Colombia’s Natural Gas Market

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29 August 2008
Goal

• Improve transparency and efficiency of gas market with coordinated auction for long-term gas contracts
Objective of auction

- Efficient price formation
- Transparency
- Neutrality
- Risk management
- Liquidity
- Simplicity
- Consistency
Efficient price formation

• Reliable price signals based on market fundamentals
• Competitive prices
Transparency

- Open process
- Bids are comparable
- Clear why winners won
- Prompt regulatory review and approval
- Regulatory certainty
Neutrality

- All suppliers treated equally
- All demanders treated equally
Risk management

• Reduces risk for both sides of market
• Price stability, yet responsive to long-term market fundamentals
• Shields from transient events
• Addresses counterparty risk
Liquidity

- Promotes secondary market
- Liquid market for primary products
- Liquid market for derivative products
  - Long-term strips
  - Short-term slices
Simplicity

• For participants
• For auctioneer
• For regulator
Consistency

• Consistent with other key elements
  – Transport market
  – Electricity market
    • Spot energy market
    • Firm energy market

• Consistent with best practice in world
Colombia Setting
Supply

All numbers are approximate

• Two main fields
  – Coast (Guajira)
    • 50% of reserves; 65% of production
    • Ecopetrol; Chevron
  – Interior (Cusiana)
    • 50% of reserves; 25% of production (but growing)
    • Ecopetrol; BP; Total

• About 10 years of proven reserves
Demand

• Type
  – Residential-commercial 19%
  – Industrial 45%
  – Electricity 24%
  – Vehicles 11%

• Location: 34% coast; 52% interior; 14% Ven.
  – Coast: 49% of demand is electricity
  – Interior: little electricity in typical year (more capacity), two large LDC
Transport

- Distance-based regulated price
- Often constrained
- How to make assignment consistent with transport constraints?
Contracts

• Mostly take-or-pay with high minimum percentage over month or year
• Mostly 1 or 2 year, but some 10-15 year
• Large variety of contracts
• Bilateral market is not transparent
Other features

• No LNG
• No storage
• Regulated price on coast
• Market price in interior
CREG proposal

- Producers declare quantity
  - Reserves
  - Potential production
  - Production available for market

- Mechanism for assigning quantity
  - Administrative for those with regulated price
  - Auction for remaining demand
Auction proposal
Mandatory participation by producers

• Mandatory: Producer sells all long-term contracts in auction
• Voluntary: Producer may sell long-term contracts in bilateral market
• Mandatory participation guarantees that all demand will participate in auction
• Mandatory participation enhances transparency and improves price signal
Auction scope

- Nation, region, field (delivery point), producer
- Different delivery points with same contract period are close substitutes (especially if near by)
- Same delivery point with overlapping contract period are close substitutes
- Close substitutes should be auctioned at same time to facilitate arbitrage and reduce transaction costs
Product definition

• Delivery point (e.g., Cusiana)
• Firm gas
• Take-or-pay
  – Minimum percentage (monthly or yearly)
  – Cap on rate of take (hourly or daily)
• Indexed
• Duration
• Lot size
• Guarantees and penalties
Standard contract

- Simplifies market (fewer products)
- Reduces transaction costs
- Increases liquidity
- Enhances secondary market
- Improves transparency
- Benefits sellers and buyers

Producers work with buyers and CREG to establish standard contract.
Auction

• Producers offer supply schedule
  – Quantity offered for each product
  – May offer more at higher prices
  – Announced before auction starts
  – Royalty quantity offered on same terms

• All products that are close substitutes are in the same auction
Sample supply schedules

Offer 100 lots with reserve price of $4

Reserve price should equal opportunity cost (opportunity of selling gas at future time)
## Supply example

### 2009 auction for delivery at Cusiana

<table>
<thead>
<tr>
<th>Product 1</th>
<th>Product 2</th>
<th>Product 3</th>
<th>Product 4</th>
<th>Product 5</th>
</tr>
</thead>
<tbody>
<tr>
<td>year</td>
<td>2010</td>
<td>2011</td>
<td>2012</td>
<td>2013</td>
</tr>
<tr>
<td>Lot</td>
<td>300</td>
<td>200</td>
<td>400</td>
<td>100</td>
</tr>
</tbody>
</table>

Commitment Period

- **Product 1**
  - 300 MBTU/d in 2010

- **Product 2**
  - 200 MBTU/d in 2011 and 2012

- **Product 3**
  - 400 MBTU/d in 2012

- **Product 4**
  - 100 MBTU/d in 2013

- **Product 5**
  - 200 MBTU/d in 2013

### Notes

- Products only differ in duration; all start in 2010.
- Buyer winning 6 lots gets 3 pink, 2 blue, 1 orange.
- Seller decides split among durations before auction.

