UPSTREAM ISSUES IN THE COLOMBIAN NATURAL GAS MARKET

David Harbord
Market Analysis Ltd, Oxford
www.market-analysis.co.uk

Congreso Annual de Naturgas, Cartegena
26 March 2010

Terms of Reference

Market Analysis Ltd commissioned by the CREG to conduct an economic study to:

1. Analyze the current issues and market conditions in the natural gas supply industry in Colombia and make recommendations for reform where needed.
2. Taking into account the views of industry and government agencies, including the CREG.
3. We have consulted with distributors (GasNatural, Gascaribe, Alcanos, Gases de Occidente, EPM), power stations (Isagen, Alcogen), industry associations (Naturgas), producers (Ecopetrol, Chevron, Pacific Rubiales, BP) and industrial consumers (Cerrematoso, Abocol).
4. We have also considered the preliminary analysis of Frontier Economics, and the proposals made by Pöyry Energy Consulting on behalf of the National Hydrocarbon Agency (ANH).

Background to Study

Our previous study for the CREG, “Regulation and Incentives for Investment in the Colombian Gas Transport Network" (February 2010) analyzed the gas transport market and the regulatory framework in Colombia and concluded that:

- No major reforms to the regulatory framework are needed, but some changes to the charging structure are advisable, for example:
  - the split between commodity versus capacity charges
  - the calculation of the utilization factor
  - need to provide better price signals for pipeline usage and location decisions, via the introduction of auctions for transport contracts (similar to those in the UK and other European countries)
  - some minor relaxations in the rules on vertical intergration

Background to Study ...

We also found that:

- Recent stresses in the gas transport network created by the EL Nino event were caused, in part, by a failure of market participants to signal the need for system expansion via a demand for long-term, firm capacity contracts.
- I.e. some consumers and distributors purchased interruptible transport contracts (and were interrupted).
- This meant that the TGI did not see a demand to expand capacity on its pipeline network until firm demand came in 2009.
- Large expansions in the TGI capacity are now underway
- Nevertheless, numerous market participants told us that gas producers were withholding firm gas supply contracts from the market to exploit their market power in supply, making consumers unwilling to contract for firm pipeline capacity.
- A major purpose of the current study is to investigate this issue, and to make recommendations for reform where necessary.

Upstream Gas Supply I

90% of Colombia's gas supply comes from two main fields:

- Guajira has about ½ of Colombia's reserves, and 65% of production
- average production in 2009 was 663 GBTUDs
- gas sold at a regulated price of $3.88 per MBTUD (US), indexed twice a year to the New York fuel oil price
- the "Cusiana" fields with about ½ of Colombian reserves and 25% of production
- produce approximately 250 GBTUDs
- gas prices from these fields are unregulated
- auctions for 32,821 MBTUDs of long-term, firm contracts held in December 2009 for Cusiana field, resulting in a price of $6.14 (US) per MBTUD
- other fields produce around 80 GBTU per day **(**La Creciente, 40 GBTUDs; Payoa, 20 GBTUDs; other, 20 GBTUDs; Gibraltar, 30 GBTUDs)

Upstream Gas Supply II

Association Contracts:

- Guajira fields are jointly operated by Ecopetrol and Chevron Texaco under an association contract, extended in 2003 to continue for the life of the field
- Ecopetrol share of production is 65.6% and Chevron's 34.4%
- “Cusiana” fields are operated by Ecopetrol, BP, and Tepma/Total under five association contracts
- Ecopetrol's share is currently 60%, BP's 24.8% and Tepma's 15.2%
- From 2010 – 2019 these contracts expire and Ecopetrol will acquire control of the fields
- Under association contracts, production and investment decisions are made jointly by the companies
- Hence not really independent competitors in supply, even if required to market gas independently

