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NRECA International Ltd.
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Final Report

Project Due Diligence Report for Natural Gas Distribution Options in the Chapare

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1. Executive Summary

NRECA International (NRECA) in collaboration withy the Vice Ministry of Hydrocarbons, DAI, and gas supply and distribution companies, prepared this due diligence report for the proposed Chapare Natural Gas Distribution Project (hereafter referred to as "the Project") at the request of USAID. This final report is based on an assessment of the Project that was conducted over several months in early 2004, and subsequently revised later in the same year. The Report addresses the following issues:

- Natural gas demand among all sectors, including residential, commercial, industrial and vehicular,
- Transportation options for serving natural gas demand in the Chapare, including a conventional three-inch pipeline, a "virtual" pipeline that would include overland transportation of compressed natural gas (CNG),
- Financial and economic returns to the Project based on data and assumptions that were developed throughout the Project due diligence phase, and
- Institutional options for ownership and management of a natural gas distribution company in the Chapare.

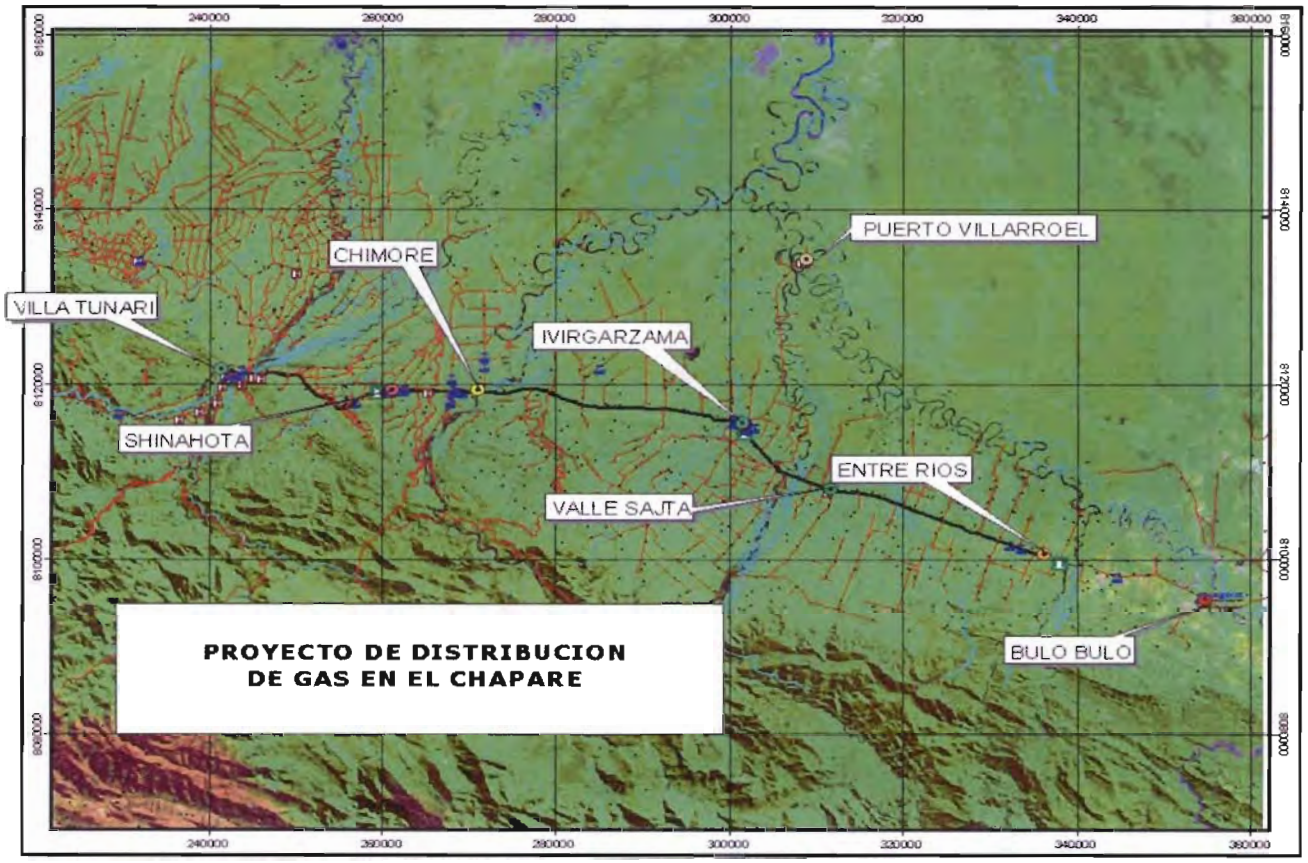
This report summarizes the results of the market and financial analysis, and considers several options of ownership and management of the gas transmission and distribution companies.

1.1 Project Overview

The Project is designed to develop a transportation and distribution system to supply natural gas from Santa Cruz to five towns in the Chapare. The focus of the Project centers on two alternate transport options. One involves the construction of a three-inch gas pipeline from Entre Ríos to Villa Tunari that would parallel an existing petroleum products pipeline and connect to gas distribution systems to be developed in the key towns along the Project route. The second alternative would consist of development and operation of a "virtual pipeline", or vehicular transport system that would deliver CNG via specialized modules from a central compression station near the production wells to CNG stations at or near demand centers.

A map of the project location and related infrastructure is provided in Exhibit 1.

Exhibit 1: Project Location and Related Infrastructure



A consumer education component was envisioned specifically to facilitate the conversion of gasoline engines to CNG; to promote local conversion of gasoline to CNG-fueled vehicles; to promote adoption of gas water heaters, stoves, and other household appliances; and, in general to inform the public of safety and financial benefits of natural gas.

The Project also includes the development of gas distribution systems in each of five communities in the Chapare. These local distribution systems will include primary and secondary distribution lines, together with service connections to approximately 2,500 residential, commercial and industrial customers in the first year. The estimated total capital cost of the distribution systems is roughly $1.9 million, exclusive of construction management and project oversight costs.[1]

[1] Estimates of capital and operational costs were based on the most accurate market prices at the time the analysis was undertaken. Given the prevailing volatility in international petroleum product prices, as well as the cost of steel, these estimates may have to be revised if and when a decision is taken to implement the Project.

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Due to the rather divergent set of project options under evaluation for this project, four separate models were designed to illustrate probable financial returns for each set of alternatives. The following options were evaluated;

1. Case 1: Gas distribution system providing service to residential, commercial, and industrial consumers, with gas provided through a three inch conventional gas pipeline. No CNG sales included in this case.
2. Case 2: Same as Case 1, but including investment in CNG service stations and gas sales for 50% of potential vehicular market throughout project life.
3. Case 3: Gas distribution system providing service to residential, commercial, and industrial consumers, with gas provided through a virtual pipeline. No CNG sales included in this case, and;
4. Case 4. Same as Case 3, but including investment in CNG service stations and gas sales for 50% of potential vehicular market throughout project life.

The project team conducted a financial evaluation of each of the four cases detailed above, and the majority of these options result in negative financial returns on investment. The only case that demonstrated attractive returns was the use of the conventional gas pipeline combined with demand from vehicular fleets for CNG. In any other case under consideration, a higher level of grant funding and/or higher tariffs will be required to make the Project financially viable.

The financial results are illustrated in Table 1 below.[2]

Table 1: Summary of Financial Results for each Case

Project Option	Total Investment	Working Capital Deficit	Financial IRR
Case 1	$7,160,000	$500,000	negative
Case 2	$8,805,000	0	26%
Case 3	$5,789,000	$5,409,000	negative
Case 4	$7,134,000	$820,000	negative

[2] NRECA assumed that a maximum of $4 million would be made available in capital grant funds to underwrite the construction cost of the project. It was further assumed that an equity ceiling of $1 million would be invested by the project company for the pipeline and distribution system in separate investments. The balance of the investment required would have to be financed from development or commercial banking institutions. Low interest loan funds from development banking institutions were estimated at 8% annual interest, while commercial loans were valued at 10% interest.

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1.2 Key Findings

1.2.1 Financial& Economic Analysis

- The Project is financially viable only when demand from sales of CNG is included in the financial projections. However, this conclusion implies that the long term financial sustainability of a $9 million investment in transmission and distribution infrastructure will be subject to the performance of three CNG service stations.
- The virtual pipeline option is not currently financially viable and faces significant future downside risk due to the rising cost of diesel for transportation and frequent transport interruptions in the Chapare.
- The physical gas pipeline and virtual pipeline options yield significantly higher rates of return if retail compressed natural gas (CNG) sales for vehicular transportation is included as a revenue stream for distribution purposes.
- Tariff increases of $0.80 - $1.00/MCF, for residential and commercial, and $0.40/MCF for industrial consumers, respectively, would be necessary to deliver Project financial returns of 15.6%. This might make the project sufficiently attractive to a commercial bank, but it would likely require some form of loan guarantee from either the Government or USAID.
- Higher capital grants on the order of $5.4 million would also result in a high Project return on equity, but there is currently not assurance that an increase in grant funding would be available to the Project.
- Total estimated life of project economic returns from the investment in the gas distribution system are approximately $17.5 million; which represents high economic value from an initial capital investment of approximately $9 million for the pipeline case with CNG sales.