**Suppliers**
- Pink
- Blue
- Orange

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*lot = 1000 MBTU/d*
Alternative: Supply by year

*Not recommended*

2009 auction for delivery at Cusiana

2010 2011 2012 2013 2014

Products are not substitutes for buyers

Product 1  Product 2  Product 3  Product 4  Product 5

Suppliers
Annual auction event

- Annual auction well-suited to long-term contracts (one or more years)
- Producers offer all quantity
  - Capacity less existing firm gas contracts
  - Each year new quantity becomes available
    - Expiring contracts
    - Capacity expansions
- Auction by field or region (e.g. interior)
Simultaneous ascending clock auction

- Separate price for each product
- Demanders express quantity for each product given prices
- Prices rise for products with excess demand
- Auction ends when no excess demand
- Activity rule: bidder’s aggregate quantity declines as prices rise

Auction determines market price for each product.
Ascending clock auction:
All bids above clearing price win and pay clearing price
Ascending clock auction
## Sample auction

### 2009 auction for delivery at Cusiana

All contracts start in 2010; lot = 1000 MBTU/d; price = $/MBTU

<table>
<thead>
<tr>
<th>Round</th>
<th>Supply</th>
<th>1-year</th>
<th>2-year</th>
<th>3-year</th>
<th>4-year</th>
<th>5-year</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Price</td>
<td>$5.00</td>
<td>$5.00</td>
<td>$5.00</td>
<td>$5.00</td>
<td>$5.00</td>
<td>2300</td>
</tr>
<tr>
<td></td>
<td>Demand</td>
<td>1200</td>
<td>800</td>
<td>300</td>
<td>700</td>
<td>900</td>
<td>3900</td>
</tr>
<tr>
<td>2</td>
<td>Price</td>
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<td>$5.40</td>
<td>$5.00</td>
<td>$5.40</td>
<td>$5.60</td>
<td>3900</td>
</tr>
<tr>
<td></td>
<td>Demand</td>
<td>1000</td>
<td>900</td>
<td>600</td>
<td>600</td>
<td>800</td>
<td>3900</td>
</tr>
<tr>
<td>3</td>
<td>Price</td>
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<td>$5.90</td>
<td>$5.50</td>
<td>$5.80</td>
<td>$6.00</td>
<td>3700</td>
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<tr>
<td></td>
<td>Demand</td>
<td>900</td>
<td>900</td>
<td>600</td>
<td>550</td>
<td>750</td>
<td>3700</td>
</tr>
</tbody>
</table>

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Ascending clock has important advantages

• Price and assignment discovery
• Buyers can build desired portfolio of supply across products given prices
• Assumes “price only” auction
  – All other features are same
    • No substantial difference among sellers
    • No substantial difference among buyers
    • Credit differences addressed with guarantee policy established before auction starts
Activity rule

• A bidder can only maintain or reduce its aggregate quantity (total number of lots) as prices rise
• Allows full substitution among products
• Avoids bid sniping and improves price discover
Information policy

• Supply schedule and starting prices announced before auction
• After every round, auctioneer reports (at least)
  – Excess demand for each product
  – Prices for next round
    (determined from extent of excess demand)
International experience

All use ascending clock auction to sell long-term gas contracts

• German gas release program (E.ON Ruhrgas)
• Hungary gas release program (E.ON Ruhrgas)
• Danish Oil and Natural Gas gas release programme
  – Series of six annual auctions (2006 – 2011)
• Gaz de France gas storage auction
  – Single auction (Feb 2006)
• Gaz de France gas release programme
  – Single auction (Oct 2004)
• Total gas release program
  – Single auction (Oct 2004)
Organization

• Producers jointly conduct auction
• Independent auctioneer
• Regulatory oversight
What if seller is also buyer?

• Seller announces supply schedule (like others)
• Seller is a price taker for quantity it buys
• Quantity it buys is effectively removed from supply schedule
Priority for internal demand

• If at clearing price export wins quantity, losing internal demand has right of first refusal to displace export
• Right of first refusal granted in order of quantity reductions (last to reduce first)
• Clearing prices do not change; only change is some export quantity may be displaced by internal demand
Addressing market power

- Open and transparent process
- Seller must commit to supply schedule before auction starts
- Auction watched for exercise of market power
- Additional steps taken as needed, such as cap on reserve price
Secondary market

• Bilateral trade of long-term products among demanders, not producers
• Day-ahead market to balance positions
Transport

• Auction does not address transport
• Buyer requires firm gas + transport
  – Ideally, both are purchased at same time and transport price is congestion price
  – With gas purchased first, auction outcome may violate transport constraints
  – With transport purchased first, transport may be inconsistent with auction outcome
Approaches to improve transparency

• Require standard contracts
• Establish registry of contracts
  – Parties and terms disclosed
  – Implied supply and demand by location, and supporting pipeline flows
Questions