Improving Natural Gas Distribution in Chile (P152065)

Implementation Report

June 5, 2015

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NATURAL GAS REGULATION IN CHILE

A. Background

1. Chile has been a relatively energy-poor country; its major endowment of modern energy has been its hydroelectric potential, which has been developed up to its economic limit. Otherwise, Chile imports 96% of its oil, 76% of its natural gas, and 94% of its coal[1]. The demand for natural gas was supplied by local production until 1996, mainly from fields located in the South of the country. Imports of gas from Argentina through pipelines started in 1997, and consumption increased by a factor of 2.4 between 1997 and 2000.

2. Gross consumption in 2000 amounted to around 63,000Tcal[2] (equivalent to around 690MCFD). Increasing imports led to peak consumption in 2004 of around 80,000Tcal. In 2004 economic conditions in Argentina deteriorated, price controls were imposed, and gas production decreased due to lack of exploration. Supplies to Chile were restricted and decreased from 63,000Tcal in 2004 to 7,000Tcal in 2008, at which point gross consumption was equivalent to that in 1997.

3. To compensate for the reduction in imports from Argentina, an LNG gasification terminal with a 2.5 million tons (Mt)[3] per year capacity was built in the bay of Quintero, which was concluded in 2009, at a cost of US$1,050 million. It was delivered on time and within budget. The terminal also has storage capacity of 2x160,000 m^3 + 1x14,000 m^3 tanks.

4. This terminal supplies gas to the Central region of Chile, which comprises the three principal cities of Santiago, Concepción, and Valparaiso. Imports through Quintero began in 2009 and grew from 0.35Mt in 2009 to around 2.2Mt in 2013/14, roughly equivalent to 70% the level of pipeline imports in 1997.

5. A second LNG terminal was built in Mejillones, in the northern Antofagasta region, which mainly supplies power facilities for the mining sector. Imports through this terminal began in April 2010 and have remained in the 0.45–0.57 Mt/year range. For practical purposes, this analysis will concentrate on gas supplies to the Central region sourced from the Quintero terminal.

6. **Corporate structure.** The Quintero terminal was built by the GNL Quintero company, whose investors include ENAP S.A., Metrogas S.A., Endesa S.A., and BG Group:

- ENAP is a state-owned oil and gas company; its gas business consists of servicing its refinery and also transporting LNG by lorries and regasifying in "Satellite Regasification Plants—SRPs" for further distribution;
- Metrogas is the main natural gas distribution company in the metropolitan Santiago area;
- Endesa is a power company owned by the ENEL group;

[1] Ministry of Energy, Energy Balance for 2012.
[2] Ministry of Energy, Energy Balance 2000
[3] 1 Mt = 10^9 kg; 1Mt of LNG contains around 47000 GBtu, @ 47 MBtu/t; it is equivalent to around 1.3 Gm^3 of dry natural gas. 1Mt of LNG per year is equivalent to around 124 MCFD

- BG Group is an international gas company; it sold its interest in the Quintero terminal in 2013 to Enagás of Spain; it was acquired by Shell in 2015.

7. **Transport**: a 166km pipeline from Quintero transports natural gas to power plants, to the refinery, and to distributors in Santiago and Valparaiso. It is owned by Electrogas, whose investors are Colbún, a power generation company, Endesa, and ENAP (see above). A significant portion of the LNG is transported by truck.

8. **Distribution**: the two main distribution companies are Metrogas in Santiago and Gasvalpo in Valparaiso. Metrogas shareholders include (i) Gasco S.A., an LPG distribution company with 52% participation and recently acquired by Gas Natural Fenosa of Spain, (ii) COPEC S.A., an oil and oil products distributor with 40%, and (iii) Trigas S.A., an industrial and medical gas producer and distributor. Gasvalpo is a municipal company. Metrogas was organized by Gasco in 1995 to expand into the natural gas business by distributing gas from the Argentina-Chile pipeline (Gasoducto del Pacífico), of which it is a shareholder.

