectúa por referencia general, sino por referencia a estándares y códigos de prácticas individuales y incluye excepciones y otras adaptaciones según los requisitos locales.

Estructura del Mercado y Competitividad

El mercado de GLP en Guatemala está dominado por dos grupos de la familia Zaragoza de México, TOMZA (Tomás Zaragoza) y ZETA (Miguel Zaragoza). Durante los 18 meses pasados, ZETA ha seguido una estratégica agresiva incorporando aspectos de logística, precios, integración vertical, adquisiciones y penetración de mercados. Las posiciones en el mercado y la logística de las dos empresas dominantes son tan fuertes que parece difícil imaginar la posibilidad de nuevas entradas en el mercado de GLP, particularmente mientras ZETA mantiene su ánimo de cortar precios. En vista de dichas circunstancias la materia principal de preocupación de los funcionarios de la DGH es la concentración excesiva en el mercado. ***Mientras esta concentración ha creado el potencial de control del mercado y reducción de competencia, todavía no se ha manifestado en márgenes y precios más altos. El consejo a ambos, la DGH y las autoridades anti-monopólicas, sería mantener la vigilancia de tendencias futuras de aumentar márgenes y precios a niveles de un mercado monopolista.***

Prácticas Comerciales Fraudulentas

Además del aspecto crítico de concentración excesiva en el mercado, se trataron dos materias adicionales con los funcionarios de la DGH:

3. *Llenado insuficiente de cilindros (“short selling”) de GLP.* La Sección Gas de la DGH teniendo la responsabilidad para la cadena de suministro hasta e incluyendo las envasadoras no tiene evidencia de abuso sistemático. El Departamento de Licencias, responsable para el resto de la cadena, tampoco tiene evidencia de mayores problemas a este nivel.
4. *Cilindros nuevos como contrabando de Guatemala a países vecinos.* Los funcionarios de la DGH y los operadores no destacan esto como un mayor problema en comparación con el problema general de mantenimiento y reposición del inventario de cilindros.

“Benchmarking” de Precios y Márgenes

Nuestra comparación de precios del GLP en cilindros pequeños sin impuestos en varios países indica que Guatemala en la actualidad parece ser de “mejor práctica” en términos de márgenes imputados para suministro del producto al consumidor final.

Seguridad y Protección Ambiental

La legislación y regulación vigente establece amplia autoridad y facultades

suficientemente definidas de la DGH para la supervisión, inspecciones y sanciones de la cadena de suministro para todos los productos, incluyendo el GLP. Por la adopción de los principales estándares internacionales por referencia específica podría mantener un sistema de fiscalización muy eficiente si tuviera el soporte político necesario, suficientes recursos humanos y medidas técnicas. ***Sin embargo, el personal y otros recursos actuales de la DGH parecen insuficientes para inspeccionar y controlar las instalaciones y operaciones de la cadena de suministro de GLP con la frecuencia y el rigor apropiado.***

Mejoramiento de Cilindros

La propiedad de cilindros en Guatemala no ha sido establecido por ley, regulación ni de ninguna otra manera. Mientras el parque total de cilindros en circulación se estima en unos 4 millones, nadie realmente sabe con precisión cuantos cilindros existan y cuantos requieran reparación o retiro. Cualquier cilindro puede ser llenado en cualquier envasadora, irrespectivamente de su color y rotulado. No existen reglas para el intercambio de cilindros ni mecanismos relacionados y no se requieren intercambios formales entre empresas porque no esta definida la propiedad de los cilindros. Tampoco existen reglas para el pintado de cilindros para propósitos de identificación. Sin embargo, las empresas distribuidoras están pintando cilindros en colores diferentes para crear su identidad en el mercado. A pesar de los estándares de calidad y mantenimiento establecidos para cilindros de GLP por los reglamentos vigentes, la falta de la definición de propiedad significa que ninguna responsabilidad legal existe para mantener y/o reparar los cilindros y válvulas.

En el negocio mundial de GLP se usan dos sistemas principales de propiedad de cilindros: Propiedad de la empresa de GLP o propiedad del usuario:

- c) *Propiedad de la empresa*: La empresa presta o renta el cilindro al usuario. El usuario intercambia el cilindro vacío por uno lleno pagando solamente para el gas. La empresa queda responsable para suministrar y envasar cilindros mantenidos según estándares vigentes. Típicamente la inversión del propietario queda asegurado por un *sistema de depósitos o garantías reembolsables en efectivo*.
- d) *Propiedad del usuario*: Aquí hay dos modalidades comunes:
 - 3) Sistema de envasado y distribución centralizado: En la planta envasadora el usuario intercambia un cilindro de su propiedad legal por otro del mismo tipo. Como el usuario no retiene la posesión física del mismo cilindro que trajo a la transacción de intercambio, no queda responsable para su retiro al final de la vida útil del cilindro. En este instante el abastecedor del GLP tendrá la responsabilidad de mantenimiento o reposición porque el cilindro inicial se encuentra en su inventario "flotante".
 - 4) Sistema de distribución a granel con "mini envasadoras": El usuario tiene su cilindro identificado individualmente, lo trae a la envasadora local y se va con su cilindro llenado, quedándose con el mismo cilindro por su vida útil y la responsabilidad de cualquier mantenimiento o reemplazo. Aquí el elemento clave de seguridad es la diligencia del envasador en la inspección rigurosa y rechazo necesario de cualquier cilindro que no cumpla con los estándares

mínimos. Se debe rehusar el envase al usuario si no adquiere un cilindro nuevo. En este caso la envasadora o su abastecedor tendrá la responsabilidad de reciclar o disponer del cilindro usado en la manera apropiada.

Guatemala corresponde al caso b) 1) como ha sido la práctica vender los cilindros de GLP al usuario final. Se observa que otros países de la región, como Chile y Brasil, usan el sistema a) – propiedad de la empresa con depósitos reembolsables. Los dos países principales que usan el sistema b) 2) – distribución a granel con mini envasadoras, son los EEUU y Canadá.

Sistema de Chile: Uno de los aspectos positivos de sistema de propiedad de empresa con depósito reembolsable de Chile son las reglas claras acerca de la intercambiabilidad de cilindros de las diferentes empresas. Esto significa que cada operador está asegurado de retener la mayoría de su parque de cilindros para su propio uso, valiendo la pena gastar dinero de su margen para la rehabilitación y reposición de cilindros. ***Se recomienda fuertemente que Guatemala investigue la posibilidad de convertir su sistema de manejo de cilindros a algo similar al sistema a), usando el marco regulatorio de Chile como modelo.***

Comparación del Costo Inicial de Equipo

El actual precio de venta al menor de un cilindro de 25 libras y accesorios es alrededor de \$32, mientras el mismo cilindro más una estufa básica de dos quemadores cuesta hasta \$54. ***Esto compara bien con los precios del mismo tipo de equipo en el mundo en desarrollo, y es mucho más bajo que el costo de equipo comparable en América del Norte.***

Medidas para Facilitar el Uso de GLP por los Pobres

Hay varios factores determinantes de la propensión de un consumidor de usar el GLP como combustible doméstico en vez de la biomasa tradicional. El nivel de ingreso familiar es el factor determinante más importante. Hasta en el grupo de ingreso rural “alto”, una campaña de mercadeo tendría probablemente que incluir mecanismos como programas de “crédito micro” o descuentos promocionales para facilitar el financiamiento del equipo inicial. Para la mitad de domicilios rurales de ingresos más bajos es difícil imaginar cómo gente de este grupo, en su mayoría al margen de la economía de ingresos en efectivo, podría ser una meta seria para el mercadeo de GLP, como no tendría suficientes ingresos sustentables en efectivo para comprar el producto en una manera continua. ***Para este segmento de la población las metas de alivio de pobreza y la reducción de la contaminación intramural de aire tendrían que ser perseguidas por un programa de desarrollo y promoción de estufas de combustión de leña más económicas, eficientes y menos contaminantes.***

Un arreglo típico por los proveedores de estufas en Guatemala es la división del precio en tres pagos mensuales de US\$23 para el paquete básico de US\$54. El gasto de este costo inicial debería ser manejable para los 20% de los ingresos rurales más altos, pero probablemente requiera soporte adicional para los grupos de ingresos más bajos. El mismo abastecedor del GLP podría desarrollar mecanismos de financiamiento con el usuario pagando un monto adicional con cada compra de relleno de su cilindro por un período más extendido, como hasta 12 meses. ***También podría desarrollarse***

mecanismos de financiamiento por medio de organizaciones rurales existentes, como las cooperativas. Descuentos promocionales importantes para el paquete inicial de equipo también se podrían considerar. Sin embargo, no se recomienda subsidios directos para el mismo gas. Los abastecedores del GLP posiblemente podrían justificar una contribución al consumidor como parte de su plan de desarrollo del mercado a mediano o largo plazo. Asumiendo que el abastecedor del GLP obtendrá beneficios de un aumento de su participación en el mercado por el mejoramiento de economías de escala y la reducción asociada del costo por unidad en su infraestructura logística, el descuento promocional del equipo inicial podría representar una “inversión” recuperable por transcurso del tiempo. Sería amortizado por las ganancias de las ventas y costos reducidos durante el ciclo de vida del proyecto.

LPG FOR HOUSEHOLD USE IN GUATEMALA

1.0 INTRODUCTION

LPG is a fuel of increasing importance in Guatemala. In addition to already being the cooking fuel of preference for urban households it is increasingly being looked to as the rural household fuel which could diminish, if not replace, the dominant fuel wood use in rural areas. Due to indoor air pollution associated with the use of this biomass resource as a cooking fuel, there are definite health hazards associated with its use. In addition, the excessive cutting of fuel wood may lead to localized and/or widespread deforestation with attendant soil erosion and watershed contamination implications.

Because LPG demand is a strong function of income, and among low income households the demand in turn is strongly price elastic, economically inefficient higher prices would constrain the penetration of LPG use into household markets lower down the income scale. Whether or not the end-user LPG prices in Guatemala are markedly higher than best international practice benchmark levels is therefore an important question to examine. Factors that might contribute to prices being higher might include the following:

- Excessive market concentration, leading to possible market control and reduced competition;
- Fraudulent practices such as short-selling of LPG
- Smuggling of new LPG cylinders out of Guatemala to neighboring countries; this causes excessive costs to the industry and constrains their investment in new cylinder stocks, which they would need in order to support market growth/penetration.

It is in this context that the consultant, William G. Matthews, of Ottawa, Canada was requested by the World Bank to undertake a diagnostic assessment of the LPG industry and market in Guatemala. The main objective of the study is to examine the structure of the LPG market, benchmark the current LPG price level against international best practice, and, should the price level be found to be significantly higher, suggest ways of lowering it. In addition, the analysis will address various forms of commercial malpractice in the market and propose measures for tackling them. Special attention will be paid to the role of the policy framework. Lastly, this study will comment on the safety regulations governing the LPG market in Guatemala, review potentially dangerous practices and briefly assess safety records, and highlight areas where the government needs to address in the future.