Upstream Gas Supply III

Upstream gas production is highly concentrated

- Herfindahl-Hirschman Index (HHI) for gas supply is 4357 (above 1,800 considered “highly concentrated” by US DOJ)
- Concentration will increase when Ecopetrol acquires complete control over the Cusiana field from 2010 to 2019

Table 1. Gas supply by company in 2009

Company	GBTUD	Share
Ecopetrol	670	63%
Chevron	236	22%
BP	62	6%
Tepma/Total	28	3%
Pacific Rubiales	42	4%
Others	25	2%
TOTAL	1,063	100%

Demand I

Four main categories of demand:

- residential and commercial (19%); industrial (45%); electricity generation (24%); and vehicles (11%)
- exports to Venezuela currently account for 14% of demand
- most gas is sold in long-term firm and interruptible contracts with durations of one or two years, although some contracts are much longer
- contracts are mostly take-or-pay with a high minimum percentage of "take" over the month or year (approx. 80%)
- interior gas-fired power plants have lower “takes” (25% - 70%)
- also a “day-ahead” spot market for short-term balancing trades
- and a secondary contract market with participation of producers and shippers

Demand II

The market is unconcentrated on the demand side.

- the market HHI's for 2008 – 2010 are 793, 931 and 914 respectively

Annual average contract positions of purchasers, 2008-2010

	Average 2008	Market share	Average 2009	Market share	Average 2010	Market share
E2	125,000	14.04%	140,000	15.09%	134,583	14.89%
GECELCA	109,200	12.26%	100,700	10.86%	57,260	6.34%
GAS NATURAL	105,200	11.81%	95,192	10.26%	96,715	10.70%
EPM	84,300	9.47%	83,787	9.03%	84,553	9.36%
ISAGEN	59,000	6.63%	59,000	6.36%	59,000	6.53%
ECOPETROL REFINERIA	55,000	6.18%	55,377	5.97%	74,019	8.19%
TERMOFLORES	52,874	5.94%	34,126	3.68%	34,126	3.78%
PDVSA	50,000	5.61%	150,000	16.17%	150,000	16.60%
CEMENTOS ARGOS	36,000	4.04%	5,727	0.62%	0	0.00%
EPSA	36,000	4.04%	36,000	3.88%	36,000	3.98%
MERIELECTRICA	32,800	3.68%	32,800	3.54%	32,800	3.63%
ABONOS COLOMBIANOS	20,500	2.30%	20,500	2.21%	20,500	2.27%
OTHER	124,666	14.00%	114,321	12.33%	124,193	13.74%
TOTAL	**890,540.08**	**100%**	**927,530.67**	**100%**	**903,748.50**	**100%**

Regulatory Background

Numerous regulatory measures since the mid 1990s concerning:

- regulation of prices for Guajira and de-regulation of Cusiana. Guajira regulation to be reviewed in September 2010 to decide whether to de-regulate prices (CREG Resolution 057, 1996; CREG Resolution 023, 2000; CREG Resolution 118, 2005, CREG Resolution 070, 2006)
- establishing rules for, or prohibiting, the joint marketing of gas (CREG Resolution 057, 1996; CREG Resolution 093, 2006)
- definition of “take-or-pay” and firm contracts, including penalties for breach (CREG Resolution 023, 2000; Ministerial Decree 880; CREG Resolution 70, 2005; CREG Resolution 188, 2009)
- establishing auction procedure to allocate gas when demand exceeds supply (CREG 070, 2006; CREG 095, 2008)
- Ministerial Decrees 2687 (July 2008) and 4670 (10 December 2008) on declarations of firm and interruptible gas supplies
- Decree 2687 and CREG 095 were designed to elicit larger quantities of firm gas supplies from producers

Declarations and Auctions

Ministerial Decree 2687 (July 2008) required gas producers to submit annual declarations to the Ministry of Mines and Energy specifying for each field and company:

- the total gas reserves (potential production) available from each field for a ten-year period
- the amount of committed (i.e. contracted) production
- the amount of the available potential gas production offered as interruptible gas supplies
- the amount of available potential gas production offered as firm gas supplies

CREG 95, 2008 specified that:

- firm gas from unregulated fields must be sold via an ascending, simultaneous auction within 45 days of the declaration, whenever D>S at the reservation price set by producer
- otherwise, gas can be sold via bilateral contracts
- firm gas from Guajira sold at regulated price according to an an allocation procedure

Declarations and Auctions II

Three declarations: 09/2008; 02/2009; and 09/2009.