9. **Market size**. The 2012 energy balance of Chile yields a natural gas production of 1,232Mm^3, imports of 3,917Mm^3, and a total consumption of 4,879Mm^3 after accounting for stock variations; these physical values are equivalent to 46 10^6MBtu, 146 10^6MBtu, and 182 10^6MBtu, respectively. Total gross consumption of natural gas is equivalent to around 470 MCFD. Natural gas accounts for around 20 percent of total modern energy consumption (i.e. excluding biomass).

10. About 1/3 of natural gas goes to final (secondary) consumption, and 2/3 go towards transformation centers. Final consumption of 15,555 Tcal divides among the transport (2%), industry and mining (45%), commercial (7%), public (2%), residential (28%), and energy[4] (16%) subsectors. Ninety percent of natural gas that goes to transformation centers is accounted for by electricity production.

11. **Urban market for natural gas.** The main consumption centers of the Metropolitan Area of Santiago and the city of Valparaíso yield the following consumption distribution of natural gas:

Consumption of Natural Gas (Mm^3) for 2014			
	Metropolitan Area	Valparaiso	Total
Industrial	662	129	791 (67%)
Commercial	68	12.3	80 (7%)
Residential	266	26.3	292 (25%)
Other	17	0	17 (1%)
Total	1014	167	1181

Source: Superintendencia de Electricidad y Combustibles

Although it is not documented, the number of industrial consumers in the Metrogas network is around 70,000 and other retail consumers' number about 509,000.

12. **Institutional setup.** The sector is governed by the following statutes[5]:

- The Gas Service Law (Law No. 323 of 1931, modified in 1989);

[4] Refinery use

[5] Ruiz, José Antonio, "Mercado del Gas Natural en Chile", Comisión Nacional de Energía, agosto de 2006 (ppt presentation).

- The legislation on provisional and definitive concessions for gas distribution and transport (Decree No. 265 of 1995);
- The legislation on gas distribution and transportation safety (Decrees No. 254 of 1995 and No. 67 of 2004);
- Ruling on contingencies and constraints to gas supply (Ruling No. 754 of 2004 of the Electricity and Fuels Superintendence).

13. Highlights from these statutes include:

- Government policy is based on having energy-related activities developed by the private sector;
- There is minimal regulation compared to other countries; the principal regulated activities are network-based gas distribution and to a lesser degree gas transportation through pipelines; these activities require concessions;
- There are no constraints on vertical or horizontal integration;
- The law regulates concessions and determines the role of the State in these matters;
- Prices can be freely established except for those in the Southern 12th region; they should be made public, and discrimination among users with similar characteristics is not allowed, but they can be differentiated (residential, commercial, industrial) and block pricing is allowed;
- Prices for consumers of less than 2,700m^3 per month can be established by the Ministry of the Economy if "excess" profitability, i.e. a rate of return (ROR) in excess of 5% of the WACC, is detected by the Tribunal for the Defense of Free Competition;
- The Ministry of the Economy has an established procedure for calculating the ROR based upon network costs and treating gas purchases as a pass-through.

14. **Prices.** The tariff schedule applied by Metrogas is shown in Table 2:

	Block (m^3/month)[1]	Price (USUS$/m^3)[2]
	0 to 5	US$1.61
Excess	5 to 10	US$1.28
Excess	10 to 25	US$1.28
Excess	25 to 40	US$0.86
Excess	40 to 60	US$0.41
Excess	60 to 130	US$0.91
Excess	130 to 170	US$0.91
Excess	170 to 700	US$0.91
Excess	700 to 900	US$0.89
Excess	over 900	US$0.91

[1]Std m^3, 9300kcal/m^3 [2]Includes VAT

For example, a small consumer consuming 20m^3 would pay [1.61*5+1.28*5+1.28*10]=US$27.25, which translates into US$1.36/m^3, or about US$38/MBtu. A large 1000m^3 user would pay US$907, equivalent to US$0.91/m^3 or about US$25/MBtu.

15. **Costs and markup.** The only reference for natural gas costs consists of the import price, which is declared at the Quintero terminal. Imports[6] vary in the range of 2.1 to 2.3 Mt/year; the average cost has varied from a high of US$600/t in 2012 (around US$13.6/MBtu) to US$336/t in 2013 and US$440/t (US$10/MBtu) in 2014. In 2015 import prices are on the order of US$324/t (US$7.4/MBtu). Comparing the prices charged by Metrogas and the import costs at the Quintero terminal yields a markup that can vary between US$24/MBtu and US$30/MBtu.