This report includes an assessment of the sector, including policy, legal, regulatory & institutional framework, industry/market structure, and costs & prices. In addition it identifies and comments on, the consultant's understanding of the problems to be addressed. The consultant has been assisted in this work by Dr. Hilmar Zeissig of Houston International Business Corporation

The main field mission was undertaken by Mr. Matthews, May 5 through 10, 2002. Following review, revision and acceptance of the Final Report, including Executive Summary in both English and Spanish, the consultant will schedule a second mission to present the study findings.

2.0 CURRENT STATE OF THE MARKET

2.1 Policy Framework

Until 1992, the hydrocarbon supply chain of Guatemala was under strict government regulation and control based on the old Petroleum Law No. 130 of 1983. The State had the import monopoly, the Texaco owned refinery operated with guaranteed margins, and prices and margins for distributors, transporters and retailers of petroleum products were set by the government. The reform of the supply system was initiated in 1992 with the liberalization of imports. The refinery remained under a concession agreement which is valid until 2002 and provided, among other advantages, a protective import duty of 10% for refined products. However, this protection was eliminated during the fourth quarter of 1999.

The regulatory framework for the subsector was substantially reformed by the new Marketing of Hydrocarbons Law (“Ley de Comercialización de Hidrocarburos”, Decreto No. 109-97 del 26-XI-1997) and its General Regulation (Decreto No. 522-99 of 22-VII-1999). The law includes LPG as one of the petroleum products and subjects it to the general health, safety and environmental protection (HSE) rules and a few special provisions concerning the LPG supply chain. The Regulation contains detailed licensing and general HSE provisions for the supply installations and operations for all petroleum products, as well as a number of special rules for the licensing of LPG storage, transport and distribution facilities and operations. Otherwise, a specific regulatory framework for LPG does not exist in Guatemala.

The Dirección General de Hidrocarburos (DGH) of the Ministry of Energy and Mines (MEM), as shown in Figure 1, is in charge of the implementation and enforcement of the regulatory framework for the subsector. The organization of the departments and sections of the DGH was originally created by the regulation of the law which established the Ministry (Acuerdo Gubernativo No. 73 of 10-II-1984). The present structure reflects the changes in the regulatory framework, the petroleum infrastructure and the market conditions which eliminated certain tasks of the DGH, changed others and created new ones as shown in Figure 2.

GUATEMALA: MINISTERIO DE ENERGIA Y MINAS



Figure 1

**GUATEMALA: MINISTERIO DE ENERGIA Y MINAS
DIRECCION GENERAL DE HIDROCARBUROS**

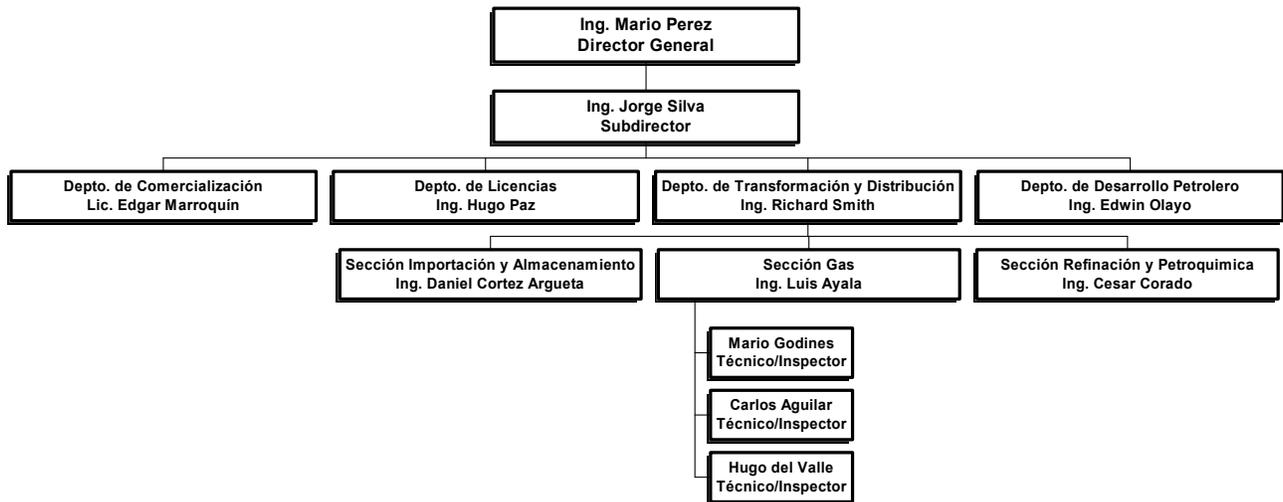


Figure 2

2.2 Consumption and Supply of LPG

2.2.1 Consumption

The total consumption of LPG in 2001 was 2.223 MMBL, up from 1.772 MMBL in 1996 for an average annual increase of 4.6% over this 5 year period. The share of the market in Guatemala in year 2001 by principal consuming sector is estimated at 73% residential, 15% commercial, 10% industrial and 2% transport (vehicle carburetion).

2.2.2 Modes and Sources of Supply

Figure 3 provides a schematic view of supply modes and sources for LPG in Guatemala up until mid-2001 there were five modes of supply: (i) from the local refinery at Escuintla, (ii) imported from USA by marine tanker, received in coastal terminal facilities at Santo Tomas on the Caribbean coast, (iii) imported through Honduras (Puerto Cortes terminal) crossing into Guatemala by road tanker, (iv) imported from Venezuela, received in coastal terminal facilities at Puerto Quetzal on the Pacific coast and, (v) imported from Mexico by road tanker, crossing the border at Tecun Uman. The Texas Petroleum refinery supplies only 5% of requirements while the remaining 95% as imports was mostly split among trucked supplies from Mexico and marine tanker shipments received through Santo Tomas and Puerto Quetzal terminals, with a small trucked import by Texaco from Honduras.

It should be pointed out that these figures represent the average for 2001. The supply situation radically changed late in the second half of 2001 (beginning about August – September) when the Mexican trucked imports were completely eliminated, due to non-competitive Mexican prices exacerbated by supply deficiencies in Mexico. The large Zeta Gas terminal on the Pacific coast came into full operation and, combined with Tomza on the Caribbean, these marine terminals have dominated supply since late 2001, continuing to the present. The small Texaco supplies from the refinery and via Honduras have continued their share of the total supply although the refinery supply may disappear if the Texas Petroleum refinery at Escuintla shuts down in the near future as is speculated.

A contributing factor in this supply shift has been the absorption of “independents” by the two large groups – Tomza and Zeta. The independents largely relied on the trucked supplies from Mexico. For example, Guategas shows as an independent supplier/marketer in the 2001 statistics, but was taken over by Tomza in the second half of the year. Effectively there are now no independent importers/marketers of LPG operating in Guatemala.¹

2.3 Market Structure and Shares of Participants

¹ The company “Gas San Jorge” still exists in principle as an independent but in practice its only storage/bottling plant near Guatemala City was out-of-service at the time of mission and they had no supply or sales showing in the 2002 statistics compiled by DGH.

Figure 4 provides an overview of the LPG industry and market structure in Guatemala. Legally, vertical integration in the downstream market is prohibited. Although there appears by the company names to be some break in the vertical integration of the market, due to the establishment of separate corporate entities with different names and tax identification numbers belonging to the same group, the industry is actually dominated vertically by two large groups both of which are branches of the Zaragoza family of Mexico:

ZETA Group

- Marine receiving/storage terminal - *Zeta Gas de Centro America*
- Road receiving/storage depot – *Gas Nacional*
- Road Transport – *Transportes Quetzal*
- Importation and repair of cylinders – *Arrendadora Atlas S.A.*
- Storage and Bottling Plants – *Gas Nacional (8 plants), Gas Zeta (1 plant)*
- Retail Distribution – *Zeta Express*