1.2.2 Transportation Options

- The petroleum products pipeline operated by Transredes will not be available for use on the project.
- The proposed three-inch conventional gas trunk line will be built in three segments (Entre Ríos-Ivirgarsama, Ivirgarsama-Chimoré, and Chimoré-Villa Tunari), a medium-pressure system serving industrial customers, and a low-pressure system for domestic service in five towns in the Chapare.
- The capital cost to develop a three-inch 103 km pipeline from Entre Rios to Villa Tunari is estimated to be $5.2 million. The inclusion of three CNG service stations as part of Case 2 will increase the overall investment to approximately $8.8 million.
- The cost to develop a "virtual" pipeline is estimated at $3.0 million. Estimated operating costs increase significantly as market demand increases due to corresponding increases in transport costs.
- The conventional gas pipeline transmission option involves greater capital investment than the virtual pipeline, but has lower operational risks and greater financial returns.

1.2.3 Natural Gas Demand

- Demand for natural gas in the Project Area is projected to increase from a base of 155,000 MCF/yr. during the first year of operations to over 480,000 MCF/yr. by the eighth year of operation.[3]
- The vehicular sector is expected to comprise the majority of gas demand in the Project Area.
- Residential and commercial gas demand is expected to account for most of non-CNG demand over the forecast period, and is estimated to increase from a base of 68,000 MCF/year to 108,000 MCF/year.

1.2.4 Institutional Options

- A review of institutional options suggests that a special-purpose corporation is the preferred structure for the new gas distribution utility.
- Discussions with potential stakeholders in the Project were curtailed due to the political crisis in Bolivia and the uncertainty over the government policy on hydrocarbons.

[3] Assumes sales of CNG.

2. Introduction

The benefits of natural gas as a clean and economic energy source are unchallenged. Domestic prices in Bolivia are below $1 per million thousand cubic feet (MCF), by far the most economic thermal fuel supply available in country. Natural gas is both plentiful and an extremely clean-burning fuel, an ideal substitute for heavy oils used for boilers and power generation.

However, while an impressive gas transmission system has been built from fields in Santa Cruz and Cochabamba to all the major Bolivian cities, distribution networks are quite limited, offering service to large industrial users and to power generation stations. Very few housing subdivisions have natural gas service even in urban La Paz, Cochabamba, and Santa Cruz. Moreover, there is virtually no natural gas service in non-urbanized areas.

NRECA conducted a preliminary study in 2002 - 2003 of a natural gas transmission and distribution project that would displace liquid transport fuels and result in a distribution network for industrial, commercial, and residential consumers. The estimated financial results of this study were modest, but the Project was an attractive infrastructure investment from the point of view of economic returns.

At the request of USAID, NRECA performed a more detailed evaluation in February, 2004, of the issues and options related to establishing natural gas distribution service in the Chapare for the purpose of serving vehicular, industrial, commercial, and residential market segments. NRECA refined this analysis in a subsequent due diligence assessment in late 2004 that included financial and economic analysis of alternative gas transportation options, including a conventional gas pipeline and "virtual pipeline" that would include overland compressed natural gas transport by truck, and sales of CNG via service stations for vehicular use.

3. Market Assessment

A comprehensive market assessment was conducted to determine estimated demand for natural gas in the target market area that includes Villa Tunari, Shinahota, Chimoré, Ivirgarzama, and Entre Ríos. Potential energy demand was also estimated for Puerto Villarroel, which is a major transit area where higher than normal vehicular traffic was expected to increase potential sales of CNG.

Total estimated gas demand in the project area by dividing consumers into four general categories, including industrial, commercial, residential, and vehicular (CNG). Data was collected for each respective market segment through means of a comprehensive field survey. Over 350 surveys were conducted in these six communities to develop a rigorous estimate of natural gas demand among the four consumer sectors.

Table 2.1 summarizes the number of survey instruments completed for each respective market segment by municipality.

Table 2: Gas Demand Surveys by Municipality and Consumer Sector.

Municipality	Number of Surveys				
	Residential	Commercial	Industrial	Vehicular	TOTAL
Villa Tunari	24	11	1	8	**44**
Shinaota	33	4	0	12	**49**
Chimoré	38	8	12	7	**65**
Ivirgarzama	45	12	5	9	**71**
Puerto Villarroel	44	8	0	7	**59**
Entre Rios	42	8	0	13	**63**
TOTAL	**226**	**51**	**18**	**56**	**351**

3.1 Estimated Natural Gas Demand by Sector

A forecast of gas demand was estimated by sector for each consumer type based on the data derived from the surveys and estimates of future demand. The inclusion of CNG sales results in total gas demand of over 155,000 MCF for the first full year of Project operation, and increases rapidly to 480,000 MCF during the eighth year of the Project. If CNG sales are omitted from the forecast, demand from the residential, commercial and industrial sectors is far lower in the initial year of operations and grows at a much lower rate over the forecast period.

The overall forecast of gas demand for the Project is presented in Exhibit 2 below.

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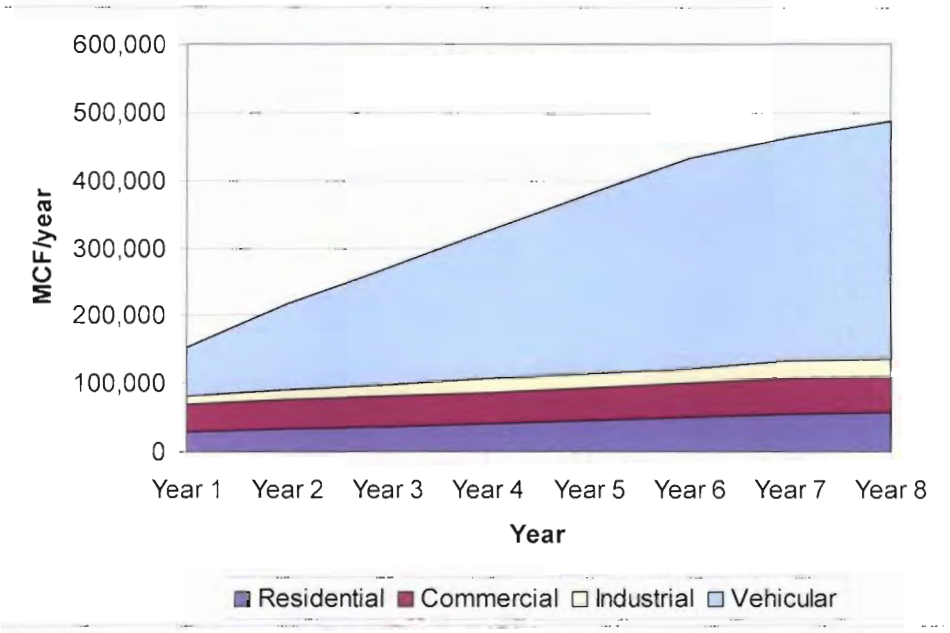
Exhibit 2: Forecast of Natural Gas Demand by Sector



Note: Consumption values for large commercial, small industrial, and large industrial are average values, but demand for each category was measured individually.

3.1.1 Residential

The surveys conducted in Villa Tunari, Shinahota, Chimore, Ivirgarzama and Entre Rios revealed that there are approximately 5,720 homes.. The estimated demand from residential users is approximately 12.5 MCF/year, based on current household demand for liquid propane gas (LPG).

Estimates indicate that approximately 40% initial penetration rate can be expected in the first year, based upon responses to questions in the survey that queried users on their desire to switch from LPG to natural gas use. Responses indicate that very few consumers are aware of the advantages of natural gas over LPG, but most users would prefer it for the sake of convenience due to the need to switch gas bottles when they expire. Taking the responses into consideration, it is estimated that approximately as 2,280 homes will request and receive natural gas service in the first year of project implementation.

