Brazil Natural Gas Lessons from the U.S.A.

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Introduction
LNG Project sanctions since 2016, plus 2020 potential FIDs (pre- and post-Covid)

Gas prices
$/mmBtu
Offshore, 23 July 2020,


• Although, owing to the slowdown in demand in March/April caused by the falling oil price and COVID-19, Petrobras’ overall output of oil, NGLs and natural gas in the 2Q was 3.7% lower than in the 1Q

• But Petrobras saved 97.7% of the natural gas from its producing fields in the 2Q

US Experience
US Natural Gas (early era)

- 1821
  - William Hart dug first successful natural gas well in Fredonia, New York
  - Fredonia Gas Light Company became the first American natural gas local distribution company (LDC)
- 1836
  - Philadelphia created the first city-owned LDC (now over 900 city-owned LDCs in US)
- 19th century:
  - Most natural gas was used for lighting
  - But in 1885, the invention of the Bunsen burner began an era if using natural gas for heating, cooking, industrial use, and electricity generation
  - In many areas with low-density population, natural gas was considered a “nuisance”
- 1920s:
  - Mass production of seamless steel pipe began an era of long-distance gas pipelines

History of US Natural Gas (regulatory era)

- First, LDCs were regulated by state governments
- Interstate pipelines exercised both monopsony and monopoly power as both merchants and transporters of natural gas
- 1938
  - The Natural Gas Act empowered the Federal Power Commission:
    - To regulate tariffs charged by interstate pipelines,
    - To certify the need for new interstate pipelines
- 1954
  - US Supreme Court held that NGA also required the FPC to regulate the wellhead pricing of natural gas
- 1977
  - Dept of Energy Organization Act consolidated the regulation of most gas, oil, and electricity transmission into the newly created Federal Energy Regulatory Commission
Map showing onshore and offshore Brazilian Basins for conventional and unconventional hydrocarbons (natural gas and oil) reserves and oil and gas spots in the Santos and Campos Basin used for Pre-salt oil extractions. (Adapted from EIA 2013 and Petrobras 2014b).
1978 to 1989 (gradual deregulation era)

- 1978
  - Natural Gas Policy Act initiated a move toward gradual gas price deregulation
- 1985
  - FERC Order No. 436 required natural gas pipelines to provide “open access” for transportation services
    - Allowing natural gas consumers to negotiate prices directly with producers and contract separately for transportation
- 1989
  - Natural Gas Wellhead Decontrol Act
    - Completed the process of deregulating natural gas prices at the wellhead
- 1991
  - FERC issued a Notice of Proposed Ruled Rulemaking, resulting in:
    - Order No. 636, 1992, (The Restructuring Rule) mandated that pipelines “unbundle” gas transport, storage, and sales services, creating a more competitive gas market
    - Order No. 637, 2000, correcting inefficiencies in Order 636 pertaining to the release of pipeline capacity to various customers

FERC Order No. 639, 2004-5

- Requires transport of natural gas from offshore OCS (outer continental shelf) be non-discriminatory and open-access
  - Regulations provide for greater market transparency, similar to the regulation of interstate pipelines
  - Creates a common regulatory scheme for all OCS gas services suppliers
  - Reporting requirements for OCS gas services suppliers: disclosure of operated facilities, affiliates, and existing customer contracts including conditions of service and rates charged
Current Era

- Natural gas producers and marketers are no longer price regulated
- Interstate pipeline companies are regulated
  - Tariffs
  - Requires non-discriminatory open access for producers, marketers, LDCs, and end users
  - Siting and construction of new pipelines
  - Prohibited from owning gas transported in their systems
- LDCs continue to be regulated by state public service commissions (excluding most city-owned gas systems) regarding rates and construction of distribution pipelines

State Regulation of Natural Gas Production

- Well permitting
- Well location
- Well HSE rules
- Regulation of production (but no direct ratable taking requirements)
Result of deregulation