TOMZA Group

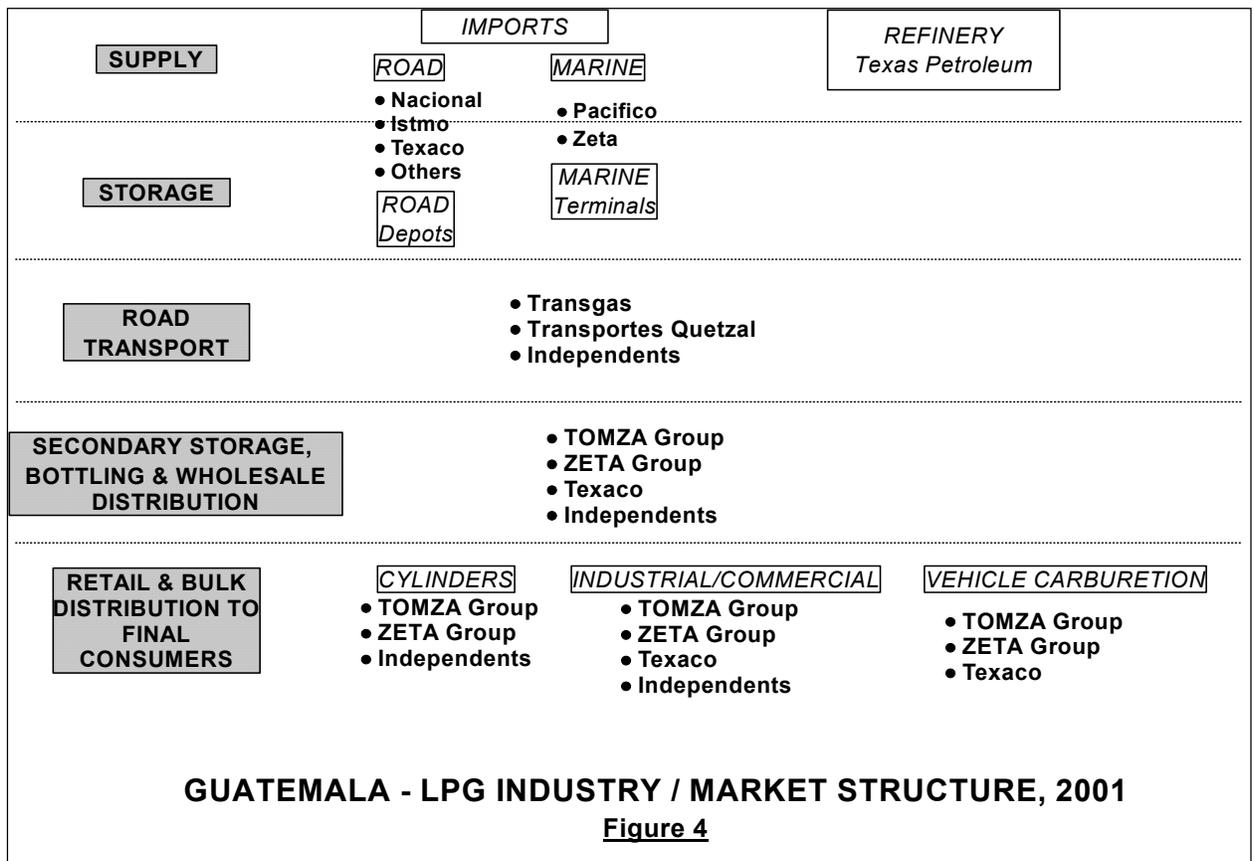
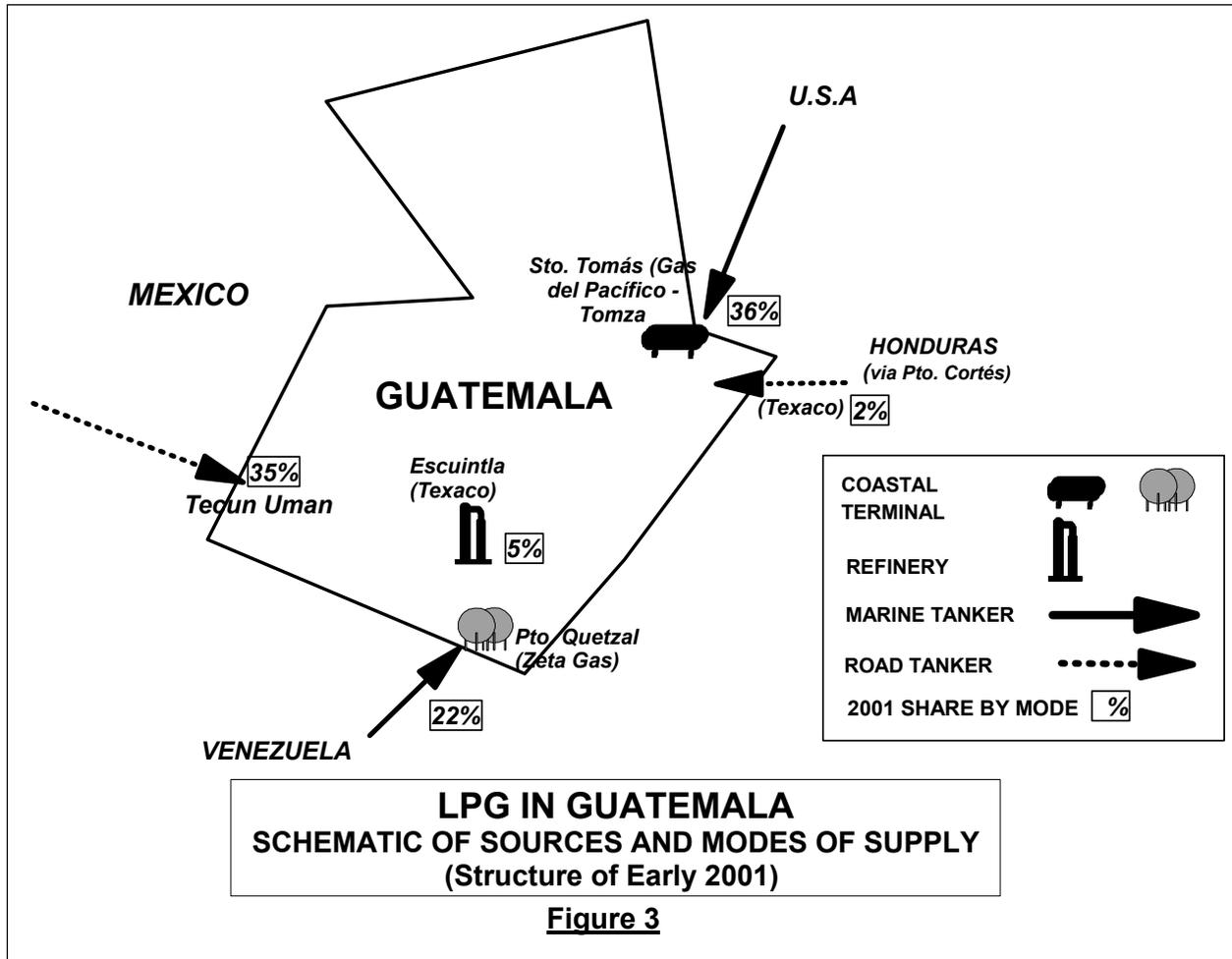
- Marine receiving/storage terminal - *Gas del Pacifico*
- Road receiving/storage depot – *Gas del Istmo*
- Road Transport - *Transgas*
- Importation and repair of cylinders – *Gas Metropolitano, Tropigas*
- Storage and Bottling Plants – *Gas Metropolitano (14 plants), Tropigas (3 plants), Guategas (3 plants).*
- Retail Distribution – *Tomza Plus*

Table 1: Guatemala 2001, LPG Sales by Market Segment and by Company

	Cylinder Sales		Bulk Sales		Carburetion Sales		Total Sales	
	MBL	Share	MBL	Share	MBL	Share	MBL	Share
Zeta Group	687	42%	219	40%	4	11%	909	41%
Tomza Group	791	49%	202	37%	7	20%	1,000	45%
Guategas	139	9%	-	0%	-	0%	139	6%
Texaco	-	0%	127	23%	23	69%	150	7%
TOTAL	1,618	100%	547	100%	34	100%	2,199	100%
	73.6%		24.9%		1.5%		100.0%	

In addition to this highly vertically integrated structure the control of the final markets by

the two groups combined is striking. Table 1 illustrates this market dominance. Zeta and Tomza combined controlled 86% of the total market and 91% of the residential market in 2001. Since Guategas was taken over by Tomza in the second half of 2001 the dominance is even greater with the two Zaragoza family groups now controlling 100% of residential market and 92% of the total LPG market in the country. The total sales/consumption figure 2,199 MBL shown in the table excludes some 24 MBL of "own consumption" by the companies themselves, giving a total consumption figure of 2,223 MBL in 2001.



2.4 Infrastructure

2.4.1 Storage and Bottling Installations

The total LPG storage and bottling installation infrastructure of Guatemala is summarized in Table 2. There are a total of 32 individual installations with a combined storage capacity of some 22 million US gallons (526 thousand barrels). The majority of this storage, some 19.7 million gallons is accounted for by the two large marine receiving terminals, Zeta Gas at Puerto Quetzal on the Pacific coast and Gas del Pacífico (TOMZA) at Santo Tomás de Castillo on the Caribbean. The Zeta Gas installation is a large, new modern facility capable of receiving refrigerated LPG tankers up to 28,000 DWT capacity. The facility is designed to both receive and store the product in refrigerated state. This refrigerated mode is a more efficient logistics/storage

LOCATION	OWNER/OPERATOR		TYPE OF INSTALLATION	STORAGE CAPACITY	
	<u>Registered Company</u>	<u>Group</u>		000s US Gallons	Barrels
Santo Tomás de Castilla	Gas del Pacífico	TOMZA	Marine bulk receiving/road shipping depot	1,735	41,301
Tecún Umán	Gas Metropolitano	TOMZA	Road bulk receiving/shipping depot	350	8,333
San Miguel Petapa	Gas Metropolitano	TOMZA	Road bulk receiving/shipping depot	278	6,619
Tecún Umán	Guategas	TOMZA	Road bulk receiving/shipping depot	30	714
Zona 18, Ciudad	Gas Metropolitano	TOMZA	Secondary receiving/bottling	40	944
Cuyotenango	Gas Metropolitano	TOMZA	Secondary receiving/bottling	63	1,507
Totonicapan	Gas Metropolitano	TOMZA	Secondary receiving/bottling	30	714
Peten	Gas Metropolitano	TOMZA	Secondary receiving/bottling	21	500
Escuintla	Gas Metropolitano	TOMZA	Secondary receiving/bottling	18	429
El Tejar	Gas Metropolitano	TOMZA	Secondary receiving/bottling	21	500
Jutiapa	Gas Metropolitano	TOMZA	Secondary receiving/bottling	21	500
El Rancho	Gas Metropolitano	TOMZA	Secondary receiving/bottling	18	429
Cobán	Gas Metropolitano	TOMZA	Secondary receiving/bottling	21	509
Zacapa	Gas Metropolitano	TOMZA	Secondary receiving/bottling	22	512
Jalapa	Gas Metropolitano	TOMZA	Secondary receiving/bottling	21	509
Quetzaltenango	Tropigas	TOMZA	Secondary receiving/bottling	48	1,142
Retalhuleu	Tropigas	TOMZA	Secondary receiving/bottling	21	500
Zona 12, El Portillo	Tropigas	TOMZA	Secondary receiving/bottling	270	6,432
Mixco	Guategas	TOMZA	Secondary receiving/bottling	63	1,500
Chiquimula	Guategas	TOMZA	Secondary receiving/bottling	30	714
Escuintla	Guategas	TOMZA	Secondary receiving/bottling	30	714
TOTAL NUMBER AND CAPACITY OF GROUP		TOMZA	21	3,151	75,022
Puerto Quetzal	Zeta Gas de Centroamerica	ZETA	Marine bulk receiving/road shipping depot	18,000	428,571
Tecún Umán	Gas Nacional	ZETA	Road bulk receiving/shipping depot	264	6,290
Villa Nueva	Gas Zeta	ZETA	Secondary receiving/bottling	330	7,863
Aldea el Chato	Gas Nacional	ZETA	Secondary receiving/bottling	119	2,830
Escuintla	Gas Nacional	ZETA	Secondary receiving/bottling	30	714
Retalhuleu	Gas Nacional	ZETA	Secondary receiving/bottling	43	1,021
Salcaja	Gas Nacional	ZETA	Secondary receiving/bottling	40	950
Cobán	Gas Nacional	ZETA	Secondary receiving/bottling	30	714
Chimaltenango	Gas Nacional	ZETA	Secondary receiving/bottling	30	714
Zacapa	Gas Nacional	ZETA	Secondary receiving/bottling	40	952
TOTAL NUMBER AND CAPACITY OF GROUP		ZETA	10	18,926	450,621
Mixco	Gas San Jorge	Gas San Jorge	Secondary receiving/bottling	11	262
TOTAL NUMBER AND CAPACITY OF GROUP		Gas San Jorge	1	11	262
TOTAL NUMBER AND CAPACITY - GUATEMALA			32	22,088	525,905

modality for LPG when there is sufficient scale of operations to justify it, and is standard in the industry now for tanker shipments greater than the 3,000 – 5,000 DWT size.

The older Gas del Pacífico (TOMZA) marine terminal at Santo Tomás de Castilla is

much smaller and only capable of storing pressurized LPG at ambient temperature, although product arrives in refrigerated tankers of about 4,000 DWT and is converted from ship to shore by heating/vaporization and compression to pressurized product.

As noted, there are two primary bulk receiving terminals originally designed to receive shipments by road from Mexico. These are now largely unused as the marine receiving mode has now taken over, apart from Texaco’s small movements from Honduras.

