

Why untenable US natural gas boom may soon need wellhead price-floor regulation for industry survival

In one of his occasional contributions on oil and gas strategy challenges, Ruud Weijermars* discusses concerns about the sustainability of the US natural gas business model and suggests that wellhead price-floor regulation may be the solution.

Geoscientists and petroleum engineers are primarily focused on solving sub-surface puzzles and technology challenges. Emerging doubts about the financial fundamentals of US natural gas companies pose a serious threat to the prolongation of their early success. Replacing dwindling indigenous gas supplies from conventionals by unconventional has raised great expectations for further production growth, both in the US (NPC, 2007; Kuuskraa et al., 2007; Anonymous, 2008; Andrews et al., 2009); and elsewhere in the world (PTAC, 2006; EBN, 2009; Hulbert, 2010; Jaffe, 2010; Knight, 2010). Natural gas remains in vogue as a transition fuel (Jaccard, 2005), and modest US consumption growth is mostly due to the switching of coal-fired power stations to cleaner gas power generation under pressure from EPA regulations (NARUC, 2001; EPA, 2009).

The unconventional natural gas business has ascended a steep three-stage learning curve. The first stage of the learning curve shows that natural gas production from unconventional source rock actually can replace the decline of



Figure 1 Shale gas frac job with hydraulic truck array, Barnett Shale, Texas. Courtesy: <http://www.barnettshalenews.com>.

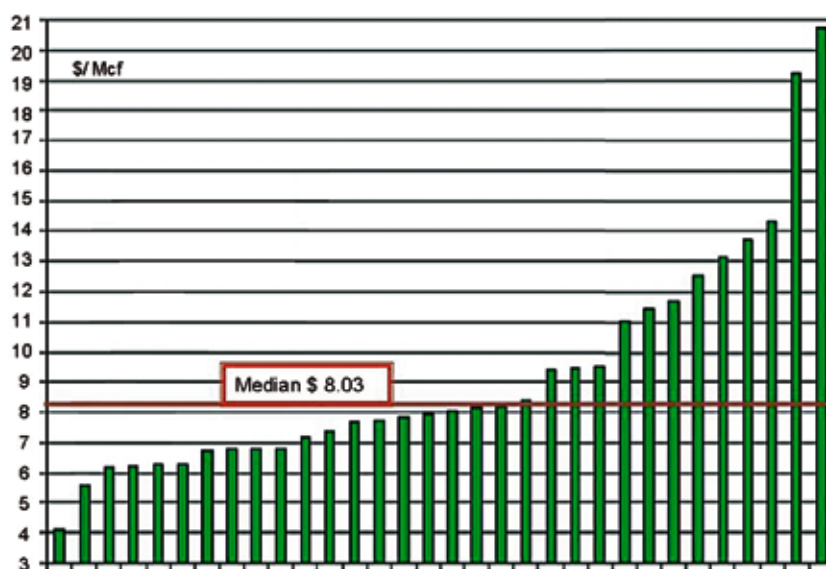


Figure 2 Break-even analysis by Bank of America of 32 major US unconventional gas operators sets a median break-even price for the industry at 8 \$/Mcf using 2008 data. The median benchmark rate is not met by 13 companies, and none of the 32 companies met break-even at 2009 wellhead prices.

conventional natural gas production, but that is only one step up the ladder. The second stage of the learning curve shows that many US natural gas production companies encounter serious difficulty in meeting break-even cost (see below). The third stage of the learning curve has just begun and can only become successful when investor confidence can be maintained; this includes stemming persistent concerns about the industry's cash flow decline. For example, 24 of the 45 leading US gas operators had capital expenditure (CAPEX)/cash flow ratios larger than 1 in Q1 of 2010 (Dell and Lockshin, 2010), meaning free cash flow from operations needs additional financing to cover capital expenditure programmes.

Low cash flow from gas sales

Several recent analyst reports confirm the consistent weak cash flow results for a significant number of US unconventional natural gas companies (Schaefer, 2009; Cohen, 2009; Nasta, 2010). For most companies, outright stoppage of production is no option. Consequently, the majority of US natural gas operators continue to outspend their net earnings on CAPEX programmes. They must do so, because of the short life-cycle of unconventional gas wells. If they were to stop CAPEX for new wells, free cash flow would dry up quickly too. Low well productivity, together with high cost of recovery (well completion cost and frac jobs, Fig. 1), low gas prices, and the drying up of access to new capi-

* Department of Geotechnology, Delft University of Technology, the Netherlands. E-mail: r.weijermars@tudelft.nl

tal for acquisition of better acreage are the underlying causes for lagging cash flow from unconventional wells.

A recent cash flow analysis based on five-year averages (2004–2008) showed that even prior to the recession (Weijermars, 2010a) unconventional operators commonly could not fund capital expenditures (CAPEX) for end-of-life-cycle replacement from the free cash flow of their short life-cycle wells. The underlying reason is that the average break-even price of about 8 \$/Mcf has not been met in anyone year of the unconventional gas life-cycle (Fig. 2). The depressed gas price is due to oversupply and lagging consumption growth, which has kept wellhead and wholesale prices for natural gas at the lower end of the price elasticity range. None of the 32 companies benchmarked in Figure 2 met break-even at 2009 wellhead and spot market prices (details below).