Guarija:

- Chevron offered firm gas from 2009-13 in first declaration
- No firm gas has been offered since February 2009
- From 2012 large quantities offered as interruptible contracts

Cusiana:

- No firm gas offered in first two declarations
- Large quantities of interruptible offered from 2012/2013
- Ecopetrol offered small quantities of firm gas in October 2009
- Auctioned 32,821 MBTUDs in five-year contracts from August 2010

La Creciente:

- Offered firm gas in first two declarations, but no auction held
- Currently offering mostly interruptible from 2012/13

Conclusions from Declarations

- Little or no firm gas is being offered, especially from 2012 onwards
- Large quantities of interruptible gas offered, but not all available production
- Producers have used the “loophole” in Ministerial Decree 2687 to avoid offering long-term, firm gas contracts

Ecopetrol, Chevron and BP gave different reasons for this:

- geological uncertainties (or contractual complexity) surrounding future gas supplies from particular fields;
- uncertainty about future market conditions;
- regulatory uncertainty concerning future regulation of prices and contracts; and
- a preference for selling via bilateral negotiations and contracts as opposed to auctions (Chevron and Ecopetrol)

Views of the Buyers

- Gas purchasers (GasNatural, Isagen, Alcogen, and others), have complained about the lack of availability of firm gas contracts
- Gas-fired power plants are required to obtain firm gas and transport contracts to participate in the reliability charge scheme in the electricity market
- Distributors were required to obtain firm contracts to serve the regulated market (relaxed in CREG 75, 2008)
- Lack of firm gas upstream has impacts on contracting in the transport market
- Most purchasers have expressed a preference for auctions over bilateral contracting
- Most purchasers think Guajira regulation distorts the market, and favour liberalization and auctions

Preference for deregulation and auctions is conditional on sufficient quantities being offered in the auctions to establish competitive prices.

The Problems

Colombia faces issues similar to those which led to the introduction of gas release programmes, and virtual capacity auctions, in a number of European countries:

- a highly concentrated upstream market with a single dominant producer (Ecopetrol)
- has led to an apparent under-supply of long-term, firm gas contracts with consequent repercussions on the transport market
- gas release programs in UK, Spain, Italy, France, Denmark, Germany, Austria and Hungary were implemented to address similar issues

Decree 2687 and CREG 95 were designed to ensure that larger quantities of firm gas were offered to the market, but:

- “loophole” in the decree has allowed producers to declare most/all available supplies as interruptible, to avoid selling gas in auctions
- special treatment of Guajira distorts Colombian gas market and producers' incentives
- i.e. regulated price applies to both and firm and interruptible contracts, so producers should prefer to sell interruptible
- no “market price” for gas established in Colombia

Proposal: A Colombian "Gas Release" Program

Our proposal addresses these issues by:

(1) Liberalizing the price of Guajira gas so long as competitive auctions can be held for all Colombian gas supply.

(2) Requiring all producers to offer all of their available supply in single, country-wide, mandatory auctions, adapting the Cramton (2008) auction proposals.