Based on experience with other rural utilities, it is estimated that the residential market saturation point will be approximately 70 percent of the total number of households, or about 4,130 of the 5,720 households that presently exist. Moreover, we estimate new connections will be made at the rate of five percent per year until the saturation point is reached. Thereafter new residential connections will be made at the rate of two percent per year as a function general population growth. Population growth based on most recent census data is project at just under three percent per year. It should be noted that

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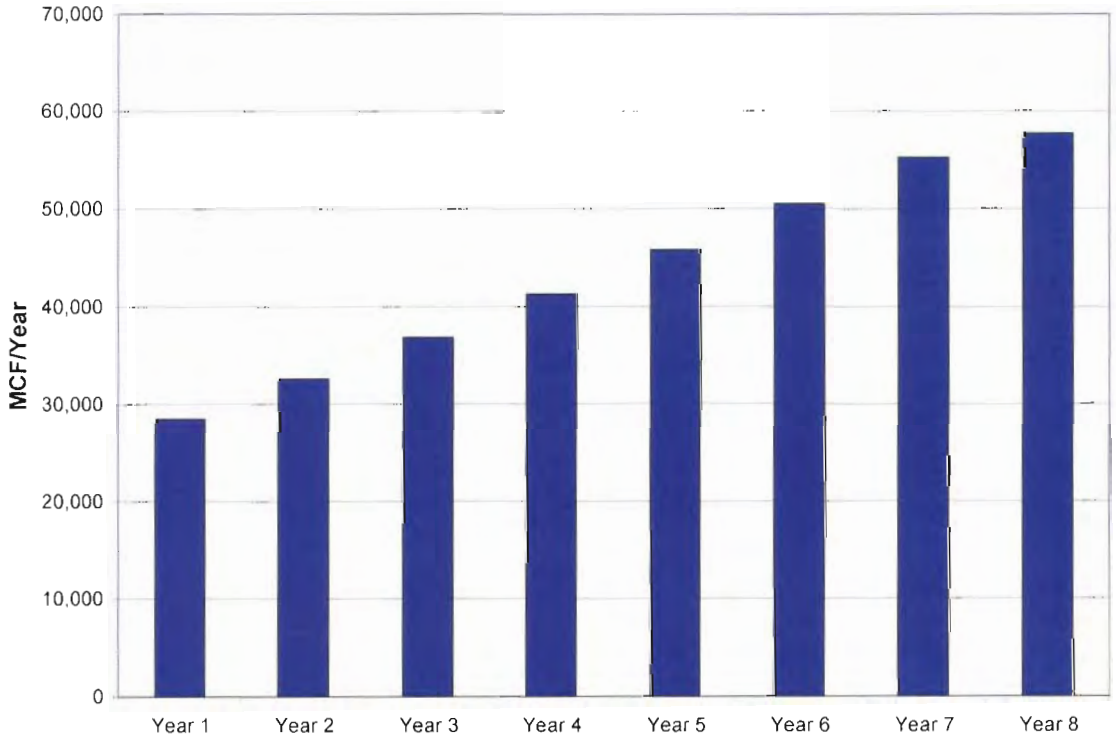
our market penetration assumptions are also based on the assumption that connection costs will be financed bringing the initial cost to the individual consumer to a very affordable level.

Usage per household is based on field survey data averaging about twobottles of LPG per month and adjusted slightly upward to account for wood-fuel cooking. This translates to a natural gas equivalent of just over 30 cubic feet per day (CF/D) per home.

Estimated demand from residential households is shows in Exhibit 3 below.

Exhibit 3: Estimated Residential Gas Demand, Years 1-8



3.1.2 Commercial

Field investigations confirmed the existence of approximately 500 commercial businesses in the project area, the vast majority of which are small commercial. The February, 2004 study team performed an analysis of the business consumption by the category to determine the average consumption of gas for all small commercial businesses. This study revealed that approximately two thirds of the businesses use natural gas, and others like carpentry shops, mechanical repair shops, dry goods stores, etc., do not have a need for thermal energy.

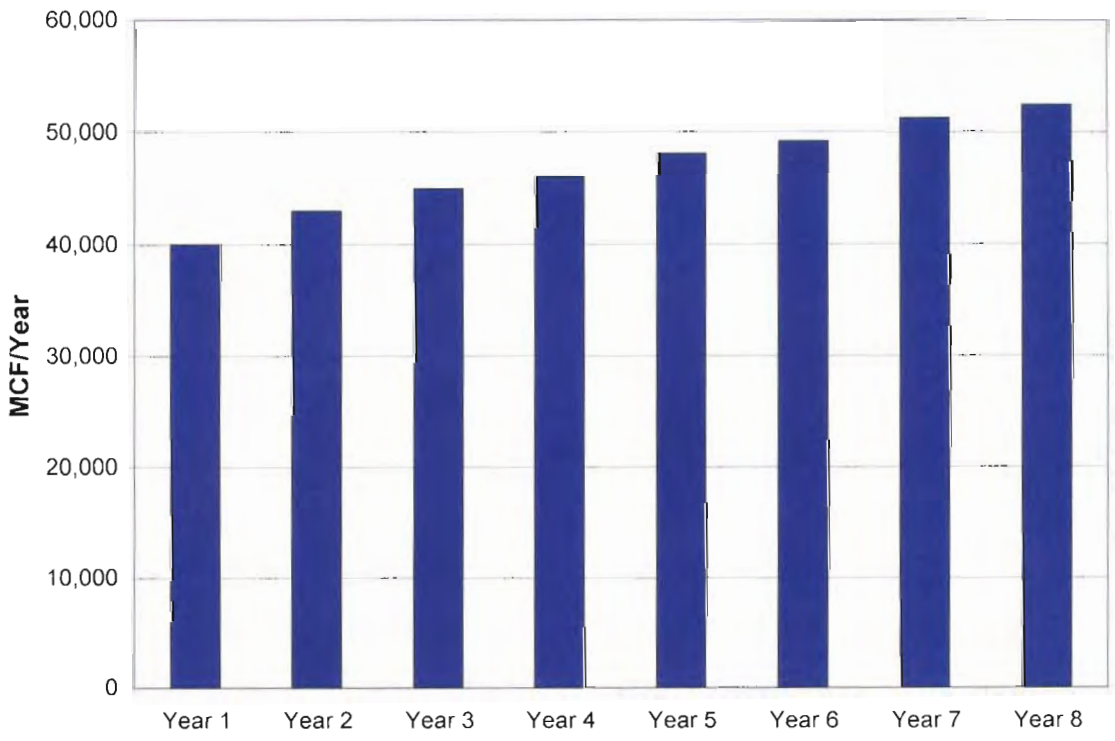
The potential clients of the proposed natural gas distribution company, therefore number 313, approximately 85% of which are expected to connect to the project company during

the first year of gas distribution system operation. Service connection costs are assumed to be included in the capital cost of the project and not charged to the new clients in an effort to increase access to service. New small commercial customers were projected at a rate slightly higher than population growth, or about 4% per year. Energy usage for the small commercial group was calculated on an average natural gas equivalent basis of about 20 bottles of LPG per month, or just less than 300 CF/D per consumer.

In addition to the small commercial group, nine large commercial operations were identified. Energy use for this group, which included several bakeries and a catering operation, was analyzed on an individual survey basis. New large commercial customers were projected at the rate of one every two years.

Exhibit 4 provides a graphic summary of estimated gas demand from commercial consumers over the first eight years of the Project.