B. Issues

16. **Government objectives.** The Government issued a policy document (the "Energy Agenda") through the Ministry of Energy, in May 2014. A summary of the principal questions addressed in the agenda include:

- A pervasive and central problem of high energy costs (electricity in particular) and the need to address them; it notes that they increased from US$65/MWh at the regulated-customer in 2006 to US$128/MWh in December 2013;
- A strategy to address the high energy cost by a more active role of Government to provide reliable, sustainable, and inclusive energy development at reasonable prices;
- To provide transparency regarding electricity and gas information and to increase competition, efficiency, and diversification of the energy market and of the electricity market in particular;
- To turn ENAP into a stronger enterprise with a prominent role in the energy challenges facing the country;
- To ensure more participation of LNG in the national energy matrix to seek to reduce current prices of electricity;
- To improve the regulation of gas distribution networks.

In accordance with the latter approach, ENAP wants to increase LNG capacity to provide more flexible supplies and to reduce the probability of a supply shortfall.

17. **High gas prices at the retail level.** The perceived high price for gas at the final consumer level is attributed to an excessive markup due to pipeline transportation and network distribution costs. As noted above, total consumption in 2012 amounted to 4.9Gm^3; compared to other countries in the region this is relatively modest (Venezuela and Brazil consume in excess of 30Gm^3, and Colombia's market is around 8.5Gm^3). This could point towards a relatively undeveloped market with excess capacity and high product costs.

18. Comparing the current retail price level of natural gas to that in other countries yields the following results:

- In a large market such as Spain, which is dependent on LNG imports for its supply, the residential consumer price is on the order of 32US$/MBtu with supply costs on the order of those in Chile (US$10/MBtu) and an important network cost markup of US$17/MBtu;

[6] Comisión Nacional de Energía

- In Colombia, with its own production, and where prices are regulated and there is competition for long term contracts, prices vary widely between a producer region such as the Atlantic Coast (around US$5/MBtu for industrial users in Barranquilla) and the interior (Bogotá), which requires long pipeline transport, and where prices are around US$12 to US$14/MBtu for similar consumers;
- Network costs in countries like France, Germany, and the UK lead to markups in the US$4-6/MBtu range.

Based on these examples, there would appear to be a case for delving further into the network costs in the Central Region of Chile and seeking an explanation for the high transport and distribution costs imposed on consumers.

19. Despite the previous observations, no final conclusions should be drawn, as higher than normal prices can be due to circumstances outside the control of the distribution companies. In particular, excess capacity of gas lines could be at the root of the problem, as the costs of the network must be borne by a volume of gas sales that is small relative to the capacity of the network. Long periods of excess capacity are not uncommon in infrastructure projects due to the slow maturing of the market and the penetration of a new source of energy. The consequence of such excess capacity is a higher price to pay for the network investment, at least during the initial years. As the market grows and the physical sales volume increases, excess capacity is absorbed and prices can begin to decrease. Currently there isn't sufficient information to test this hypothesis in the Chilean system.

20. **Inadequate pricing structure.** A consequence of an excess capacity situation exacerbates pricing problems because it concentrates recouping investment on a small volume of consumption. This leads to perverse incentives as it sends the signal to consumers to conserve on gas consumption, whereas the correct signal consists of promoting gas use in order to fill the gap between demand and capacity; this incorrect signal promotes less demand which in turn requires higher prices to break even financially, and so on. This type of inefficient pricing could be addressed by a system of fixed charges that reflect some of the network investment costs and consumption (i.e. m^3-related) charges that mostly reflect the actual resource cost. Such an approach is often unpopular politically, despite its capacity to lower the total bill of a consumer. However, given the current challenges in the Chilean natural gas sector, it is an option worth exploring.