There are some 28 secondary inland storage and bottling plants located near population concentrations throughout the country which are fed by bulk road tanker from the primary marine depots.

2.4.2 Cylinders and Appurtenances

Cylinders

LPG is distributed in cylinders to residential and commercial consumers. The most common residential size in Guatemala is the nominal 25 lb container², followed by the 35 lb. size. As seen by Table 3 these two sizes comprise some 94% of the volume of

Table 3: Guatemala LPG - Cylinder Sizes

Cylinder Size lb.	Proportion of cylinder LPG market
20	0.5%
25	77.0%
35	17.0%
40	1.5%
60	1.5%
100	2.5%
TOTAL	100.0%

Source: MEM/DGH/DTD/Sección Gas

LPG distributed by cylinder. The other sizes are 20, 40, 60 and 100³. The total LPG cylinder stock is not known precisely but, based on the total market and number of individual clients is estimated by both DGH and the industry at more than 4 million .

² The size in lb. represents the accepted safe volume of commercial propane to which the container may be filled. The 25 lb. size represents an allowable filling of 5.9 US gal of propane compared with a water capacity of 7.1 gallons.

³ A 10 lb. cylinder size has also been referred to in the literature, but there were no figures from MEM/DGH/DTD/Sección Gas on the volume of market represented by this size; it is considered insignificant at present.

New cylinders are supplied through importation and from domestic producers. A summary of the cylinder fabrication industry in Guatemala is shown in Table 4. It comprises three companies with a total production of some 20,000 cylinders per month, serving both the domestic and export markets. These fabricators supply the domestic market with some 100,000 cylinders per year and also have an important export business.

Table 4: Guatemala – LPG Cylinder Fabricators

Company	Plant Location	Monthly Production
CILCASA	Guatemala City	14,000
INDUSTRIAS NIVI	Tecpan	6,000
La Chapinita	Mixco	500

It is estimated that, at present, the imported supply represents about 140,000 cylinders per year; the importing companies include affiliates of the two large LPG distributor groups, TOMZA and ZETA, as well as about four independent importers. The source countries for imports are Mexico, Venezuela and El Salvador. TOMZA and ZETA both own cylinder manufacturing operations in the source countries, but none in Guatemala. They acquire the bulk of their cylinder needs from within their own vertically-integrated organizations. Adding domestic supply to imported supply it is estimated that the total number of new cylinders entering service in Guatemala is about 240,000 per year at present.

Whether fabricated domestically or imported, the cylinders must conform to the Guatemalan standard: Official Norm COGUANOR NGO No. 51 009 of 19-XI-1993 covering the specifications, manufacturing, transport and storage of portable steel cylinders for LPG.

Cylinder Valves

There are generally four basic valve models used in Guatemala. The P.O.L. type is used on the larger sizes of cylinders – 40, 60 and 100 lb. The “click-on” type is used on smaller cylinders, notably the most common residential size 25 lb. in addition to the 40 lb., 35 lb. and 20 lb. sizes.

Total Equipment End-User Costs – Summary

The total equipment end-user costs in Guatemala at the time of mission, May 2002, is summarized in Table 5. These figures are based on buying the equipment in one cash payment. If the retailer finances the purchase for the buyer over 3 even monthly payments the total cost will increase by about 20 to 25%. This means, for example that

the 2 burner package would cost about \$65 spread over 3 payments or a minimum cash outlay of some \$23 to get started.

Table 5: Guatemala May 2002

Retail Cost of End-User LPG Cylinder & Cooking Equipment

Package of Equipment	Cash Cost	
	Quetzales	US\$
1. 25 lb cylinder, valve/regulator tubing, with about 5 to 10 lb. LPG ⁴	250	31.60
2. All the above plus 2 burner stove	425	53.80
3. All the above with 3 burner stove	470	59.50

Source: Interview of retailer "Almacen Monja Blanca", Tecpan, with confirmation of data by figures/estimates of DGH/DTD/Sección Gas

2.5 LPG Composition - Specifications

In accordance with the established standards in Guatemala the range of composition permitted is shown in Table 6.

Table 6: LPG Guatemala – Composition Specifications

	Maximum	Minimum
Propane	90%	60%
Butane	40%	10%

The actual compositions that are typical of the product which is imported and marketed by the two dominant groups is as follows:

- ZETA: Propane 70%, Butane 30%
- TOMZA: Propane 90%, Butane 10%

2.6 Cost & Price Structure

Prices and margins for most petroleum products were liberalized in 1994, while a system of reference prices was maintained for gasoline, diesel and LPG. This was modified in May of 1995 with the establishment of US Gulf Coast FOB prices as

⁴ The equipment supplier includes a small quantity of LPG in the cylinder for promotional purposes and, as they stated in our interview, to be able to demonstrate the operation of the stove in the shop.

reference. However, the application remained voluntary for the oil marketing companies. Prices and margins are monitored by the DGH, but it has no authority to enforce the application of the import reference formula or to intervene in cases of abuse. Article 5 of the new Marketing of Hydrocarbons Law of 1997 establishes the principle that those who carry out activities in the chain of hydrocarbon supply shall individually and freely establish the prices for their services and products which should reflect the conditions of national and international markets.

2.6.1 Imputed Price Structure, May 2002

In May 2002, at the time of the field mission, the prevailing retail price for LPG in cylinders for residential use was some 38 Q. per 25 lb. cylinder in the Guatemala City metropolitan area. An estimate of the breakdown into component elements of this final price to the consumer is provided as Table 7. For ease of comparison with other jurisdictions the structure has been expressed in four different units as shown.

Table 7: “Imputed” Residential LPG Price Structure, Guatemala City, May ,2002

Elements		US\$/USGal	US\$/Kg	Q./USGal	Q/25 lb Cyl
1.	FOB Cost	0.38	0.193	2.98	17.15
2.	Marine Freight & freight-related charges	0.11	0.056	0.86	4.97
3.	CIF Guatemala	0.49	0.248	3.85	22.12
4.	Gross Margin for bulk transport, storage, bottling and wholesale distribution	0.15	0.076	1.18	6.81
5.	Retail Margin	0.11	0.056	0.87	5.00
6.	IVA (value-added tax)	0.09	0.046	0.71	4.07
7.	Price to Public	0.84	0.427	6.61	38.00

The following are notes on the methodology used to derive this “imputed” structure:

- Elements 1. and 2., FOB Costs as well as marine freight and related charges such as insurance were derived as a composite of actual TOMZA and ZETA figures (from DGH) for recent cargoes received in Guatemala;
- Element 4., the gross margin being realized by the operators to cover receiving and storage terminal, internal bulk transport, secondary storage and bottling was derived as a residual after subtracting all the other assumed elements from the final price to the public.
- Element 5., Retail margin being allowed by the operators was estimated at Q. 5 per cylinder. TOMZA was quoted as saying that ideally the retailers would like something in the range of Q. 7 to 10 per cylinder and used to achieve this before the current “price war” but were now receiving less on average.

- Element 6., IVA is 12% of the final price, excluding IVA (12/112 X Price to Public);
- Element 7., the final price to the public in the capital, Q.38 per 25 lb. cylinder, was derived from three sources: DGH survey information, information received in interviews with TOMZA and ZETA officials and information received from a visit by the consultant to an actual LPG cylinder retail outlet in Guatemala City. The actual range as quoted by TOMZA and ZETA was said to be Q.37 to 38 in the capital – the higher figure was used here.

2.6.2 Variation in Prices by Location

Table 8 is a summary from DGH of their estimate of recent prices in principal population centres throughout Guatemala

Table 8: Prices to the Public for LPG in 25 lb. Cylinders Throughout Guatemala During Week of 22 to 28 April 2002

Location	Q./cylinder
Guatemala City	38.00
Escuintla	44.00
Retalhuleu	42.50
Cobán	42.75
Petén	46.50
Huehuetenango	44.33
Quetzaltenango	40.00
San Marcos	42.33
Chiquimula	40.60
Santa Rosa	41.13
El Progreso	38.00
Zacapa	43.00
Jutiapa	57.83
Jalapa	57.50

The rationale for price differentiation by location is generally a combination of logistics costs as well as scale of storage, bottling and distribution operations. Guatemala City, though not the closest location to the main receiving points, has by far the largest scale in terms of storage, bottling and distribution operations. Degree of market competition may be a factor in the nature of price differentiation in some locations but is not thought to play a major role. In addition to the locations shown, the consultant had an opportunity to survey a couple of outlets in the Tecpan area. The prevailing price there during early May, 2002 was Q. 43 per cylinder. With the exception of Jutiapa and Jalapa most upcountry locations had price differentials over the capital of 2 to 6 Q. per cylinder. Jutiapa and Jalapa are special cases: The total LPG market is very small and, since they are close to the El Salvador border, most of it is supplied through smuggling (“contrabando hormiga”), since El Salvador prices are low. The price shown is for the

single dealer in each area; this dealer supplies LPG sourced through Guatemalan channels, but in fact sells very little. The effective average price to the public, in these two population areas, including El Salvador supplies at low price prevailing in that country, would be much lower than the dealer price shown in the table.

2.6.3 Recent Trend in Prices to the Public

Since early 2001 the price of LPG in 25 lb. cylinders to final consumers in Guatemala city has declined a total of 28 Q./cylinder from 66 Q./cylinder in January 2001 to 38 Q./cylinder in Feb-April 2001. This trend is shown in Figure 5.

During this same period the international reference price has declined as well but not to the same extent as the Guatemalan domestic price. This is illustrated in figure 6. Over the same period the Mont Belvieu, Texas reference price has declined by the equivalent of only 16 Q./cylinder from 35 Q./cylinder in January 2001 to 19 Q./cylinder in April 2001. With marine freight remaining roughly constant over this same period it means that the total internal margins in Guatemala have fallen drastically – some Q 12./cylinder.

2.6.4 Comparisons With Other Countries

The graph, figure 7 shows this same trend in Guatemalan prices over 2001-2002 compared with the price of LPG in small cylinders sold to final consumers in several other countries. The Guatemalan price ex-tax is much lower than the comparable ex-tax prices of the USA, Chile, Canada and Mexico. As indicated by the trend in prices, the difference between Guatemalan prices and those of USA and Chile has increased considerably over the period. This trend as well as the decrease in imputed internal margins over the period is a confirmation of the price-cutting “price war” climate which has prevailed over the past few months in Guatemala.