Cramton (2008) proposed a simultaneous, ascending clock auction design for long-term firm gas contracts, with the following features:

- Mandatory auction for producers, i.e. producers can only sell long-term contracts in the auctions (no bilateral contracting)
- A single auction including all (unregulated) fields and producers
- Standardized contracts for firm gas specifying, e.g. start dates and durations, lot sizes, take-or-pay percentages and contractual conditions and penalties
- Producer commitment to supply schedules in advance of the auction
- Producers left free to specify quantities of each product and reserve prices

Colombian “Gas Release” Program II

Cramton's auction proposal excluded Guajira, and did not address market power issues, in particular withholding of supply to increase prices. Our proposal adapts his design to:

- Mandatory annual or semi-annual auctions for all fields, including deregulated Guajira
- All producers in all fields are required to sell all of their *firm and interruptible gas* contracts in the auctions
- Quantity of gas offered by each producer should equal all available supply, i.e. the potential production for each year ("Potencial de Producción"), multiplied by the producer's share of that production, less the committed sales in that year ("Demanda Nacional" and "Exportaciones")
- Gas sold in standardized firm and interruptible contracts with the same start date, for durations of one to five or ten years
- Reserve prices capped at same level for firm and interruptible gas contracts
- Gas which remains unsold in one auction must be offered for sale in subsequent auctions, and not sold bilaterally or in “secondary” market.

Colombian "Gas Release" Program III

Our proposal adapts Ministerial Decree 2687, CREG Resolution 095, and Cramton (2008) auction design to address market power issues and withholding of supply. The aim is to:

- close the loopholes in existing regulations to ensure that "competitive" quantities of gas will be offered to the auctions
- make the upstream market more open and transparent, so all long-term contracts are sold on the same terms to all purchasers (including sales for export)
- provide a mechanism for establishing competitive, country-wide prices for both firm and interruptible gas contracts
- allow buyers to arbitrage over contract duration, location, and firm versus interruptible contracts in a single auction

So long as the market power of producers can be controlled by forcing the "release" of gas, deregulating the Guajira price will reduce the current distortions in the market.

Issues I

A number of implementation issues will need to be resolved:

I. Producer manipulation of capacity or production declarations

- if producers' declarations cannot be independently monitored or verified, scope may remain for reducing quantities to increase auction prices
- incentive to withhold supply is reduced by requirement that long-term contracts are sold *only* in the auctions, but may not be removed altogether
- technical constraints in gas production may also make this less of a concern
- but sellers with market power may still have some incentive to increase profits by declaring less gas available than they actually have

Hence it will be useful to investigate potential for regulatory monitoring of available supply declarations.

Issues II

II. Incentives to offer firm versus interruptible contracts

- given the requirement to sell all long-term contracts in auctions, there may be no remaining incentive to manipulate market by offering mostly interruptible contracts
- i.e. producers incentives to declare only interruptible gas available are largely due to (i) Decree 2687; and (ii) Guajira price regulation - hence further regulation may not be needed
- alternative would be to require a minimum percentage of each producer's supply be offered as firm contracts of one to five year durations, with higher proportions in earlier years for shorter-term contracts
- e.g. 75% of first year supply, 65% of second year, ...etc.
- more of the firm gas would be sold in shorter-term contracts, but since auctions are frequent, buyers will be able to obtain firm gas
- but this imposes risk on producers which may be undesirable

Issues III

III. Setting reserve prices

- without regulated reserve prices, sellers could still withhold quantity by choosing high reserve prices
- no obviously correct reserve prices available, but producers have used Guajira prices in past auctions (e.g. Pacific Rubiales, Ecopetrol)
- Cusiana gas opportunity cost determined by price of oil
- perhaps Cusiana reserve prices should be set on that basis to reflect opportunity cost

IV. Standardizing contracts

- Peter Cramton proposed industry and government should agree standardized contracts for auctions
- some developments since then, e.g. Decree 880 which defined firm contracts, and proposed CREG Resolution 188 of 2009
- more work to be done on this, esp. to include interruptible contracts

Issues IV

V. Alternative auction designs

- Cramton clock auction format familiar in Colombia and has good properties
- proposed activity rules and bidders' ability to switch demand between products deserves reconsideration
- other auction designs, e.g. Klemperer (2010) sealed-bid auction could be considered (but not purpose of this study)

VI. Simultaneous transport and gas auctions?

- ideally, gas and transport would be purchased at the same time, to resolve buyers' coordination problems
- our previous study recommended auctions for transport contracts to improve congestion and location price signals
- simultaneous auctions for gas and transport would be complex and Cramton viewed this as too ambitious to develop in the near term
- best developed independently in short term?