21. **Lack of competition.** The absence of market forces and vertical integration are viewed as some of the factors behind the high prices for natural gas. Some of the factors to be taken into account include:

- Implicit vertical integration: interests of the distribution company Metrogas in the upstream Quintero terminal;
- Investment presence of final users in different stages of the supply chain, e.g. participation of ENDESA in the Quintero terminal and the transport company, as well as participation of Colbún in transport;
- Natural monopolies in transport and distribution;

- Simultaneous distribution of natural gas and LPG by affiliates of the same company; such is the case of Metrogas, which is partially owned by Gasco, the LPG distributor;
- A widespread perception of monopoly profits associated with Metrogas and its latest rate of return, which, at 16 percent, exceeded the statutory, allowed level.

22. **The need for regulation.** The claims regarding monopoly behavior have been disputed by the industry[7]. The gist of the argument is (a) that natural gas is not a natural monopoly because it faces competition by LPG as a practically identical substitute, and (b) that natural gas distribution faces scale diseconomies. These hypotheses are highly debatable:

a) The first argument does not necessarily, by itself, imply that there is no need for regulation or that a supplier cannot extract monopoly rents; indeed, the presence of a higher cost substitute to a monopolist's services merely sets a ceiling to the profit-maximizing price, without limiting the excess profits themselves;

b) Distribution through networks, including electricity, water, and natural gas usually face two types of economies:

   i. In dense areas there are economies of scale because connecting a new customer where you already have the infrastructure to serve a number of other users costs less than the average cost incurred with all customers in the area;

   ii. As one moves away from the dense areas, e.g. towards the suburbs, users become more separated and connecting a new one becomes more expensive; in the case of natural gas it makes more economic sense to serve the customer with LPG; as cities grow, density in these far-away areas increases and it becomes economical to switch from LPG to natural gas.

   It therefore does not appear that natural gas distribution exhibits diseconomies of scale except when contemplating serving dispersed markets, where it will only penetrate once there is a "critical density" to justify investing in the required infrastructure (and exploiting economies of scale). An exception to the previous refutation occurs when concessionaires have an "obligation to serve", which often happens in electricity distribution, therefore forcing the distributor to supply "faraway"—uneconomical—customers; this is not the case of the Chilean natural gas distribution companies.

23. Two additional arguments for regulation include: (a) the distribution company manages both natural gas and LPG, and can manipulate its prices to extract monopoly rents, and (b) consumers face significant switchover costs due to the need to adapt their appliances to each fuel. Everything leads towards the conclusion that natural gas

[7] Galetovic, Alexander, and Sanhueza, Ricardo. : "La economía básica de la distribución de gas por red en Chile", January 22 2015, commissioned by the natural gas association ("Asociación de Empresas de Gas Natural—AGN—).

distribution constitutes a natural monopoly in much the same way that power distribution is a natural monopoly despite options for self-generation, and that it is a valid candidate for economic regulation.

24. **The regulatory climate.** Finally, there is the attitude relative to imposing regulation on an industry such as natural gas. The Antitrust Court (Tribunal for the Defense of Free Competition) was established in 2003 as a successor of the Antimonopoly Commission. Its general orientation has been to oppose any measure that is perceived as restrictive of free competition, including price regulation. Its role within the natural gas subsector consists of detecting behavior that is contrary to competitive markets and to refer these cases to authorities in charge of taking corrective action. Its role is eminently ex-post and subject to litigation given that the existing criteria for determining such behavior is related to the rate of return (ROR) criterion, which can be explained by different financial effects that are not necessarily related to uncompetitive actions.

C. Options

25. The Chilean power sector has a long tradition of relying on market forces for the supply of electricity. Unbundling, putting in place competitive incentives in those areas where markets are possible, and regulating those areas of the sector that by their nature do not allow competition, have all been implemented in the power sector. Introducing such notions for the gas subsector would not be a surprise for the authorities. The major obstacle to overcome is the size of the market and how realistic it is to assume that real competition can be sustained at different levels.

26. **Existing reform discussions.** The Government is aware of the need to address changes to the existing law. A draft reform is under discussion, which maintains the general regulatory structure of the 1931 law in the sense that (i) it maintains the ROR criterion for determining non-competitive behavior and market power, (ii) it would conserve the ROR limits, but it would establish lower ceilings in order to limit potential excess profits, and (iii) it would establish compensation mechanisms to concerned customers. The intent of the modifications consists of creating a framework that will influence concessionaires to avoid breaching the ROR limit and thereby limit potential excess profits.