Price of LPG in 25 lb. Cylinder Guatemala City, 2001 - 2002

Q./Cylinder

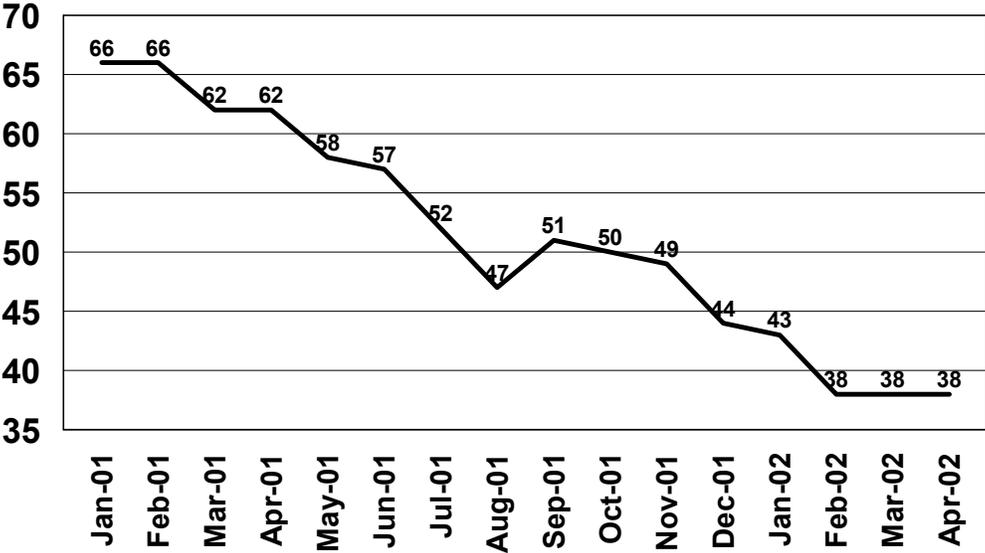


Figure 5

Comparison - Price of LPG 25 lb. Cylinder VS. Platt's LPG Mont Belvieu Guatemala City 2001-2002

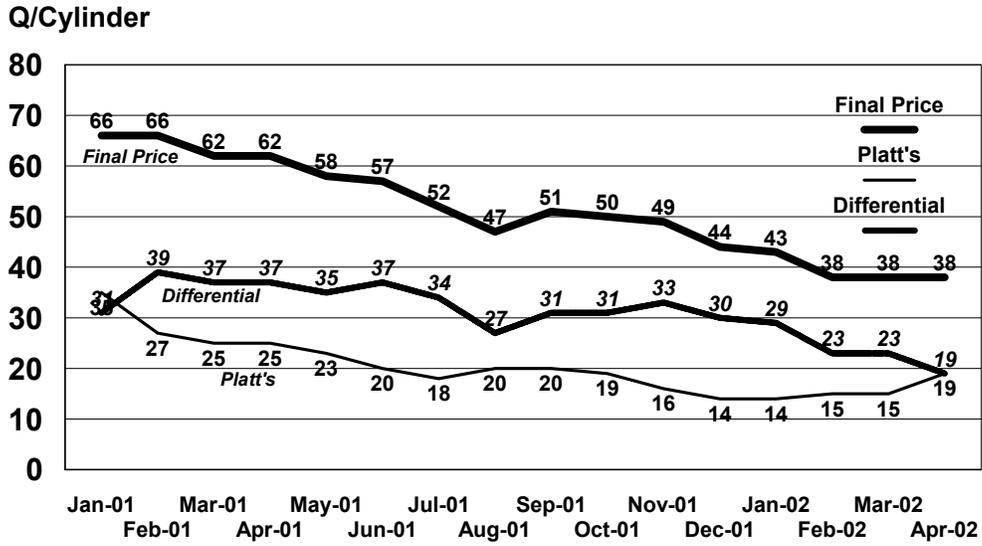


Figure 6

Comparison - Price of LPG in Small Cylinders Guatemala VS. Other Countries Prices Ex-Tax 2001-2002

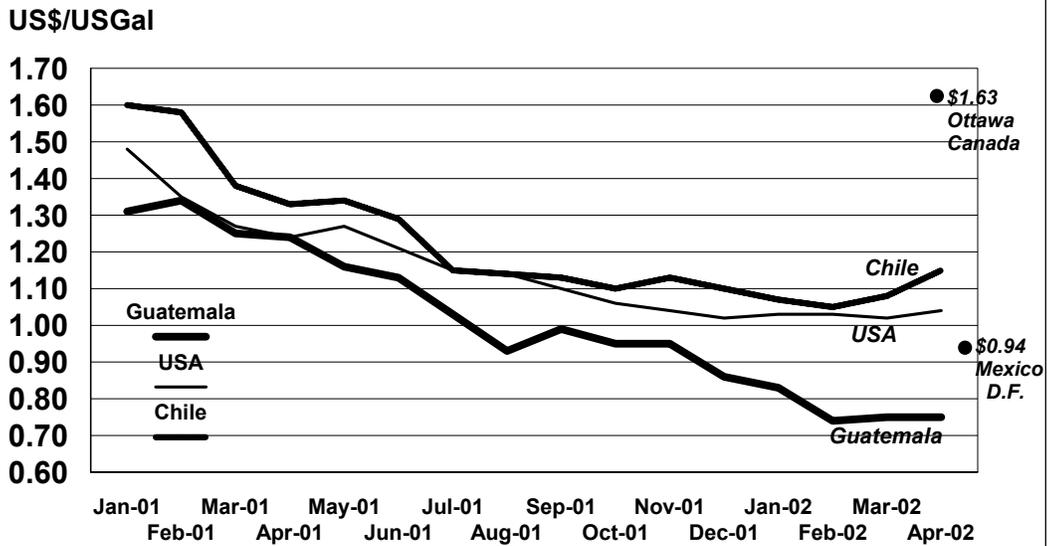


Figure 7

2.7 HSE Regulations, Technical Specifications, Inspection and Enforcement.

Regulation No. 522 of 1999, issued under the new Hydrocarbon Marketing Law No. 109 of 1997, contains detailed provisions for the application and approval process for licensing of the different activities in the supply chain for petroleum products. In addition, the Regulation establishes specific conditions for LPG distribution facilities for domestic and automotive use, for storage and transport of LPG in stationary tanks and portable cylinders, as well as for the import, fabrication, repair and maintenance of cylinders. In addition to other formal requirements for all applicants, the installations, equipment and operations to be licensed have to comply with HSE rules and technical specifications. Most of those rules and specifications for construction, operation and maintenance are not contained in the Regulations itself, but established by general references to international norms and standards, such as those issued by ANSI, API, ASME, ASTM and NFPA.

Only four local technical standards exist in Guatemala for LPG:

- COGUANOR's Official Norm (NGO) No. 51 004 of 11-VII-1985 for quality specifications of LPG,
- NGO No. 51 009 of 19-XI-1993 covering the specifications, manufacturing, transport and storage of portable steel cylinders for LPG,
- NGO No. 51 027 for LPG cylinders used in automobiles, and
- NGO No. 51 028 for the disposal of LPG containers.

COGUANOR (Comisión Guatemalteca de Normas) was created by Decree No. 1523 of 5-V-1962 as the government body in charge of standardization and normalization, which depends of the Ministry of Economy. No specialized private organization exists in the country which deals with the preparation or evaluation of technical standards. COGUANOR follows the typical procedures in the preparation and issuance of norms and standards through Technical Committees, composed of public and private sector representatives and experts related to the respective matters. Standards and codes of practice of other countries and of international organizations are to be taken into account during the preparation of new national standards either in the form of Obligatory Norms (NGO) or recommended, voluntary norms (NGR).

COGUANOR is also charged by law to verify the conformity of products and services with the existing official norms. According to an annual inspection plan it is supposed to take samples at manufacturing and consumer sites which should be analyzed and certified by public or private experts or laboratories authorized by the Ministry of Economy. This provision of the general legislation, however, does not prevent the DGH from performing its own inspections based on its attributions according to the Hydrocarbon Marketing Law of 1997 and its Regulation. The DGH is responsible for the surveillance, enforcement and control of established HSE rules, standards and specifications pertaining to equipment and practices in the entire LPG supply/distribution chain in Guatemala. The published license conditions for LPG distributors include the announcement that the DGH reserves the right to perform inspections without notice to verify compliance with the applicable HSE rules and to cancel the licenses or impose other sanctions in case of non-compliance.

Responsibilities for those activities are apportioned among two Departments within DGH

- DTD/SG for the infrastructure and practices pertaining to importation, exportation, bulk road transport and bottling of LPG and cylinder manufacturing and importation;
- DL for the road transport of cylinders, retailing, and final consumers;

DTD/SG has a total of four inspectors in the Guatemala City office (including the Section head) plus one inspector resident at the Atlantic coast. The consultant reviewed the scope of the DTD/SG inspection duties in some detail in order to get an indication of the level of effort required in relation to actual staffing. This task list is summarized in Table 9 as well as a rough indicator of person-days required for each.

Table 9: Inspections and Other Duties of the Sección Gas

Inspections	Comment re Number, frequency	Person-days required
Tanker arrivals	30 per year,	75 to 90
Road shipments	Only Texaco at present (was much higher in past)	10 to 20
Cylinder Fabrication, sample taking	3 plants, 6 times per year each	36 to 40
Cylinder imports, sample taking	2 importers, 6 times per year each	24 to 30
Marine Terminals and Filling Plants	30 plants, once per month each	360 to 500
Special , ad-hoc for new construction		20 to 30
<u>Other Duties:</u>	Total estimated time for all	250 to 300
Preparation & follow-up of judgments (“dictámenes”),		
Preparation & follow-up of accusatory actions (“denuncias”)		
Technical Reporting		
Attendance at Meetings		
Preparation of Briefing notes for superiors		
Training		
TOTAL		775 to 1010

The frequency of inspections shown in the table are “ideal”. With these inspection tasks concomitant with such an extensive infrastructure, plus the person-days required for other duties, the small number of inspectors are usually unable to meet these ideal inspection targets. This means that the health, safety and environmental aspects of the supply/distribution chain may, at times, be put at risk.

The Departamento de Licencias, handling the cylinder transport, retailers and end-users is also hard-pressed to meet its inspection targets given the manpower and equipment allotted to it. It has a total of eight inspectors to handle the entire abovementioned LPG areas as well as the entire service station network and road transport of products sold in the service stations. Roughly two inspector person-years out of eight could be considered available for the LPG inspections. Considering the hundreds of retailers as well as the cylinder road transport and end-user inspection duties this appears inadequate. The actual number of inspectors required to undertake an ideal inspection program would have to be derived using a similar approach as roughly defined in Table 9 for the DTD/SG.

2.8 Cylinder ownership, repair, exchange and replacement

The ownership of the cylinders in Guatemala has not been established by law or regulation or in any other fashion. Although the total stock of cylinders is estimated at about 4 million, nobody really knows with precision how many cylinders exist and how much repair and replacement is needed. Although It has been estimated by DGH that some 70% of the cylinders are “owned” by the final consumer it is felt that this number is based on the proportion of cylinders in the “possession” of consumers at any given time. No proof of ownership is required to get the cylinders filled. The remaining 30% of cylinders are in the possession of the distribution companies simply because that is the rough percentage of total circulating stock that is in filling plants, in truck transit or in sales outlets at any given time. Any cylinder may be filled at any filling plant, regardless of its color or markings.