• Results:
  • Gas production increased (ultimately, thanks to shale gas)
  • Proved gas reserves ("gas bubble") decreased
  • Gas usage increased
  • Natural gas became more affordable
  • But the late 1980s and early 90s were painful, requiring renegotiation of long-term contracts that assumed natural gas prices could only rise
  • Recently a few cities have started curtailing new residential gas hookups over GHG concerns
Gas-related transactions

- Midstream gathering and processing
- Transport (regulated)
- Gas sales

The Gas Mid-Stream—Pipeline Quality Methane

- BTU or energy content
- High water content requires “dehydration” (pipeline quality gas should be less than about 3 kg per 1000 BTUs)
- Carbon Dioxide may have to be removed (pipeline quality gas should be less than 2-3% CO2)
- Hydrogen Sulfide may have to be removed by “treating” (pipeline quality gas should be “sweet”—less than 0.5% H2S, not “sour”)
- NGLs may need to be “processed” for valuable liquids, e.g., butane, ethane, pentane, propane, and natural gasoline
Gas Processing Agreements—Types

• Fixed: processor receives a fee for processing usually based upon volumes of processed gas or resulting NGLs
• “Keep Whole”: Processor gets the NGLs but agrees to keep whole the producer on a Btu basis
• POP-% of proceeds—processor sells the NGLs and pays producer a portion of the proceeds and producer gets the dry gas
• POL-% of liquids—processor gets a share of the NGLs and sells them for its own account and producer gets the balance and the dry gas
• Many variables of above

Gas Processing Agreements—Special Terms

• “Shrinkage”—gas shrinks in volume and BTU during processing, including the gas consumed in plant operations
  • How shrinkage is handled affects the processing fees and terms
• NGL, water, CO2, and H2S content and the need for compression before and after processing affect costs
• Contract must address varying gas measurement at different locations from wellhead downstream
Natural Gas Marketing via Pipelines

Natural Gas as a “Commodity”

- Once “processed,” natural gas (methane) is basically a fungible “commodity” characterized by price volatility
  - Thus, the gas a producer sells is not necessarily the same physical gas delivered to buyer
  - Commodity prices are volatile based on supply and demand
- Gas Commodity Futures market brings transparency:
  - Buying and selling natural gas under fixed-term contracts for delivery at the Henry Hub
  - Contract terms are one to 36 months and established at NYMEX
  - NYMEX is only one of a varying and increasing number of futures derivative contracts
  - Most futures contracts market “paper” gas, not physical gas, to facilitate “hedging” and “speculating”
- Spot sales: daily markets that establish price at particular market locations but usually facilitated by a monthly cycle
- Multi-month sales
Modern US Gas Marketing/Marketers

- **What is gas marketing?** Process of coordinating, throughout the supply chain, the business of bringing natural gas from the wellhead to end-users

- **Who are gas marketers?** Affiliates of producers, pipelines, LDCs, large end users, or independents (largest are pipeline and LDC affiliates)

- **What do gas marketers do?**
  - Arrange transportation, storage, accounting, and other services to facilitate gas sales
  - Buy, sell, and/or broker gas to other marketers, LDCs or end users
  - Use financial instruments and markets to hedge their risk exposure and also speculate

- **Why have gas marketers?**
  - Commoditize natural gas
    - Facilitate liquidity and transparency
    - Help ensure secure gas supplies and provide a transactional pathway for gas to reach end users
Contracts for Physical Delivery of Natural Gas:
Spot Contracts (1)

• Useful for any gas, but best suited for:
  • Long-life blocks, especially where producer could produce more gas;
  • New properties that can be quickly connected to a pipeline; and
  • Associated gas
• Spot prices tend to be seasonal in US, whether for direct use or for electricity
• Mostly standardized terms: North American Energy Standards Board
• Often made quickly and remotely (by phone or internet)
• Monthly cycle of sales

Contracts for Physical Delivery of Natural Gas:
Spot Contracts (2)