Exhibit 4: Estimated Commercial Gas Demand, Years 1-8

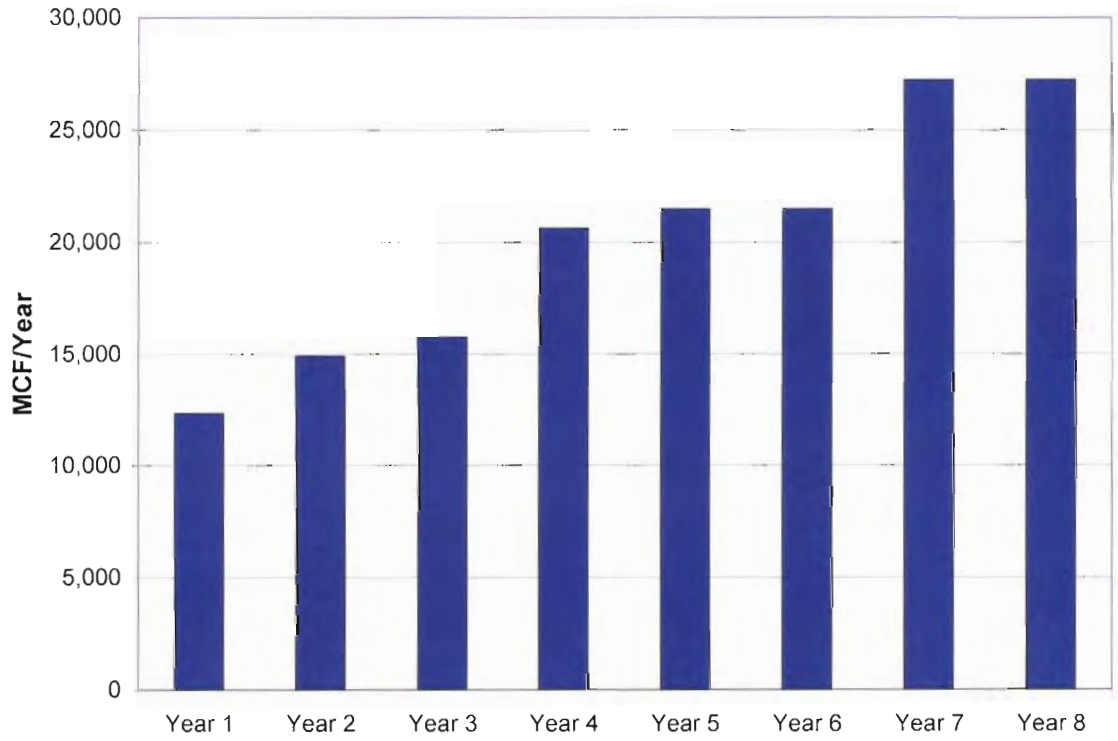


3.1.3 Industrial

Field investigations identified six small industrial users (all food processing) and two large industrial users (both palmito plants), each of which was surveyed individually to estimate monthly fuel consumption patterns. New small industrial customers were projected at the rate of one every two years. New large industrial customers were projected at the rate of one every three years.

Estimated demand for natural gas from industrial consumers is presented in Exhibit 5 below.

Exhibit 5: Estimated Industrial Gas Demand, Years 1-8



3.1.4 Vehicular (CNG)

Prior to conducting the field investigations, several discussions were held with team members and Vice Ministry of Hydrocarbons experts to discuss the issue of heavy vehicle CNG use. A consensus was reached that it is highly unlikely that heavy vehicles can or will convert to use CNG, and that the project should not rely on CNG sales to heavy vehicle traffic in the Chapare. Should CNG sales to heavy vehicles occur, it would certainly enhance project viability, but since the possibility of significant sales is extremely low, CNG sales to heavy vehicles has not been considered.

The market study therefore focused on defining the total light weight vehicle fleet in the Chapare. This turns out to be a non-trivial process, due to the fact that census data and the data managed by the taxi associations and other local groups is not consistent. Since the local data is probably the most current, the NRECA/DAI team decided to base the market study on data derived in the Chapare.

Three types of light weight vehicles compose the potential market for CNG sales in the Chapare. There are full time and part-time taxis, as well as transitory vehicles passing from Cochabamba to Santa Cruz and vice-versa. There are approximately 2200 light weight vehicles in the Chapare, of which about 1400 are considered to be full-time taxis and the remainder, part-time taxis. Of this number, approximately 90% have diesel engines and the remainder have gasoline engines. Those with gasoline engines can be readily and inexpensively converted to CNG use, while conversion of diesel engines to CNG is more expensive not likely to see very high penetration.

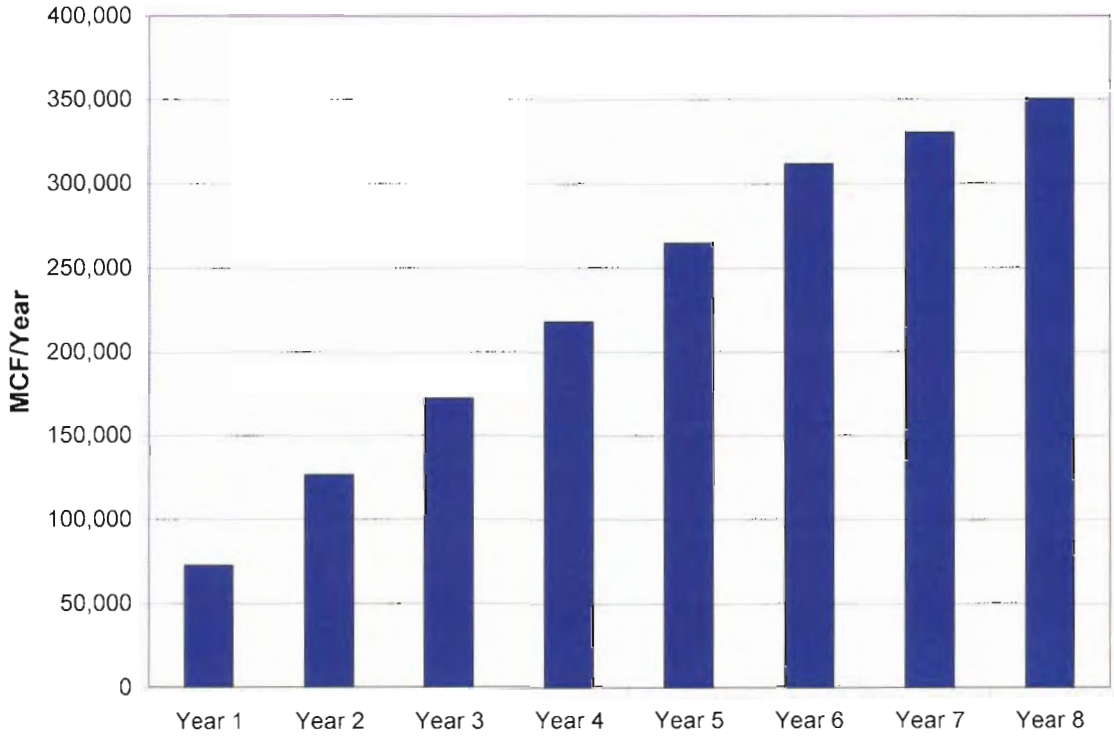
In addition, it is estimated that approximately 315 vehicles pass through the Chapare per day (based upon vehicle counts in San Jacinto and Bulo Bulo in 2003). However, based upon data from Santa Cruz and Cochabamba vehicle fleets, only 10% are likely to be CNG-ready.

Field data collected on average fuel consumption for diesel and gasoline for local light fleet usage indicated nearly identical levels of consumption, at approximately 490 liters/vehicle-month. In terms of equivalent CNG consumption, this would yield approximately 515 CF/D per active vehicle. Non-active vehicles, assuming personal use and sporadic taxi service, were projected at 50 percent the consumption level of active vehicles.

The demand analysis for CNG vehicular sales was therefore estimated based upon the assumption that 100% of the gasoline engine taxis would be converted to CNG within two years of project execution, and diesel conversion would occur at the rate of 15% of the diesel vehicular fleet per year. The results of this analysis were very similar to the February, 2004 analysis performed by NRECA.

Total estimated demand from Vehicles over the forecast period is illustrated in the following Exhibit 6.

Exhibit 6: Estimated Gas Demand from Vehicles, Years 1-8



4. Gas Transportation Options

When the Project was originally analyzed in early 2004, an existing petroleum products pipeline owned by Transredes was considered a potential gas transport option. However, a decision was reached by the Vice Ministry of Hydrocarbons and Transredes to utilize this pipeline to transport petroleum products from the Carrasco fields to Cochabamba for processing and it is therefore unavailable for the Chapare gas distribution project.

NRECA determined that there are two potential transport options available to the Project. One involves the development of a new, small diameter pipeline. This traditional three inch pipeline would transport gas from Entre Rios to towns in the Project area. The second option would be the development of a virtual pipeline, which would involve a mobile supply chain involving trucks that would link the gas compression station at the wellhead to three retail CNG stations in the Project area.

For purposes of this analysis, both the virtual and traditional pipeline alternatives have been modeled to ascertain which of the two alternatives is more attractive. The following section will summarize estimates of the capital and operating costs associated with development of both a conventional three-inch and an unconventional virtual pipeline, respectively.

A presentation of financial analysis for each respective transportation option is shown in Section 6 below. The financial analysis takes into consideration the capital and operations and maintenance costs associated with each option, the estimated revenue accruing from sales of natural gas and CNG, and any subsidies that might be applied to the projects.

4.1 Option 1: Virtual pipeline

The "virtual pipeline" option would involve the transport of natural gas in compressed form from a compression station to three or more distribution points within the Project Area. This option has seemed limited use to date in applications when the size of the market does not merit construction of a fixed pipeline. It has been employed in Argentina with some success. The system is composed of the following major components:

1. High capacity compressor, able to compress up to 1,600 m^3 per hour.
2. Compressed gas transport modules, 1500 m^3 capacity.
3. Transport system composed of tractor-trailers with capacity to haul four modules from site to site.
4. Gas regulators at each distribution point, including those for residential, commercial, and industrial consumers.
5. CNG compression stations for vehicular applications.

Virtual pipeline applications enjoy significantly lower capital costs than conventional gas pipeline development, but the transportation costs result in significantly higher operating expenses. Virtual pipeline operating costs increase as the market expands and more volume is transported to the CNG stations to meet growing market demand.