No rules exist for the exchange of cylinders or any related mechanism, and no formal exchanges between companies need to take place because ownership has not been legally defined. No rules exist concerning the painting or marking of cylinders for identification purposes. However, the distribution companies paint their cylinders in different colors in order to create their identity in the market place.

As mentioned before, the Regulation No. 552 establishes quality and maintenance standards for LPG cylinders according to international standards. However, since ownership has not been legally established there is no legal responsibility defined to maintain and/or repair the cylinders, valves etc. Company personnel is not adequately trained to maintain or repair cylinders, and there are no certified repair shops with qualified personnel.

3.0 ISSUES

In this section we have drawn on much of the review and analysis information already discussed and included under the “state of the market”, section 2. We have included the issue headers as originally shown in the TOR and repeated in the Inception Report. As noted, issue 3.8 has been subsumed into 3.1.

3.1 Policy, institutional and regulatory framework

In theory, COGUANOR is the only government body in Guatemala authorized to prepare and issue norms and standards. However, in practice, confusion has been caused due to the fact that various other government entities, including the MEM, are adopting international standards or have put in effect other instruments which are called norms, but frequently are mixtures of technical standards, regulations and manuals of procedure. According to Art. 71 of the Marketing of Hydrocarbons Regulation No. 522 of 1999 the DGH is authorized to issue instructions, manuals and circulars relative to the publications and compliance with quality specifications, HSE rules, inspection procedures and other requirements as to the location, construction, operation, maintenance of petroleum installations. The relationship between those overlapping rule making authorities should be clarified by legislative action.

The regulatory framework for the petroleum sector in general, and specifically for the LPG supply, as described above, consists to a large extent of general references to international standards and codes of practice. An example of this problematic situation is Art. 12 k) of Regulations No. 522-99 which requires that all license applications contain the declaration that “... *the equipment, material and installations to be used in the project shall comply with the characteristics and specifications which are established by applicable obligatory norms of Guatemala or, in case that those do not exist, with standards accepted by the international petroleum industry, such as ANSI, API, ASME, ASTM and NFPA....*” As a matter of fact, this provision constitutes a general adoption by reference of an almost unlimited number of international standards which is not compatible with the attributions and procedures of COGUANOR as the official normalization authority in charge of the above mentioned Decree No. 1523-62. In practical terms, the generality of those references makes it nearly impossible for the users as well as the enforcement agency to define the exact rules for each particular case. This creates a high degree of uncertainty for the operators and leaves too much discretion within the inspection and sanctioning process.

The same problem exists in many other countries which have not established their own, complete regulatory framework. In Central America, only Costa Rica has a special regulation for the storage and bottling of LPG (Decreto MINAE-S-28622 del 18-V-2000) which is very detailed, but also contains general references to international standards. Other countries, such as Mexico and Perú, have special regulations, national norms and standards which are even more detailed, because they translate, transcribe and incorporate large portions of the applicable international standards, but for all practical purposes, still remain inevitably incomplete and often out-dated because of the large number of the international norms which are subject to frequent changes and additions.

On the other hand, highly developed jurisdictions, such as most of the US Federal States and European countries are only issuing general regulations which define the institutional attributions, licensing requirements and enforcement authorities with relatively few technical specifications. The latter are covered by the formal adoption of internationally accepted norms and standards under the respective general legislation. The adoptions are made by specific, rather than general, references to individual standards and codes of practice and include exceptions and other adaptations according to local requirements. A typical example is the Texas National Resource Code (TNRC) of 1-IX-1980 in its version of 1-IX-1999. It contains in Chapter 113 the LPG Code, based on which the Texas Railroad Commission, as the regulatory agency, issues the LP-Gas Safety Rules which, in turn, adopt by reference and adapt, among others, the principal LPG standards, such as NFPA codes Nos. 51, 54 and 58.

Nicaragua has a modern Hydrocarbon Supply Law and Regulation (Ley No. 277 of 6-II-1998 and Decreto No. 38-98 of 6-V-1999) which do not contain technical details, but rather provide for the adoption by reference and adaptation of international standards and establish a detailed procedure which has been gradually and successfully implemented in recent years.

3.2 Market structure and competitiveness

As discussed in Section 2.3 above, the LPG market in Guatemala is dominated by the two Mexican Zaragoza family groups TOMZA (Tomás Zaragoza) and ZETA (Miguel Zaragoza). Besides these two groups, only Texaco maintains a small market share in bulk sales to industrial/commercial customers. In the past 18 months ZETA has followed an aggressive business strategy with main elements as follows:

- **Logistics:** Commissioning of the large, new 18 million US gallon refrigerated LPG marine receiving/storage terminal on the Pacific coast at Puerto Quetzal, capable of receiving refrigerated LPG tankers up to 28,000 DWT. It is able to improve its economies of scale beyond those achieved through Gutemalan market volume alone, by supplying markets in neighbouring Central American countries and even into southern Mexico.
- **Pricing:** Cutting retail cylinder prices and margins to levels which made it impossible for the smaller operators to compete and remain financially viable. Even TOMZA has felt the pinch and has had to reduce dealer margins and attempt to economize where possible, sometimes at the expense of good maintenance practices.
- **Vertical Integration:** ZETA has taken over ownership and operation of most of its retail network, through its affiliate “ZETA Express”. This reinforces its ability to cut prices and generally control retail practices in line with its commercial objectives.
- **Acquisitions:** Both ZETA and TOMZA between them have acquired all the financially challenged smaller operators as the price cutting impacted them.
- **Market Share:** ZETA has increased its market share so that it is now roughly equal to that of TOMZA; its stated objective is to capture 75% of the total Gutemalan market. This will not be wholly at the expense of current TOMZA volume since ZETA’s intent is to considerably expand the total LPG market, capturing remaining

urban consumers not using LPG as well as achieving a significant penetration into rural areas where consumers are largely reliant on traditional fuelwood/biomass.

The logistics and market positions of the two dominant companies is so strong that it is difficult to envision the possibility of any new entrants to the market, particularly while ZETA is in the price-cutting mode.

In view of those circumstances, the main issue of some concern to DGH officials was that of *excessive market concentration*. As agreed with these same officials and confirmed by our analysis herein, although this market concentration has led to potential for market control and reduced competition, it has not as yet manifested itself in higher margins and prices. Our analysis (sections 2.3, 2.6 3.2 and 3.4) confirms the recent trend in market concentration and control, but also indicates that prices and margins are low by international standards. The caution to both DGH and anti-monopoly authorities, as stated below, would be to remain vigilant to possible future moves to increase margins and prices to monopolistic market levels.

The present situation in Guatemala's LPG market raises serious concerns as to risk of monopolistic tendencies the potential for which frequently is created by eliminating competition through aggressive price reductions. Even if this brings temporary advantages for the consumers, the long term effects could be dangerous. Defending the principles of a competitive market system would normally justify government actions in order to protect smaller participants and to facilitate the entrants of new competitors. Articles 36-38 of the Hydrocarbon Marketing Law prohibit certain types of anti-competitive behavior, but it appears doubtful that the DGH/MEM as enforcement agency has the experience and legal instruments to deal with those types of problems which are not of a technical nature. The review of the general anti-trust and fair trade laws and institutions of Guatemala was not part of this consultancy. Their ability to monitor the development and to act quickly and efficiently will be of critical importance if the two dominating suppliers were to start to abuse the market power which they have gained. It should also be considered to clarify and strengthen the legal prohibition of vertical integration in the LPG market which so far has been successfully circumvented by the TOMZA and ZETA groups. Other Central American countries, such as El Salvador and Nicaragua, are considering legislation which would simply limit the market shares of each participant to a certain percentage. From a conceptual point of view, this type of regulatory intervention is not compatible with the principle of fair competition and an open, efficient sector where all operators are working to the same set of licensing requirements, rules and standards. However, the potential alternative of one firm capturing the bulk of the market has been found to be even less competitive in the long run, and hence there is a need to make anti-trust legislation effective. Generally, a mix of regulations governing the sector structure (such as market share), conduct and performance are utilized to ensure fair competition. Regulatory agencies adjust the mix of regulations in these three areas to suit the circumstances, including their ability to regulate and monitor.

In addition, the permanent implementation of market share limits could be circumvented in the same way as the prohibition of vertical integration. Temporary limitations for certain participants in the market may be justified if specific findings prove that they violate the pricing rule of Art. 5 of Law 109-97 and/or applicable provisions of the

consumer protection and anti-trust legislation which, however, should also contain other preventive instruments and sanctions for non-compliance.

3.3 Commercial malpractice

The issue of *short selling of LPG* was raised with DGH officials. The Sección Gas (SG) of DTD has responsibility for the supply/distribution chain up to and including the filling of cylinders. The Departamento de Licencias (DL) has the responsibility downstream of this – cylinder transportation, retailing and end-use. As part of their duties the SG inspectors do spot checks on cylinder filling equipment and practices. They had no records confirming any major problem at this level, but there is a possibility that there might be cylinder “decanting” malpractice downstream of the filling plant. There were no records as to the extent of this problem but it was indicated that, in any case, the consumer protection body “DIACO” of the Ministerio de Economía is charged with this responsibility in its role of surveillance and enforcement of weights and measures. The DL also deals with issues concerning the final, household consumer of LPG, but these are mainly issues of safety in terms of the consumers’ equipment setup and practices.

The *smuggling of new LPG cylinders out of Guatemala* to neighboring countries was not highlighted as a major problem by either DGH officials or the operators in relation to the overall problem of maintenance and renewal of the cylinder stock in general. It was mentioned that there was a certain amount of small-scale smuggling (“contrabando hormiga”) mainly targeting the high-quality “Sherwood” valves rather than the cylinders per se. In this type of operation it was common to see an exchange of valves, replacing (and retaining) the Sherwood in place of lower-quality Chilean or Mexican models

3.4 Price/Margins Benchmarking

As indicated by our comparison of LPG small cylinder prices ex-tax in several countries (Section 2.6.4) the prices in Guatemala at present are among the lowest in terms of imputed margins⁵ for supply and distribution of the product to final consumers. As indicated by the trend in prices in relation to the price at the main supply reference point, Mont Belvieu, as well as the trend in comparison with the other countries this situation has significantly improved since early 2001. Even in early 2001, however, the prices and margins were comparable to those of the USA and significantly lower than those of Chile.