Duration of the Gas Release Programme

- gas release programs are designed to alleviate, or mitigate, market power problems
- need to remain in place until market becomes competitive
- e.g. UK program lasted from 1992- 1995, when British Gas had reduced market share; Hungarian program is for 10 years to 2015; EDF auctions are indefinite
- little prospect of more competition in Colombia in near to medium term, where market power of Ecopetrol in Cusiana will increase from 2010-2019

Measures to increase competition:

- “royalty gas” is currently marketed by Ecopetrol on behalf of the ANH
- this increases Ecopetrol control of market supply
- should be placed in auctions at zero reserve price directly by government
- since this accounts for possibly 15% of gas supply in Colombia, it will help
- Ecopetrol should also be prevented from acquiring control over any new gas fields or supplies in Colombia

Increasing Competition in Supply

Only long-term solution is to reduce concentration of upstream market power:

- this requires reversing decision to give more control over Cusiana fields to EcoPetrol
- possible alternative would be to split Cusiana into independently controlled fields, perhaps by auctioning off production and exploitation rights to different companies
- no more “association-type” contracts which allow for joint decision making over production and investments
- ideally, the same would be done at Guajira, although current contracts may prevent this

Absent significant improvements in upstream market structure, Colombia need to maintain a gas release program.

Gas Release Versus the "Single Buyer" Proposal

Pöyry Energy Consulting, on behalf of ANH, propose a "single buyer agency" to act as "counterweight" to the limited number of producers in the Colombian market:

- requires all gas be sold to “single buyer” at a negotiated price, based on producers' costs of production and need to provide incentives for new gas exploration and production
- single buyer then resells gas in auctions, possibly prioritising regulated consumers

Issues:

- how will single buyer determine the “right” price (e.g. what are the costs of production?). Ofgem has recently noted concern that costs of single buyer's mistakes will be borne by consumers
- requires a great deal of information and centralized decision-making, which the government is ill-equipped to do
- doesn't solve fundamental market power problem of withholding supply, i.e. how will single buyer force producers to offer competitive quantities?
- once we solve that problem, why have a middleman between buyers and sellers? Direct auctions seem preferable

Vertical Integration Issues

Ecopetrol is the dominant upstream firm and downstream activities include ownership of a refinery in Barrancabermeja (which demands up to 90 GBTUDs) and involvement in other downstream operations which purchase gas.

Concerns expressed that:

- Ecopetrol competes with resellers in secondary market and offers better terms to its own downstream operations
- requires that resellers provide information on secondary market transactions which place Ecopetrol at a competitive advantage
- Cramton suggested that:Ecopetrol announce its supply and demand schedules in advance of auction, to avoid strategic behavior during the auction
- may be insufficient: Ecopetrol should probably be limited to purchasing only amount of gas required for its operations to avoid withholding supply via another route
- given ban of Ecopetrol in secondary market, this may alleviate concerns, since all buyers will purchase gas on same terms in the auctions

Conclusions

- Auction proposal builds on previous ministerial decrees, CREG resolutions and Cramton report
- Resolves problems with current regulations, i.e. Decree 2687, CREG 095, 2008 and Guajira price controls
- Aim is to creates an open, transparent and competitive country-wide market for long-term gas contracts
- Provide good price signals for gas consumption and investment in new fields, or for alternatives such as LNG
- Numerous elements still need refinement, e.g. standardized contracts and possible requirement on producers to sell firm gas contracts
- Consistent with the development of more organized and transparent daily spot market for short-term gas
- **But**: gas release will be required indefinitely unless upstream market structure is addressed in medium or longer term

The End