The virtual pipeline is also subject to prevailing transport conditions, which present a significant downside risk. Key roads that would be used in the virtual pipeline supply chain are known for frequent blockades and strikes that result in road closures that could stall transport trucks for several days or longer. These risks present significant obstacles to the development and operation of a virtual pipeline, but a financial analysis of this option was performed to determine if it would result in a viable option for the project.

Table 3 illustrates the estimated initial capital outlay for the equipment required to manage a virtual compressed natural gas pipeline.

Table 3: Estimated Capital Costs for a Virtual Gas Pipeline.

Pipeline Components	Number	Unit Cost	Total Cost
Compression plant			
MICROBOX 132 - 1600 m^3/hr w/CAT engine	2	256,401	512,803
MAT 1500 module - 1500 m^3	4	38,743	154,970
Loading platform	5	6,280	31,400
Total Compression plant			**699,173**
Transport			
ST-4 Trailers	2	111,809	223,618
MAT 1500 modules - 1500 m^3	8	38,743	309,940
Total Transport			**533,558**
Storage & Regulation			
MAT 1500 modules - 1500 m^3	29	38,743	1,123,533
Regulators R-200s	11	16,959	186,546
Loading platforms	40	6,426	257,050
GNC stations	5	46,250	231,250
Total storage & regulation			**1,798,379**
TOTAL			**$ 3,031,109**

In addition to these rather significant capital costs, the gas transport system is quite expensive from an operational point of view. In the first few years, trucking costs to transport the high pressure compressed natural gas modules from point to point will cost approximately $416,000 per year.

Table 4 summarizes all first year operating costs for the virtual pipeline option, including labor, service costs, transport, maintenance, insurance, administrative, and commercialization costs.

Table 4: Summary of Estimated Annual Operating Costs for Virtual Pipeline

Operating cost item	Amount
Salaries & benefits	$ 97,040
Electricity and other services	12,420
Transport costs (@$3 per kilometer)	417,471
Vehicle & equipment maintenance	22,622
Various materials	500
Insurance	30,311
Administrative costs	15,000
Commercialization costs	3,247
Total operating costs	$598,611

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The estimated cost to operate and maintain the virtual pipeline is quite high. Unfortunately, these costs are expected to grow over the project life as demand for gas increases. As additional transport vehicles are used, the transportation costs increase rather dramatically from $417,000 to $624,000 in year four due to the need to add another carrier to respond to increased gas module transport. Total operating costs increase from $552,000 in year three to $774,000 in year four.

4.2 Option 2: Construction of new pipeline

The Project proposes construction of a gas transport pipeline, with taps for industrial service and to CNG outlets, routed between Entre Rios and Villa Tunari. . The pipeline was dimensioned to use steel 3 inch pipe with a nominal head pressure of 1,400 psi and a discharge pressure of 700 psi at Chimoré. The total length of the pipeline is estimated at approximately 103 kilometers.

The routing for proposed pipeline would follow the main highway between Santa Cruz and Cochabamba for two practical reasons. First, the majority of the potential consumers (industry, commerce, hotels) are located along this highway. Secondly, two petroleum product pipelines are already located alone this same corridor. The intention was to locate the new pipeline so it could take advantage of the existing right of way along this corridor, reducing overall project cost. If this corridor could be used, it would yield savings for right-of-way payments as well as minimize environmental impact.

Estimated cost of design, right of way clearance, materials procurement, trenching, and many other costs associated with pipeline construction was estimated to be nearly $5.2 million. A detailed list of the costs is shown in the following Table 5 .

Table 5: Estimated Costs to Develop a Three Inch Conventional Gas Pipeline

Item	Descripción	Costs
1	Moblization	82,874
2	Design	59,473
3	Right of way clearance	120,616
4	Trenching	269,771
5	Laying pipeline	87,715
6	Welding	508,871
7	Leak testing	14,445
8	Protective coating	65,909
9	Lowering pipe into trench	184,146
10	Hydrostatic testing	29,127
11	Special road crossings	79,770
12	Restoring roadbeds	70,224
13	Seeding & landscaping	78,263
14	Signs and sign posts	9,812
15	Cathodic protection	221,667
16	Bridges	88,667
17	Steel pipe	2,021,600
18	Values, fittings, etc.	60,000
19	Gas regulation stations	120,000
20	Environmental licensing	25,000
21	Other permissions	15,000
22	As built drawings	421,295
25	Final design	126,388
26	Project supervision	210,647
27	Transredes overhead	210,647
	Total	**5,181,928**

Operating costs for the pipeline should be relatively modest. Cathodic protection will account for approximately 20% of the operating budget, with the majority required for patrolling and routine maintenance activities.

Table 6 provides a summary of operating cost estimates.

Table 6: Estimated Annual Operating Costs for Conventional Pipeline

Operations Activity	Estimated Cost
Cathode replacement	$ 10,000
Vehicle expenses	5,000
Personnel costs	40,000
A&G expenses	20,000
Total	**$75,000**

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4.3 Gas Distribution System

The distribution system will tap the transportation line in each of the major population centers along its length, resulting in five (5) pressure reduction stations from which the primary and secondary system will extend to serve domestic, commercial and industrial clients.

The primary distribution system will be designed to operate at medium pressure. The pipeline will be composed of carbon steel, with valves, accessories and metering equipment composed of brass or other similar materials. The approximate length of primary pipeline for all five communities will be 10 kilometers.

The secondary distribution system will be operated at low pressure, with secondary services composed of polythene pipe. All components will be composed of polythene with the exception of revenue meters. The secondary distribution system will be much more extensive in length than the primary, and will require approximately 45 kilometers of polythene pipe for all five communities.

The total estimated cost of the distribution system is described in detail below. It is important to note that these costs do not include capital costs associated with establishing commercial operations of the project company. Start up capital is required to purchase of service vehicles, maintenance tools and equipment, office equipment, and to provide adequate working capital. The estimate does include service connection costs due to the need to focus on promoting much higher market penetration than would be possible if these costs were not shared by the project. Financing these costs that average approximately $175 per residential and commercial user, and $12,000 for industrial consumers will overcome a huge barrier with respect to realizing a significantly higher rate of market penetration. Estimated costs to develop the distribution system cost, including service connections, are detailed in Table 7 below.

Table 7: Estimate of Capital Costs to Develop Distribution System

Primary & Secondary System	Cost ($US)
Entre Ríos	251,858
Irvirgarsama	386,365
Chimoré	270,986
Villa Tunari	211,333
Shinhota	286,986
Subtotal	1,407,528
Metering & reduction stations	250,000
Industrial meters	24,000
Subtotal	1,681,538
Engineering	75,000
Contingency	175,653
Total	$1,932,181

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The total cost for distribution system engineering, materials and construction is projected at nearly $2 million. In addition to these capital costs, the project will require financing for pre-operating costs, working capital and the costs of third-party construction management and project oversight. The total investment cost is estimated to be approximately $2.15 million.

4.4 CNG Service Station costs and potential revenues

Compressed natural gas service for vehicular traffic is growing in importance with the recent but steady increase in liquid transport fuel prices. In the March, 2004 report, The project team originally recommended against including CNG stations as an integral part of gas distribution utility operations, due primarily to knowledge and experience in managing non-utility business ventures that were problematic when managed by traditional electric utility organizations, also because of the project area is one of the most conflictive region in the country. However, as a result of extensive discussions between project partners, it was decided to evaluate the impact of including CNG gas station costs and revenues in the analysis of options for this study.

Compressed natural gas service stations are relatively capital intensive investments. They require investment in land, lot preparation, grading, and concreting; installation of conversion kit bays and vehicle repair facilities; and procurement and installation of the gas compressor station. Table 3.6 below provides a summary of the investment cost of CNG stations.

Table 8: Capital Cost Estimates for Development of CNG stations.

Item	Estimated Cost
Land	40,000
Site development	160,000
Buildings	30,000
Gas compression station	172,500
Equipment and tool (conversion, etc.)	5,000
Totals	**$407,500**

Operating costs for the CNG service stations were also estimated to model financial performance. Annual operating costs consist of personnel (labor) costs; equipment maintenance and repair costs; cost of utilities including electricity and water; and miscellaneous costs such as advertising, insurance, etc. The total annual operating costs per CNG service station have been estimated at approximately $52,000.

A financial evaluation was performed to model the performance of CNG stations in the Chapare. Even assuming relatively low collection efficiencies, given that this is a retail

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business, CNG stations appear to be an extremely attractive investment. Even with only half of the modeled market, and with relatively low collection efficiencies, the CNG stations appear to achieve 37% rate of return on equity, all assuming a market share of only 50% of the estimated market for CNG in the Chapare.