Although, as indicated above, we feel the relative ex-tax price is a good proxy for

⁵ The main bulk supply reference price point, Mont Belvieu, Texas, is applicable to both the US and Guatemala and Canada’s prices are even linked to those of the US because of the major North American LPG trading movements. This common supply point and reference price makes a comparison of final prices, ex-tax a good proxy for comparison of supply/distribution margins. In the case of Chile, largely import dependent, the regional reference price for petroleum products, even in the Southern cone tends to be established by the US Gulf Coast as reference in combination with others in a “basket”. More than 60% of Chile’s imports come from regional South American sources and its bulk supply costs in relation to Mont Belvieu reference appear to be no greater on average than those of Guatemala.

relative margins on the supply, distribution and bottling, Table 10 provides a comparison of imputed margins for Guatemala, May 2002 (section 2.6.1, Table 7) with those of several other countries for which data was available. As seen, Guatemala's gross internal margin in May, 2002 (this was the only margin data available for most countries) was much lower than the margins in other countries.

**Table 10: LPG in Small Cylinders - Supply/Distribution Margins
US\$/tonne**

	Margin for bulk transport, bottling & wholesale distribution	Total imputed gross internal margin (retail price ex-tax minus bulk supply cost)
Guatemala, May 2002	76	132
USA , April 2002		319
Canada, May, 2002		632
Chile, May 2002		345
Mexico, May 2002		275
Senegal , 1999	184	214

Since the improvement in prices to the benefit of Guatemalan consumers appears to be due to aggressive price-cutting on the part of one of the operators, ZETA, resulting in an elimination of all the small competitors (see 3.9 below), the precautionary note here would be to be vigilant in surveillance of possible future monopoly pricing.

3.5 Safety and environmental protection

The existing legislation and regulations provide the DGH with wide ranging authority and sufficiently defined faculties for supervision, inspections and sanctions of the supply chain of all products, including LPG. By adopting the principal international standards by specific reference, it could maintain a very efficient enforcement system, if it had the necessary political support, sufficient manpower and technical means. As described above (section 2.7), however, the present personnel and other resources of the DGH appear to be insufficient to inspect and control the installations and operations of the LPG supply chain with reasonable frequency and efficiency. At the same time, the lack of records makes it difficult to propose more specific measures for the strengthening of the institutional capability and the enforcement activities. The applicable law and regulations do not contain provisions concerning the record keeping and reporting obligations of the DGH. As in most other countries with a modern regulatory framework for the subsector, the DGH should create and maintain a computerized data base which reflects all inspections, enforcement actions and sanctions; periodic reports should be prepared and published for internal and external information purposes and, if

necessary, as a basis for defining additional requirements as to human and other resources of the agency.

The DGH has made a summary of the typical safety problems that they have experienced:

End-user – lack of knowledge and safety consciousness in LPG handling

- the cylinder is used for different purposes for which it is not designed – for example as a chair, to place objects on, as a flower pot stand or as a toy;
- The cylinder is placed under the table near the stove, near sources of heat or in poorly ventilated spots;
- The tubing connection and fittings between the cylinder and stove is not maintained;
- There is carelessness in igniting and turning off the stove burners and ovens;
- The stoves are used by persons unfamiliar with their operation;
- It is usual practice that the regulator valve is not turned off when the stove is not in use, even for prolonged periods;

In Cylinder Sales Outlets

- Cylinders stored in closed environments, without ventilation
- More cylinders stored than permitted by the regulations regarding licensing of the outlet;
- Cylinders stored in locations which later become living or commercial space such as in residences, shops, tortillerias;
- Locations without extinguishers and with non explosion-proof electrical system in poor condition, poor ventilation and without warning signs posted;

Condition of Cylinder Stock

- More than half the total stock of some 4 million is estimated to have completed their useful life and need to be retired.
- Because of excessive use, a high proportion of the valves have leaks;
- The collars and the bottoms of the cylinders deteriorate rapidly because of rough handling;

The DGH has developed the following recommendations:

End-user

- Upon receipt of the cylinder(s) from the distributor verify if there are leaks, and if so immediately reject/return the cylinder to distributor.
- If gas (mercaptan) odor is noted, avoid creating sparks or open flame in the area, remove the cylinder to a ventilated location and contact the distributor;

- Do not locate the cylinder immediately beside or under the stove, preferably install it outside the residence and run tubing inside to the stove;
- If possible avoid the use of rubber or plastic tubing, and substitute copper tubing instead;
- Minimize handling or fiddling with the regulator

Cylinder Sales Outlets

- Upon receipt of cylinders from the supplier, verify for leaks and reject/return to supplier any that leak
- Do not attempt to repair leaks – isolate the cylinder in a well-ventilated location awaiting return to supplier;
- Do not store the cylinders in a poorly ventilated location or in a location exposed to heat, open flame or sparks;
- Avoid rough handling of the cylinders;
- Prevent the entry and presence of minors in the outlet premises;
- Ensure that the safety measures essential for a cylinder sales outlet are followed:
 - Fire extinguishers in good working order
 - All electrical systems explosion-proof
 - Warning signs posted
 - Adequate ventilation
 - Capacity permitted for the location is not exceeded

The MEM/DGH has proposed that it should take the following actions:

- Supervise the sales outlets and sanction those which do not meet safety measures;
- Close all unlicensed sales outlets;
- Coordinate actions with fire & rescue bodies and departmental governments to minimize accidents involving LPG;
- Carry out an inventory and diagnostic of the national cylinder stock ;
- Coordinate actions with the Central American governments concerning the exchange of cylinders which already exist;
- Control and inspect the cylinders which are imported, carrying out the analysis in the MEM laboratory;
- Do a monthly inspection of the cylinder stock in each of the cylinder filling plants;
- Control and inspect the national cylinder fabrication plants;
- In the medium term, implement the Plan for the Replacement and Repair of

Cylinders;

- Launch publicity campaigns regarding the safety measures in the handling of cylinders, directed towards the retail dealers and end users in general;

3.6 Upgrading of cylinders

In the worldwide LPG business there are two principal methods of cylinder ownership: LPG company owned and customer owned.

- a) *Company owned*: When the company owns the cylinder it either loans or leases it to the customer. The customer exchanges an empty cylinder for a full one paying only for the gas. The company is responsible for filling and supplying safely maintained cylinders. It is common to have the owner's investment secured through a system of *refundable deposits or guarantees in cash*.

The Refundable Deposit System

When the cylinder is owned by the LPG company, the investment, replacement and working stock costs of cylinders are borne by the company. In order to ensure that these costs are recovered, the company will often charge a refundable deposit to the customer, the amount of which will be adequate to finance the initial investment and the subsequent maintenance activities for the remainder of the cylinder's life. The required amount is usually around 130% of the replacement cost of the cylinder. (in some cases, such as Chile, the refundable deposit is adjusted for inflation) Setting the level of deposit too low can lead to malpractice and inefficiencies in the system, e.g.: market for second-hand cylinders resulting in pirate filling, accumulation of inactive cylinders due to low incentive to return, use of cylinders for other purposes such as metal- working conversions into other products.

The purpose of the deposit is to encourage the customer not to lose the cylinder, to recover the cost of continuing cylinder investment and recover the cost of inactive cylinders. The level of refundable deposit if established fairly, and the system administered properly should provide the LPG company a level of assurance that it will not incur a loss on replacement of the metal and the consumer the assurance that the company is not making a significant profit on cylinder replacement.

In many of the very low income developing countries, even when the company owns the cylinder stock, it is not common practice to charge a deposit. The objective of this policy is to encourage LPG markets among the poor, who cannot afford the startup costs. Unfortunately such a policy leads to malpractice such as cylinder theft, use of cylinders for other purposes such as fabrication of other objects (the consultant has seen some beautiful flower planters!) as well as weakening the incentive for the LPG companies to implement full and proper maintenance procedures. A better approach is to finance the deposit fee for the consumers, outside of the LPG business, through co-operatives, micro-credit, etc. so that there is full cost recovery within the LPG business itself

- b) *Customer owned*: There are two modalities common here:

- 1) Centralized cylinder filling and distribution system. Upon replenishment, the customer exchanges a legally owned cylinder for one of like kind. Since the customer does not have physical possession of the same cylinder brought to the exchange transaction, the customer is not responsible for replacement at the end

of the cylinder's useful life. In this instance, the LPG supplier has the responsibility of maintenance and replacement, since the initial cylinder is somewhere in the inventory "float". Although the customer is the owner, he may start with a new cylinder and then receive a 10 year old one on the first exchange/replenishment – he must accept whatever is available from the company. The customer has no guarantee that if he ceases to be a LPG customer after five years that he has a five year old cylinder to sell or dispose of – it just depends on the luck of the draw in the exchange operation. The consultant has not seen any formalization of the disposition of the cylinder under the laws and regulations he has seen. In most cases it probably is being disposed of informally.

- 2) Bulk distribution, "mini-filling plant" system. The customer has a personally identified cylinder and brings it to the local filling plant to be filled and then taken away. The customer retains the same cylinder through its life and is responsible for any maintenance or replacement. The key safety element here is the diligence of the mini-plant operator in rigorously inspecting and rejecting as necessary any sub-par cylinders. The customer must be refused a filling, unless he acquires a new cylinder. In this case, the filling plant or its supplier would have the responsibility to recycle or dispose of the used cylinder in an appropriate manner.

As indicated in 2.8 above, Guatemala fits the case b) 1) since it has been the practice in Guatemala to sell LPG cylinders to final consumers and consequently about 70% of the total cylinder stock, estimated at some 4 million, is owned by the final consumers rather than the bottling/distribution companies.

Looking at countries in the region, both Chile and Brazil have system a) – Company owned with refundable deposits.

The two principal countries which have case b) 2) the bulk distribution system with localized filling plants are USA and Canada. The only developing country where the consultant has seen this system is Ghana, West Africa.

Chile System: One of the positive features of the company-owned, refundable deposit system of Chile are clear rules and regulations on the interchangeability of cylinders of the different companies. The way this is handled in the Chilean regulations serves to maintain competitiveness of the sector while at the same time not sacrificing safety considerations related to cylinder maintenance and replacement. The strict limitations on cylinder interchangeability as imposed in the Chilean regulations, also means that each operator is assured of retaining most of his cylinder stock for his own use, thus making it worthwhile for him to spend money from his margin on cylinder maintenance, repair, rehabilitation and replacement. Where the situation of cylinder ownership and interchangeability is uncontrolled and anarchic, like, for instance in Peru, it is often perceived to be necessary to devise mechanisms like a fund for rehabilitation and replacement, since the individual operator has no interest in spending money from his margin on new cylinders which he may lose to others. In the latter case the cylinder stock deteriorates without such a fund in place. Chile used to have such a fund which was so problematic to administer that they eventually changed to the present system.,

It is strongly recommended that Guatemala should investigate the possibility of converting its cylinder management system to something like that of system a) using the Chile regulatory framework as a model. One of the problems which must be tackled is how to handle the transition from the present consumer owned system to the company owned refundable deposit system. Conceptually the consumers would pay something like 130% of cylinder replacement value for the deposit (covering cylinder and cost of future maintenance and replacement), while receiving the assessed value for the cylinder which they own. Much of this would, therefore, be a “paper exchange” resulting in a contract between consumer and company with a probable small net cash amount flowing from consumer to the company. The consumer would be credited with the full amount of deposit in the form of a guarantee, consisting of valuation of cylinder plus additional amount required. This transition process as well as the ongoing situation could be controlled through special Guatemalan legislation governing cylinder management. Also in this respect, the experiences of Chile would be a useful example, since it stated a well organized transition process after the issuance of new regulations in 1989.