27. This approach has several limitations: (a) ROR regulation is not considered to be the best approach when seeking efficiency and improving service through competition; (b) the outlined method does not further the Government's objectives of incentivizing higher consumption and lowering natural gas prices; and (c) it does not appear to address the issue of cross-holdings within the natural gas business and the LPG substitute business. The Conference on Alternatives for the Future of the Gas Market Regulation held in Chile in September 2014 provided a broad view of different approaches to the problem; the following sections propose options which should be viable in Chile, and which also follow in the tradition of allowing market forces wherever possible, whilst exercising restraints in areas not amenable to competition.

Option 1

28. **Visualization.** This option is based on allowing open access to all facilities at regulated tariffs whenever replicating such facilities is uneconomic; this essentially means open access to gas pipelines and to the regasification terminal. For example, power companies would be able to source their supplies from an LNG supplier and pay regulated fees for the regasification terminal services, including storage, and the gas pipeline. It would also allow the development of a competitive supply business by which independent operators would be able to develop a market for supplying consumers and paying the upstream fees including transportation and sourcing.

29. This option requires the separation of gas transportation from gas supply/retail. A gas company will either be a pipeline company owning high and low pressure pipe networks or will be a company selling gas to consumers. The same gas company is prevented by regulation and license from doing both.

30. **Quintero LNG terminal.** The regasification terminal is a bottleneck and essentially a monopoly facility. Therefore the terminal will be required to publish terms and conditions for use of the facility including the LNG storage tanks. The existing capacity holders must make available any berthing slots well in advance if they do not intend to use the slot. The terminal will agree with the CNE and then publish tariffs for the use of the terminals including the storage tanks. The CNE will benchmark the tariffs against other LNG regasification terminals.

31. **Gas Transportation Company.** This company will own and operate the gas pipe network – a natural monopoly. It will agree and publish a Network Code with the CNE and market players. The Network Code[8] will set out transparent terms and conditions for other gas companies to use the network. The gas transportation company will also agree tariffs with the CNE for the use of the pipeline network. The CNE would benchmark the tariffs against other countries' gas transportation tariffs. The gas transportation tariffs will allow a reasonable rate of return and incentivize the company to add more gas consumers and also to expand and extend the network. The company will be licensed to operate by the CNE. The license will require the company to provide any information on request from the CNE.

32. **Gas Supply Companies.** These companies will sell gas to gas consumers – this is a competitive activity. The companies will also need to source the gas on the international LNG markets and book capacity at the Quintero LNG regasification terminal. The gas supply companies will also need to book capacity from the gas transportation company to move the gas from the LNG terminal to its customers on the gas pipeline network. The gas supply companies would be required to publish transparent prices for the residential gas consumers and not to discriminate between consumers. The gas supply companies will be licensed to operate by the CNE. The license will require the company to provide any information on request from the CNE.

[8] Network Code – the rules that cover the access to the pipe network. These rules are transparent and apply to all users of the gas network.

33. **Ownership of the gas companies.** There are two options regarding ownership of the gas companies. First, the Government/CNE could require complete separation of ownership of the gas transportation and gas supply companies. This is the approach taken in Europe, where it was decided that the ownership must be completely separate in order to make sure that the gas transportation company did not favor its own gas supply company and perhaps leak confidential information about competitors.

34. The second option is less radical and allows common ownership of the gas transportation and a gas supply company. However, the two businesses must be separate in terms of day-to-day operation and have separate Boards of Directors. Confidential information must not flow between the two companies.

35. The LNG terminal faces the same choice – whether to prevent ownership of the terminal by gas companies operating in gas supply – those companies selling gas to consumers. It would be possible for the gas transportation company to own and operate the terminal without any potential conflict. A gas supply company owning terminal capacity can potentially discriminate against other gas supply companies wishing to use the terminal and prevent true competition. Good and effective regulation is essential in either case.