5.0 Financial & Economic Analysis

An analysis of the financial and economic benefits and viability of the new gas distribution utility has been conducted, based on the two gas transport options under consideration. Each of these two gas transport options were evaluated with and without retail CNG sales. The "base" case financial projections assume that the company will sell gas wholesale to CNG retailers, while the "high" case scenario assumes that the gas distribution company will own and operate three CNG distribution stations.

5.1 Financial Analysis

The financial model includes the two gas transport options and CNG retail sales. The model projects total project income over a twenty year time frame, total project expenditures, capital costs for each investment scenario, and operating costs that specifically apply to the traditional pipeline, the virtual pipeline, and CNG stations for each respective analytical scenario. It is assumed that the entire project area would be protected through an exclusive service area concession for retail natural gas sales to residential, commercial, and industrial consumers, but that CNG sales would not enjoy the protection of a geographic concession. It has been assumed that that the company will be in a position to capture 50% market share of the CNG market segment, should it engage in retail sales of CNG. The model horizon is 20 years, consistent with asset life and other regulatory considerations.

5.1.1 Capital Costs

Capital costs for the project have been estimated as reflected in Section 4 above for each project option and for each segment of the base project. The capital costs as used by the financial model are summarized in Table 9 as follows.

Table 9: Comparison of Estimated Investment Cost for Project Options

Project Component	Investment Cost
Distribution system	$1,932,181
Conventional 3" pipeline	$5,181,928
Virtual pipeline	$3,031,109
CNG stations (total of three)	$1,222,500

A portion of the investment cost is expected to be provided as a grant in aide to the project company, but a portion of the funds should be invested as owner equity. Just how the equity contribution is made in the case of the gas distribution company is grounds for further analysis, and only after a detailed analysis of the institutional options can be made. The magnitude of subsidies required has been evaluated for the distribution and transmission segments of the overall investment, assuming that these two activities would be owned and managed by separate companies.

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Expansion costs are lower than initial construction costs (by roughly half) for the residential and commercial customers as the trunk system will already be in place. Expansion costs include limited secondary, service connection and meter and are projected at $350 per connection. Industrial connections vary greatly based on the size of the load but for the purposes of the model an average cost of $10,000 per site is projected.

5.1.2 Operating Costs

Operational expenses have been evaluated for each investment option as also illustrated in section 3 above. Operating costs include the wholesale cost of gas; the wheeling charge to transport gas; staffing costs for administrative, commercial, and maintenance activities; variable customer and operations and maintenance, and contract services. System losses are theoretically non-existent but to account for seepage losses are set at one percent of total purchases. Collection efficiency is set at 95 percent of total sales for residential, commercial, and industrial consumers, and CNG retail sales. Insurance is projected at one percent of depreciated plant value.

5.1.3 Gas Costs

Discussions with natural gas producers indicate the sales and delivery contracts could be negotiated for a gas well head cost of $0.55 per MCF and transport cost of $0.41 per MCF (domestic postage stamp rate) for a total delivered cost of $0.96 per MCF. Pending legislation could further lower the gas transport cost for domestic (within Bolivia) distribution from $0.41 to $0.35/MCF, but since this is not certain the delivered price of $0.96 per MCF is used in the financial model.

As will be discussed in greater detail below, the wholesale gas price will likely have to float upwards to avoid a higher than necessary subsidy for the conventional gas pipeline case, and to ensure that Transredes can make a modest but reasonable return on its investment. This possibility will be shown for illustrative purposes only, as the gas regulatory agency will set the transmission price. However, it is quite likely that gas transmission costs for any and all rural gas distribution projects will need to be increased for the projects to be financially viable, as is the case for rural electrification projects.

5.1.4 Sales

The level of natural gas sales assumed in the financial model base case is provided in Section 3 Market Assessment section of this report. The sales projections are considered conservative in that many factors could improve sales and only a few factors could conceivably result in lower sales performance. The latter would include worst case scenarios such as political deterioration of the project area resulting in industrial and population migration, or a prolonged national economic downturn. On the positive side, greater industrial development of the area due to the availability of gas, faster than expected vehicle conversion or increases in average domestic or commercial use could all increase sales above the base case projections.

5.1.5 Tariffs

In the financial model base case tariffs are set to conform to the high end of the range of current regulated tariff levels at other natural gas distribution utilities in Bolivia. The base case tariffs in comparison to current tariffs across the country are shown in the following table. All tariffs include sales taxes.

Table 10: Existing Natural Gas Tariffs in Bolivia

Market	Residential	Commercial	Industrial	CNG
La Paz	5.48	5.37	1.70	8.50
Oruru	5.48	4.32	1.70	8.50
Potosí	5.48	4.32	1.70	8.50
Santa Cruz	5.37	5.37	1.70	8.50
Cochabamba	5.17	5.17	1.70	8.50
Sucre	5.07	5.07	1.70	8.50
Tarija	4.27	4.27	1.50	8.50

Based on the projected cost structure of the new Chapare gas distribution solid regulatory arguments could be made to increase the tariffs above those assumed in the base case financial model. However on a practical basis these rates are already at only slightly lower than LPG prices, so it was assumed that tariffs would be very similar to those employed in Cochabamba and Santa Cruz. Any increase in the price of natural gas relative to that of LPG will slow customer connections to the new utility. Conversely, if the highly subsidized price of LPG were to rise, corresponding moves in the natural gas tariff could be made without suffering a reduction in sales.

The base case tariffs do not include a minimum monthly bill for any customer class, however such a mechanism is used by existing gas distribution companies and this would likely be a recommended option for the new Chapare natural gas company.

5.1.6 Results

Due to the rather divergent set of project options under evaluation for this project, four separate models were designed to illustrate probable financial returns for each set of alternatives. The following options were evaluated;

5. Case 1: Gas distribution system providing service to residential, commercial, and industrial consumers, with gas provided through a three inch conventional gas pipeline. No CNG sales included in this case.
6. Case 2: Same as Case 1, but including investment in CNG service stations and gas sales for 50% of potential vehicular market throughout project life.
7. Case 3: Gas distribution system providing service to residential, commercial, and industrial consumers, with gas provided through a virtual pipeline. No CNG sales included in this case.
8. Case 4. Same as Case 3, but including investment in CNG service stations and gas sales for 50% of potential vehicular market throughout project life.

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Given pledges to date to financially support this project, it was assumed that a maximum of $4 million would be made available in capital grant funds to underwrite the construction cost of the project. It was further assumed that an equity ceiling of $1 million would be invested by the project company for the pipeline and distribution system in separate investments. The balance of the investment required would have to be financed from development or commercial banking institutions. Low interest loan funds from development banking institutions, if available, might be available at 8% annual interest at a 15 year term, while commercial loans were valued at 10% interest.

Given these parameters, the financial models result in nearly uniformly negative returns for the project alternatives. This suggests that if any alternative other than use of the gas pipeline with CNG sales is chosen, a higher level of grant funding and/or higher tariffs will be required. The results are summarized in
Table 11 as follows:

Table 11: Summary of Financial Model Results for each Respective Project Option

Project Option	Total Investment	Working Captial Deficit	Financial IRR
Case 1	$7,160,000	$500,000	negative
Case 2	$8,805,000	0	26%
Case 3	$5,789,000	$5,409,000	negative
Case 4	$7,134,000	$820,000	negative

The above results show that the Project is viable if CNG sales are included in overall demand and revenues, such as Case 2. However, the positive financial results in this scenario and the return on $9 million of investment capital are therefore dependent on the performance of three CNG service stations.

Cases 3 and 4 do not appear to be viable and are not recommended for further consideration given the fact that the project will be subject to further risk given that the cost of diesel is likely to increase, and given frequent transport problems in the Chapare.

To better evaluate how Case 1 might result in positive financial returns, scenario analysis was performed to vary tariff and subsidy levels. The objective was to illustrate the magnitude of the increase in tariffs and/or subsidy level that will be required to make the project viable if CNG sales are not included in the revenue ledger. Assuming tariffs can be adjusted from the pre-set levels, an increase in residential and commercial tariffs from $5.37/MCF and $5.17/MCF respectively to $6.15/MCF, and in the industrial tariff from $1.70/MCF to $2.10/MCF would yield a return of 15.6%. This might make the project sufficiently attractive to a commercial bank, but it would likely require some form of loan guarantee from either the Government or USAID.

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Alternatively, if a higher capital grant of $5.4 million were made available to the Project, it would yield a similar rate of return on equity. There is no indication that grant funds of this magnitude can be invested in the project, however. The results of these scenarios are summarized in Table 4.5 below.