This company-owned system was the one most favoured by the operators in Guatemala although the consultant received no advice from them on the administrative details of the transition from the present system.

Another example is Mexico, where a comprehensive program for cylinder repair and replacement is being implemented since 1997 by the Federal Consumer Protection Agency (Procuraduría Federal del Consumidor) in cooperation with PEMEX.

3.7 Compare the upfront startup costs for purchase or rent of, cylinders, regulators, stoves and other equipment in Guatemala with those in other countries.

The difficulty with any benchmarking comparison of costs is making a fair comparison of “apples with apples”. In the area of entry level LPG consumer equipment in developing countries there is a variation in basic startup consumer cylinder sizes from 6 kg. up to 15 kg as well as a variation in the type of cooking equipment considered the minimum acceptable, reflecting local cooking needs and habits. Basic cookers can range from one burner (“screw-on”) affixed to the top of a 6 kg. cylinder to a small 1 burner or 2 burner stove connected to a larger cylinder (usually 12 to 15 kg) by tubing and valve/regulator. The generally accepted entry level cooker in Guatemala is the basic 2 burner model. Figures 8,9 and 10 illustrate the basic LPG cooker options.

As indicated in Table 5, Section 2.4.2 above the current retail price of a 25 lb. cylinder and appurtenances is some \$ 32, while the same cylinder plus a basic 2 burner stove amounts to \$54. As shown in Table 11, this compares well with prices *for the same type of equipment* in the rest of Central America, India, Ethiopia and West Africa and is much lower than comparable equipment in North America. We have not included prices of startup packages relevant to many of the less-developed countries with the 6 kg cylinder and single burner apparatus. Such packages require a total outlay in the range of \$25 to \$40.

The point that must be made here is that whether the startup cost is \$ 40 or \$ 70, or these amounts divided into several payments, it should not be a major constraint to that portion of the rural population that is within the cash economy (see 3.9 below) and is able to purchase the commodity on an ongoing basis.

**Table 11: Cost of Basic LPG Consumer Startup Package-
Cylinder, 2 Burner Stove, Tubing & Valve/Regulator**

Country	Cost, US\$
Guatemala	54
Central America	50 to 65
India	40 to 50
Ethiopia	60
Côte d'Ivoire	48
Ghana	70
USA	80 to 90
Canada	60 to 70



**Screw-on Burner
Figure 8**



**One Burner Stove
Figure 9**



**Two Burner Stove
Figure 10**

3.8 Legal and regulatory framework

The treatment of this issue has been subsumed under 3.1.

3.9 Identify possible ways of making it easier for the poor to take up LPG without introducing undue distortions in the market.

3.9.1 LPG Marketing Considerations

As discussed with officials of ZETA during the field mission, they have an overall objective to substantially increase their LPG market in Guatemala. Since the urban market in Guatemala has a high degree of penetration already⁶, included in their plans is significant penetration of the rural market, which largely depends on traditional biomass- mostly fuel wood for household cooking needs. ZETA had no special marketing strategies formulated at the time of our discussions – other than keeping the price of the commodity as low as possible, consistent with their aggressively low pricing of recent months.

As with the urban portion of the population the propensity of rural households to convert to LPG is dependent on several factors:

- Total household income
- Household expenditure on traditional fuels
- Fuel purchasing habits, e.g. frequency of purchases and quantity/cost of traditional fuels purchased at one time
- Attitude towards LPG – safety considerations, compatibility with cooking habits and traditions ...etc

The single most important determinant is total household income. A typical socio-economic household survey (with an energy use orientation) to be used for evaluating and designing an LPG marketing program would divide the population into several income range brackets, say about 5 slices of 20% of population each. In rural Guatemala, based on estimated prevailing income distribution⁷, it is probable that only the top 2 such slices would have any significant potential for LPG penetration, the bottom 3 would be largely excluded due to limitations on income. They would typically be largely outside the cash economy and gathering most of their cooking fuel for free in the form of biomass/fuel wood. Table 12 is an extraction of a summary table on LPG use in households from a recent household expenditures survey of Guatemala. The second column is the coefficient of “availability” of LPG to households, while the third column is the coefficient of actual “takeup” by the category of households. The fourth column, “coverage”, is the product of availability X takeup, indicating the coefficient of

⁶ Based on typical household cooking energy use, number of urban households and total residential LPG consumption in Guatemala it is estimated that the degree of penetration of LPG use in urban areas is in the range of 80 to 85%. This figure also gibes with the year 2000 Living Standards Measurement Survey (LSMS) which estimated at that time that some 77% of urban households consumed LPG.

⁷ World Bank, World Development Indicators, 2001

use of LPG (in any quantity) by the particular household group. For example, of the 74 % of households on a national basis in 2000 that had LPG available to them, 61% actually purchased and used the commodity in some measure, resulting in a coverage of 45% of all national households.

Table 12: Guatemala: LPG Use in Households

	LPG		
	Availability	Take-up	Coverage
National	0.74	0.61	0.45
Urban	0.98	0.79	0.77
Rural	0.55	0.37	0.20
Region			
Metropolitan	0.96	0.86	0.83
North	0.44	0.35	0.15
Northeast	0.86	0.53	0.46
Southeast	0.71	0.45	0.32
Central	0.87	0.57	0.50
Southwest	0.72	0.50	0.36
Northwest	0.30	0.46	0.14
Peten	0.60	0.38	0.23
Poverty			
Non-poor	0.91	0.79	0.72
All poor	0.53	0.25	0.13
Extreme poor	0.33	0.04	0.01
Quintile			
1 (poorest)	0.38	0.06	0.02
2	0.61	0.29	0.18
3	0.80	0.55	0.44
4	0.92	0.80	0.74
5 (richest)	0.98	0.90	0.88
Ethnicity			
Non-indigenous	0.85	0.69	0.59
Indigenous	0.56	0.42	0.24
Quiche	0.73	0.52	0.38
Q'eqchi	0.45	0.30	0.14
Kaqchiquel	0.80	0.46	0.37
Mam	0.32	0.28	0.09
Other ind	0.39	0.34	0.13

Source: World Bank calculations using the ENCOVI 2000, Instituto Nacional de Estadística - Guatemala

Even with the “higher” rural income brackets, in order for a marketing campaign to be reasonably successful it would probably include mechanisms such as special promotional prices of the start-up equipment package of stove, cylinder, hose and

valve/regulator. As for the bottom 40%, it is difficult to see how these rural income brackets, largely outside the cash economy, could be considered as serious targets for an LPG marketing campaign. Even with micro-credit and/or marketing company-financed promotional discounts to ease the financing of start-up costs, they are unlikely to have sufficient sustainable cash income to buy the commodity on a continuous basis. For this segment of the population, the goals of poverty alleviation and reducing indoor air pollution may have to be pursued through a program of development and propagation of economical, more efficient, less-polluting fuel wood stoves.

3.9.2 Micro-Credit and Subsidies

As indicated above, section 2.4.2, the current start-up costs for a basic 2 burner package with tubing, cylinder and valve/regulator is about US\$ 54 as a one shot purchase. In an informal arrangement by the appliance retailer he would be willing to accept 3 monthly payments of US\$ 23 for the US\$ 54 package. Such a startup cost outlay should be manageable by the top one or two income deciles in rural areas, but may require some additional support for the lower brackets. The LPG supplier himself could develop financing mechanisms to have the consumer pay an additional sum in his cylinder re-fill purchases over a more extended period, say 12 months. There also may be micro-credit financing mechanisms which could be developed through existing rural organizations such as co-operatives.

Marketing firms may also consider promotional discounts on the startup equipment package. Government-sponsored price subsidies are not recommended, however, because it is difficult to target LPG price subsidy, and a universal subsidy would benefit the better-off, especially in urban areas, disproportionately. The LPG suppliers themselves could possibly justify discounts on the equipment as part of a medium to long term market development business plan. Assuming the LPG supplier reaps the benefits of additional market share through enhanced economies of scale and attendant reduced unit costs in his logistics infrastructure, the initial promotional discounts on equipment could prove to be an "investment" to be recouped over time. It would be amortized through profit on sales and reduced unit costs over a certain project life cycle.

It should be pointed out that the unit cost structure of the LPG supply/distribution business is highly sensitive to scale of operations. Start up investments and running costs are high and largely fixed. The volumes handled through the infrastructure can often be tripled or quadrupled from initial levels without any new investment or significant increase in fixed costs, resulting in significant reduction in unit costs. Hence we see ZETA's aggressive quest for additional market; among other objectives, it wishes to fill its large new receiving/storage terminal capacity. If it takes a project life cycle approach to its business plan it can justify selling below costs in the early years to gain market in order to gain a reasonable profit over the entire life, as unit costs come down.

**Persons met by William Matthews, Consultant
During his Mission to Guatemala May 5 – 10 , 2002**

Ministerio de Energía y Minas, Dirección General de Hidrocarburos

Ing. Mario A. Perez	Director General
Ing. Jorge F. Silva	Subdirector
Ing. Richard Smith	Jefe Depto. de Transformación y Distribución
Lic. Edgar Marroquin	Jefe Depto. de Comercialización
Ing. Luis Ayala	Jefe Sección de Gas
Mario Godines	Técnico/Inspector, Sección de Gas
Carlos Aguilar	Técnico/Inspector, Sección de Gas
Hugo del Valle	Técnico/Inspector, Sección de Gas
Margarito Tuchan	Técnico/Inspector, Depto. de Licencias

Comisión Guatemalteca de Normas (COGUANOR)

Ingra. Duberly Borillas	Técnico, Area de Normalización
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Benemérito Cuerpo Voluntario de Bomberos de Guatemala

Mayor Alfredo Coronado	Tercer Comandante
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Servicio de Bomberos – Municipalidad de El Tejar

Giovanni Porón	Jefe de Servicio
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LPG Industry

Gas Metropolitano S.A.

Lic. Federico Godoy	Gerente General
Freddy Lima	Jefe de Planta el Tejar

Grupo Zeta

Lic. Sergio R. Cervantes	Director General
Ing. Luis Gordillo	Gerente de Transportes

Gas San Jorge

Jorge E. Caballeros	Gerente General
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“Comercial San Lucas”, Tecpan (Independent LPG Retailer)

Expendedor Zeta Express , Zone 3 Guatemala City (Zeta-owned/operated LPG Retailer)

“Almacén Monja Blanca” , Tecpan (Retailer of complete end-user equipment packages – cylinder, tubing, valve/regulator, burners