36. **LPG supply companies.** One of the concerns is that the same gas company can sell both pipeline natural gas and bottled LPG. This results in the gas company being able to price both fuels up and down in order to both maximize profits and also prevent gas consumers switching from one fuel to the other. There is a capital cost involved in changing from one fuel to the other. If the consumer is unsure of which will be the cheaper fuel in the long run the consumer will be unable to make an informed decision as to whether to invest in changing the burners/put in the LPG tank etc. One additional concern is the lack of incentive on Metrogas to connect more consumers to the piped network in the Santiago area. The penetration is low for an urban area with some 33% of potential consumers connected to the pipe network. Due to this low percentage of connected residential consumers the unit cost of running and maintaining the network per customer is high and one of the reasons for the high gas prices. Metrogas can decide, at present, whether to connect a consumer to the pipe network or to install an LPG tank and sell LPG. This removes the incentive to connect to the natural gas pipe network since LPG is normally more expensive than natural gas. Either way Metrogas is the winner and the consumer the loser.

37. The separation of the ownership of the gas transportation system in Santiago, outlined above, from a company selling gas will help to provide a proper incentive for the new gas transportation company to connect more consumers to the network and so reduce costs for all connected customers. However, it may be best to prevent the same gas supply company selling both piped natural gas and bottled LPG in the same geographical area and thereby ensure effective competition.

Option 2

38. An alternative option for consideration is for the CNE to regulate the gas prices paid by consumers. This is normally seen as a suboptimal solution. However, it is worth considering as Option 2 could be less disruptive in terms of the legal and ownership changes required under Option 1. There are some well-known disadvantages of

determining prices. Regulating or capping prices can promote inefficiencies, as the process requires the regulator to accurately determine the gas company's costs and to calculate and set profit margins. This process requires access to good and accurate cost information, which must be provided by the gas companies. There will often be arguments between the regulator and gas companies over costs and also which benchmarks should be used when the costs are compared with those form other countries. Sometimes Governments/regulators set prices in order to cross subsidize customer segments and so avoid full transparency of social policies e.g. to help the poor.

39. In this option, the CNE would benchmark the wholesale gas costs paid by the gas companies importing LNG. The CNE would also decide what a reasonable tariff for the regasification tariff at the terminal should be. The CNE would also decide what a reasonable cost should be to transport the gas from the terminal to consumers. After performing this calculation based on benchmarking against other similar systems the CNE would set the gas prices for the residential users (probably a range of prices determined by volume consumption).

40. This would be the maximum price that Metrogas or any other company could charge in that region. The price would allow the gas company to make a reasonable profit. This option is closer to the existing regulation model in Chile although the profit check allowed for in the existing Law is ex post whereas in option 2 it is more ex ante in that the gas prices are set in advance.

41. In this option, the CNE is formally accepting that the various gas regions/concessions are monopolies and that competition by gas supply companies is not possible. There is a variation on this option, which would be to allow commercial and industrial gas consumers access to competition and to buy gas from other gas companies. This variation is somewhat a hybrid of option 1 and option 2 in that the gas pipeline network would still need to publish a Network Code and agree gas transportation tariffs with the CNE. This is necessary as the competing gas supply company wishing to sell gas to the commercial/industrial consumer would need to be able to transport the gas from the LNG terminal to the customers.

D. Comparing the options

42. The dimensions for comparing the options outlined beforehand include the regulatory burden, the obstacles to implementation, and, notably, whether the objectives of the Government can be accomplished.

43. **Regulatory burden.** The problems faced by the regulator in both options concern the volume and accuracy of information required to produce meaningful results. In both options the regulator would have to estimate similar costs for monopolistic activities, including gas terminal use and storage, pipeline costs, and distribution gas network costs, and would require similar information. Given the existing structure of the market, the difficulties for extracting information would appear to be similar with either option.

44. **Practical implementation difficulties.** The main obstacle to Option 1 would consist of having to divest interests in different stages of the system in order to achieve greater transparency and enable a degree of supply competition. These measures are

likely to be resisted and challenged by the different participants. However, it would seem somehow inevitable to gravitate towards a system based on vertically segmented activities, at least in the medium term.

45. **Government objectives.** Formally opening up the sector through free access to pipelines and terminals can provide strong incentives to increase LNG use. This would seem to be particularly important in the power sector where future plants financed through a project finance mechanism will require assurance that they will have access to fuel at well-determined prices and with regulatory backing, as opposed to private contracts with a pipeline operator. An increase in demand is likely to lead to investment in a new gas terminal to supplement the Quintero facility, and to increase storage.