Table 12: Scenario analysis for Case 1

Scenario	Subsidy	Tariff ($/MCF)*	ROE
Base	$4,001,000	5.37/5.17/1.70	negative
Higher Subsidy	$5,369,000	5.37/5.17/1.70	14.3%
Higher Tariff	$4,001,000	6.15/6.15/2.10	13.5%

* Tariffs for residential/commercial/industrial consumers, respectively.

Case 2 shows that the project could be quite profitable should the indicated level of grant funds be invested in the project. In an attempt to use a conservative estimate of commercial CNG sales, a market share of 50% was used to estimate potential CNG sales. There is, in fact, no way of knowing what percentage of the market share will be captured, and the degree to which the viability of the project depends upon CNG sales is somewhat disturbing. This argues for a more detailed evaluation of CNG costs and revenues and market share prior to the final decision to move forward with the project if CNG sales are included in the project revenue stream.

Case 3 shows clearly that the virtual pipeline option with no CNG sales is not financially viable. Neither increasing grant share of the investment nor increasing tariff levels to those mentioned above yields a financially viable project. The extremely high operating costs coupled with relatively high post-construction investment costs are the primary culprits for the failure of project viability for this scenario.

Case 4 shows that even with retail vehicular CNG sales (at 50%) the virtual pipeline option is still not viable. The Project would run significant negative cash flows in the early years, and would require a working capital infusion of $2.4 million in addition to increasing tariffs to the levels stated above. Even under these highly favorable and unlikely conditions, the rate of return on private equity would only be 6.5%. The project would require a $5 million capital subsidy in addition to the tariff increases to yield 14.5% rate of return on equity. Obviously, this is not as attractive as the natural gas pipeline option, especially given the risk associated with transporting compressed natural gas via trucks that could experience difficulties from inclement weather, poor road conditions, or, more likely, periodic traffic stoppages caused by political problems in the region.

5.2 Relative Subsidy Analysis

The preceding analysis reports the results of financial performance of the gas project by integrating the costs and revenues of gas transmission and distribution. The more likely project structure, however, will be to have two separate companies manage the transmission and distribution business. With this in mind, it is necessary and important to

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understand how each of these two segments perform, what level of subsidies they require, and to evaluate the equity requirements and rate of return on equity for each given the load projections and probable operating costs of each.

Financial performance in each case is a function of financial structure, subsidies allocated, and tariffs applied. As the following table shows, the transmission segment of the project requires the largest subsidy, as it is the most capital intensive and has the lowest plant factor. The distribution segment performs relatively well, in comparison to the transmission segment, and therefore requires a much lower net subsidy to reach financial sustainability. Moreover, it is important to note that price of gas delivered by the transmission company to the distribution company had to be increased from a projected price of $0.96/MCF to $1.20/MCF in order to overcome operating deficits. The distribution segment of the project still performs relatively well, even paying a higher transmission tariff while maintaining established distribution tariffs to all consumer classes. The results of the independent analyses are summarized in the Table 4.6 below.

Table 13: Financial Performance of the Transmission and Distribution Segments

Project Segment	Operating Cost*	Capital Cost	Equity Contribution	Required Subsidy	Debt	ROE
Distribution	$553,000	$2,104,000	$316,000	$737,000	$1,053,000	23.3%
Transmission	$183,000	$5,291,000	$423,000	$4,445,000	$476,000	18.8%
Dist w/CNG	$913,000	$3,663,000	$1,099,000	$366,000	$2,198,000	27.4%

* This is second year operating cost that escalates as demand grows each year.

The analysis shows that the transmission project requires nearly 85% of the total cost to be financed through a capital subsidy and will be financially viable only if tariffs are increased to allow for higher revenues than the postage stamp rate currently employed will allow. It is an axiom of rural infrastructure projects that rural tariffs must be higher to yield reasonable returns by the service provider, but in this case, it appears that if a higher transmission tariff is paid to the transport company, and sufficiently high subsidies are available to offset the capital costs of the distribution segment, that distribution tariffs will not have to be increased to compensate for the higher transmission tariff.

The total subsidy required for the project without CNG stations would be approximately $5,182,000. If CNG stations are developed and operable, the subsidy could be reduced to $4,811,000. However, it may be very difficult to finance both the debt and equity requirement for the option using CNG stations, unless private investors are included in the ownership group. This in itself may be problematic from a governance point of view.

5.3 Economic Analysis

An analysis of economic benefits is an important part of the project development cycle, especially when significant contributions of public funds will be required to make a project financially viable. Economic benefit analysis allows authorities to use an objective approach for optimizing the allocation of resources for projects. The economic benefit quantification is made by estimating the difference between the benefits of the

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present reality without the project and the benefits that would be obtained with the project.

The differences in real economic prices between LPG and natural gas was evaluated for this project.. Compared to paying nominal retail prices for LPG the future residential and commercial customers of the natural gas company will experience monthly expenditures for natural gas slightly lower than that being currently spent on LPG. However as LPG is heavily subsidized in Bolivia this does not reflect true economic cost to the country. It is estimated that the current price in the project area of about Bs. 21 per bottle of LPG has an economic value of Bs. 33. In the industrial and vehicle customer classes the difference in prices is even more dramatic. An analysis of unsubsidized or economic prices demonstrates a significant consumer surplus available by switching to natural gas. This is summarized in the following table:

Table 14: Summary Results of Economic Analysis

Consumer Category	Monthly Expenditures LPG	Monthly Expenditures Natural Gas	Monthly Consumer Surplus	Annual Consumer Surplus	First year Customers NPV 20yrs	Project life Customers NPV 20yrs
Residential	8.46	5.04	3.42	41	825,809	1,216,649
Small commercial	84	49	35	415	660,396	791,570
Large commercial	791	465	326	3,908	299,474	388,300
Small industrial	266	50	216	2,595	132,571	191,553
Large industrial	7,137	1,329	5,808	69,697	1,186,736	2,161,632
Vehicular CNG	215	86	129	1,550	3,487,153	12,870,990
Total consumer surplus					$6,592,136	$17,620,690

After removing subsidies for both LPG and natural gas and revealing economic prices the monthly expenditure difference between nominal and economic pricing is marked. Calculating the consumer surplus over the project life the NPV of the benefit (at 10 percent discount rate) is over $6 million for the first year customers alone and over $17 million for customers over the life of the project. These figures do not reflect the additional economic benefits related to the convenience and availability of natural gas that while difficult to estimate certainly do exist and would increase the total economic benefit of each of the project.

6.0 Company Structure

The operation of the newly constructed gas distribution system will require establishment of a new, special purpose company to manage operations, to continue to expand access to service, and to manage financial affairs of the fledging utility.

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6.1 Alternatives Company Structure

The special purpose company could take one of a number of forms, including the following:

1. Corporation
2. Cooperative society
3. Foundation or Non government organization
4. Special purpose corporation

Each of these institutional structures have been reviewed and considered by the project team and are discussed below. The team also consulted with local legal counsel to determine what legal limitations exist for each legal entity considered, and how distributions of retained earnings can be treated in the case of foundations and NGOs. The following summarizes these findings.

6.1.1 Corporation

Corporations are for-profit societies that are formed by private investors for the purpose of engaging in commercial, industrial, or service-related business activities to maximize the return on equity of the shareholders. Corporations are an ideal institutional format when an investment opportunity is commercially attractive, when the level of capitalization requires access to private equity markets, and when the expected rate of return on the investment meets or exceeds the investor's targeted profit level.

In the parlance of the regulated public services industry a for-profit corporation providing monopoly services is called an "investor-owned utility." In the case of the Chapare project the financial model showed that sales in relation to capital investment would not be sufficient to return capital to the investor at any attractive rate of return. While the project is expected to cover operating costs this is obviously not sufficient to motivate private investors. Moreover, USAID's desire to distribute any future margins to Nuevo IBTA would conflict with the interests of a private investor-owned utility. Therefore this institutional model does not appear to be the appropriate vehicle to achieve the project goals and the investor-owned utility model was discarded.

6.1.2 Cooperative Society

Public service cooperatives have been used with mixed success throughout Latin America. CRE, the largest electric distribution cooperative in the Americas, and one of the largest worldwide, is a pillar of success. CRE has successfully expanded service coverage to most of the population centers in Santa Cruz Department, it continues to reinvest in infrastructure to keep pace with the rapid expansion of services required to support the local economy, and it is managed by a highly trained, professional staff that has achieved remarkable and continued success. The CRE board is democratically elected; it has governed the cooperative through a period of rapid expansion while drawing on internal reserves to finance an aggressive expansion program, and has not suffered from any significant interventions by cooperative regulation agencies in Bolivia since its inception.