• Mid month: sellers, marketers, and buyers communicate about “potential” transactions for the following month
• About 10 days prior to the end of a month, “shippers” will “nominate” transportation needs, providing likely gas volumes, receipt and delivery points, and other information
• Pipeline and LDC capacity reconciliation staff review and provide feedback to shippers regarding capacity limit concerns or bottlenecks
• Bid Week: last full week of prior month, final needs are considered and hopefully agreed
• Last day: Contracts are finalized on standard forms, often by phone or email
Multi-Month Term

- Generally, one year or less
- Useful when sellers have an opportunity to secure a premium price
- Often “interruptible”—no legal obligation to deliver or take gas, although longer-term ones may have some standard, such as “best efforts,” which should be defined
- Other key provisions include price, quantity, delivery points, which would change from month to month
- Premised on the assumption that both parties are content at all times
- “Bespoke” contract, but generally fits within a common model

Longer Term “Warranty” Contracts

- A few years to perhaps up to 10 (some LNG might be longer)
- Premised on the assumption that one party, looking back, will have made a better deal than the other party
- Longer-term agreement needed to finance expensive mid-stream facilities
- Enforceable “firm” commitment to sell and buy gas
- Seller will ordinarily demand a “bonus” for a firm commitment, which might be a lump sum paid when the contract is made but more likely is a monthly premium price component over spot prices: called a “reservation charge” and “commodity charge”
Longer-Term “Warranty” Contracts

• Price and Performance Provisions:
  • Fixed escalation
  • Indexed to natural gas or a competing commodity (with minimums/maximums)
  • Most favored nation—two party or multi party
  • May also include a price renegotiation clause if contract is over 5 years
  • Under and Over Quantity Discounts and Premiums, as applicable
  • “Take or pay,” “take and pay,” or “take and release” for Buyer minimum quantity with perhaps limited “make-up” rights
  • Arbitration or expert determination to resolve disagreements

• Regulatory “out” clause
• Price regulation “out” clause

Longer Term “Warranty” Contracts

• Often made without specifying a source of gas unless used to secure financing for new-build mid-stream facilities
  • Treatment in the event of bankruptcy is an important consideration

• Quantity: varies from contract to contract but buyers generally pay a premium for high volumes with flexible takes

• Buyer is entitled to “liquidated damages” for failing to supply—
  • Even notwithstanding force majeure, although force majeure may lessen the amount of damages, and
  • Contract may provide a damages “cap,” at which point buyer may terminate the contract
Longer Term “Warranty” Contracts

- Seller may reserve gas
  - To power operations
  - To fulfill “free gas” clauses to the lessor
  - To fulfill take-in-kind HG fiscal terms,
  - For use in NGL processing
  - For recycling
  - For gas balancing

Typical Long-Term Gas Contract Provisions

- Quality specifications
- Quantity:
  - Daily contract quantity (DCQ), which may be seasonally adjusted
  - Annual contract quantity
  - Maximum delivery quantity (+ or - % of DCQ)
  - Minimum nomination and seller delivery obligation
  - Buyer minimum take quantity
  - Buyer carry forward credits for taking more gas than required
  - Indefinite quantity contracts are also common
- Default, force majeure (including “regulatory out”), governing law, and dispute resolution
Gas Stream Checklist

- Who will arrange for “compressing” and “moving” the gas at different stages? E.g., gathering, pipeline transport, storage, distribution
- Who will pay for “moving” the gas at these different stages?
  - Note that most “gathering” is not regulated except perhaps by state PUCs
- Who will arrange for any dehydration, treating, and CO2 removal?
- Who will arrange for any NGL processing?
- Who will pay for any NGL processing?
- Who owns and potentially profits from NGLs?
- Note that most of the above may be provided as a third-party service

Golar Power

- Bahia
- Sao Paulo (biomethane LNG from landfills)
- LNG transported by road (rather than pipeline)
- Heavy vehicles will burn LNG directly
- Cryobox™ modular LNG-Production Stations
- Gas Conditioning, Distributed LNG Production, LNG Filling Stations and Regasification Plants
Brazil gas supply vs demand

Dillion cubic meters

Source: Rystad Energy GasMarketCube and Ucube, Rystad Energy research and analysis  2 Feb 2020