While CRE has been a model of success, however, other electric and production cooperatives in Bolivia have not fared as well. Cooperatives in the altiplano (such as CORELPAZ) and in the Beni have suffered from poor technical and operational management, financial misconduct, and a series of well-publicized and in some cases, devastating interventions by the Instituto Nacional de Cooperativas, as well as by utility regulatory agencies. The electricity law passed in 1994 does not allow cooperatives to operate commercial electric distribution systems due in large part to the history of problematic performance.

Perhaps the greatest difficulty is the fact that there is no central source of technical assistance, financial support, and oversight for public service cooperatives. Were these services available and were oversight enforced, performance of rural electric and production cooperatives might have enjoyed a more successful history in Bolivia. But in the absence of an agency whose purpose it is to support and sustain member-owned public service cooperatives, the chances for successful operation are quite limited.

Given the poor performance of the vast majority of public service cooperatives in Bolivia, and moreover, given the complex set of sociological and economic conditions in the Chapare, the project team does not recommend a cooperative utility as the institutional vehicle for this project.

6.1.3 Foundations/Non Government Organization

Foundations and Non government organizations (NGOs) are very common in Bolivia. Both local and international non-government organizations have been formed and provide a variety of services in health, education, water supply, energy services, micro finance, and other services. Typically, NGOs are special purpose organizations with a specific focus, although some NGOs engage in multi-purpose activities, such as CARE, Plan International, and other international NGOs.

NGOs seldom have been formed to manage utility operations, however. They are usually formed to accomplish a specific mission, which in many cases includes establishing and nurturing a relationship with the local community through which the NGO becomes an advocate for community needs. The character of NGOs is very seldom oriented to addressing quality of service requirements, attracting investment capital for future investment needs, and projecting a professional image to domestic and international leaders. This is by no means a rule, because international NGOs such as CARE and Plan are very highly respected. However, these same NGOs do not engage in commercial activities. In the case of micro finance institutions, commercial operations have been most successful when they have been turned over to special purpose banks that have been specifically formed to manage the commercial activities of the micro and small financing agency.

Given the need to focus on efficiency and efficacy in the commercial operations of the proposed gas distribution system, and the normal identity associated with NGOs in Bolivia, this institutional vehicle is not recommended for the Chapare project. The project team believea that forming an NGO will result in practical difficulties that may

prove difficult to overcome, specifically with respect to relationships with the government regulatory agency and with relationships with financial institutions in future years.

6.1.4 Special Purpose Corporation

Given the limitations of the other institutional vehicles described above, and moreover, given the desire to generate and distribute revenues to Nuevo IBTA, a logical alternative for the new institution will be to form a special purpose, for-profit corporation. The purpose of the newly formed institution will be to develop and expand access to rural natural gas service in the project area defined in the statutes to include specific communities as described in this document, the scope of which may be subject to change after connection targets have been met in Ivirgarsama, Chimore, and Villa Tunari.

Moreover, the statutes will need to include an explicit provision stating that once connection targets and financial ratios have been achieved, that retained earnings in excess of required working capital will be distributed to Nuevo IBTA. The statutes should allow for future participation by other local and national agencies, should major investments be required to expand service to areas not included in this initial phase of capital investment, but the management and direction of the institution should be clearly and unequivocally limited to the USAID designee and no other institutional or private party.

The downside of establishing a for-profit corporation is that the new institution would pay corporate taxes once operations begin to create retained earnings. Corporate taxes are in part offset by deducting transaction taxes, but there will still remain a tax obligation, the total sum of which is dependent upon how profitable operations become down the road.

To evaluate the impact of corporate taxes, the results of the financial analysis performed as part of this study were used to discount the future net taxes. This amount was deducted from the net present value of the net earnings before taxes. In general, it appears that a net present value of approximately $120,000 in future earnings will be lost in payment of corporate taxes if a for-profit corporation is employed. Thus, we recommend that the merits and demerits of using a more broadly respected corporate structure (i.e., one that might be more widely acceptable should future capitalization be required, and one that would be viewed in greater favor by the Superintendent of Hydrocarbons) be balanced against the financial merits of establishing a foundation.

6.2 Financial Participation and Governance

It is highly unlikely that private, for profit companies will share the goals of this project and will risk investment capital in a margin public service investment such as this project represents. For all intents and purposes, all equity required to establish the infrastructure and to provide sufficient working capital to initiate commercial operations will be provided by USAID with the possibility of a contribution by the Prefecture of Cochabamba. It is important to note that no firm commitments have been made as of yet by the Prefecture.

Given the options that have been discussed in the previous section with regard to institutional options, the project team believes that the gas distribution company would be best served were it owned by a local foundation, but operated by a wholly owned subsidiary of the NGO. Affiliation with the NGO would allow the accumulated reserves to be distributed to Nuevo IBTA, so long as the by-laws of the special purpose corporation were designed to comply with this requirement, and would enhance the local character of the company as a non-profit institution serving the target communities in the Chapare. However, being managed as a corporation would allow quality control of services and personnel, would allow the institution to present a corporate face to entities external to the Chapare, and would put the new company on more firm ground with respect to government regulatory and policy setting agencies.

Board membership should be very carefully evaluated. The project team recommends that an international institution with experience in development, strengthening, and management of public service providers be used to assist in forming and supporting the new gas distribution company, and should probably be in a decision-making position for many years after construction. However, it would be useful to consider local participation in the board, including a community representative as well as a representative from the Prefecture of Cochabamba and/or a representative of YPFB, should these institutions provide substantial financial contributions in cash or in kind, as has been discussed. By all means, care needs to be taken to assure that the stewardship and governance of the institution is not controlled by a politically oriented block, which is why we advise caution in establishing board participation and selection.

Final decisions on the ownership and management model that will be employed in establishing the new service provider to manage the infrastructure investment financed by this initiative will be the focus of preliminary program activities. Discussions with interested Bolivian institutions, including SERGAS and EMCOGAS have just begun, and the terms and conditions of their participation can only be characterized as preliminary in nature.

At the moment, two alternatives have been considered that will require further elaboration and exploration for ownership/management of the natural gas distribution system. These include:

1. Establish a new service provider that would be a wholly owned subsidiary of a NGO with experience in provision of rural energy services. The new service provider would sign a service contract with a company like SERGAS or EMCOGAS to perform all O&M functions associated with managing the service territory.
2. Establish a new service provider that would hire its own staff, contract with a local gas or electric service provider to provide assistance and training for O&M functions, but would manage all operating activities independently.

Both of these alternatives present challenges and rewards that will need to be evaluated taking into consideration the actors, their willingness and ability to respond to specific project needs, and the long-term benefits of working with one or more institutions in project implementation. A decision will be made in the coming months regarding which option would be the most attractive from the point of view of program sustainability. The advantages and limitations as known at this time will be briefly explored below.

6.3 Option 1: Establish Chapare Gas Distribution Company, Contract for O&M Services

This alternative will introduce a higher level of institutional risk in that the project team will assume responsibility for forming a new, autonomous gas distribution utility, but with little or no operational responsibilities. The O&M services would be subcontracted to SERGAS, EMCOGAS, or another institution with experience in provision of public service. Without question, the greatest risk in establishing a new institution revolves around the ability of the institution to oversee operational issues, to efficiently issue and collect monthly energy bills, to effectively address customer complaints, to hire and supervise professionals to manage administrative, commercial, and maintenance functions, and to provide accurate operational information to senior management and the board of directors. Subcontracting these functions to a company with an established track record will effectively avoid many of these risks.

However, subcontracting a company also presents many obstacles. Contractors have no vested interest in attending to long-term maintenance requirements, nor will contractors make any significant efforts to provide anything more than adequate customer service. These are attributes that are most often attributed to equity participants who have a long-term, financial interest in building a long-term relationship with the community they serve.

6.4 Option 2: Establish Special Purpose Corporation to Own and Operate Gas Concession

From one perspective, establishing an independent entity whose purpose is to provide gas distribution service to the local communities for the expressed purpose of promoting local economic development integrates most of the conditions and incentives required to assure program and institutional sustainability. For example, a special purpose corporation whose statutes clearly state that profits will be reinvested in expansion of service coverage or will be invested in other public service programs guarantees that program benefits will be reinvested in the local economy and will directly benefit the community members. Moreover, if the special purpose corporation includes some form of local representation (without ceding control to the community), it will project local identity and will be seen as such by the community. In the Chapare, this could be a substantial benefit in terms of garnering acceptance by the general public and political support from local community leadership.

On the other hand, starting new institutions is a complex and inherently risky process. While NRECA has several decades of successful experience in establishing institutions of a similar nature, the risks in forming the new institution, selecting competent staff, training staff, and integrating appropriate administrative and commercial tools should not be underestimated. NRECA is confident that this process can be successfully completed in the case of the Chapare gas distribution project, but the risks will be weighed against the potential advantages of employing other options as described in the preceding points above.