US natural gas supplies, not unlike contemporary internet services, are partly paid for not by the consumer, but by others. The arithmetic is simple. The average wellhead break-even price for unconventional natural gas lies at 8 \$/Mcf in 2008/2009 (Bank of America).

The average US wellhead price paid was 3.71 \$/Mcf in 2009 (DOE/IAE, Fig. 3), which differed only fractionally from the Henry Hub gas wholesale price of 3.99 \$/Mcf (Reuters). Remember that every penny saved on the commodity price must, by US federal law, be discounted to the end consumer. US energy utilities may bill the cost of their distribution and metering services, but the commodity price itself is billed at actual wholesale price and any rebates must be passed on in natural gas retail prices. More than half of the US natural gas consumed in 2009 came from domestic unconventional sources (DOE-EIA, 2009) for which US consumers paid less than 50% of the wellhead break-even price, in essence receiving a rebate of over 25% on minimum production cost. Who then pays for the 25% commodity price discount? Answer: US tax payers and shareholders in US unconventional natural gas companies. Consequently, unconventional US gas operations are financed by tax credits, equity finance, and credit finance raised from investors and banks, and as of late, asset sales and outright mergers. All these external cash sources are drawn upon by most companies in order to supplement lack

of margin on revenues from wellhead gas sales.

This study uses a median break-even price of 8 \$/Mcf (Bank of America) as a reference, which accounts for production, general and administrative (G&A), interest, and reserve replacement costs. While there is common agreement among analysts that the current wellhead prices are below break-even prices for unconventional gas production (Fig. 2), considerable debate occurs about the actual median break-even price, attributable to variations in company's methods of life-cycle costing (Spears, 2009; Berman, 2010; Cohen, 2009; Nasta, 2010; Schaefer, 2010; Sieminski, 2010).

Find new ways to restore cash flow

Meanwhile, the recession has made investors reluctant to buy more shares, and access to debt capital funding has become too expensive for most unconventional gas companies, due to unfavourable credit ratings. The economic fundamentals all indicate that unconventional natural gas operations may remain under pressure for some years to come. Compliance with good corporate governance practices (OECD Principles of Corporate Governance 2004 and ISO 27001) means the leadership of unconventional gas companies must jointly face up to these challenges: find new ways to restore and maintain investor confidence and respond to cash flow decline by taking adequate measures. This is the only way forward toward building a sustainable natural gas business in the unconventional domain. Accelerated replacement of low quality acreage with better assets, improvement of well productivity, and lowering the cost of capital by seeking alliance with creditworthy partners are some measures that must be taken. Some companies have already found alliance partners or have been acquired (Exxon-XTO; Shell-Eastern Resources, etc).

Lowering the break-even cost of natural gas production from unconventional wells on a large scale by improvements in technology and operating efficiencies must be pursued, but may take several more years (Godec et al, 2007; Reeves

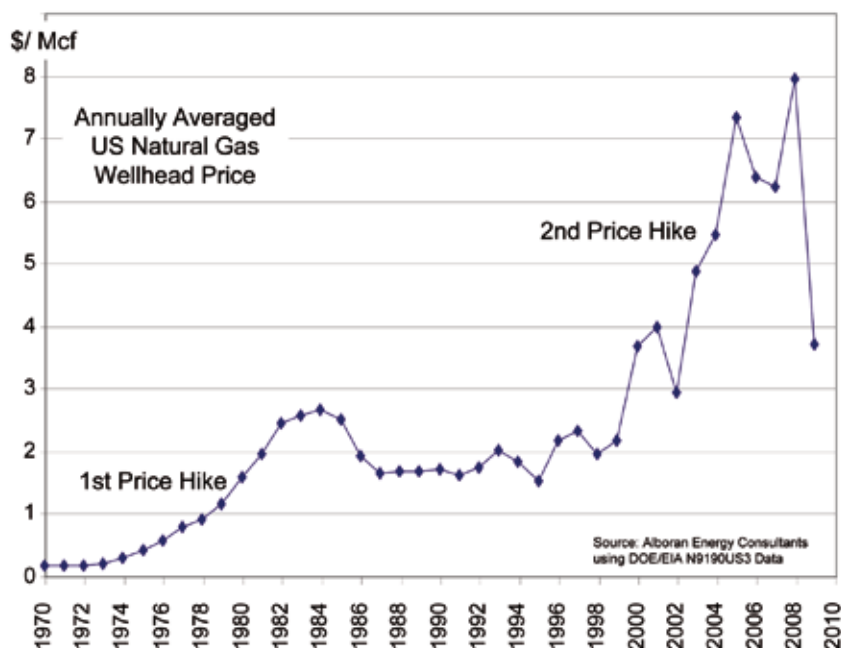


Figure 3 Annually averaged US natural gas wellhead price development over the past 40 years. Two price hike epochs occurred: a first price hike occurred after the 1973 oil crisis (till about 1983, when North Sea oil started to relief global energy prices) and a second price hike started in 1998 in step with the global trend in energy prices and peaked in 2008.

et al., 2007; Andrews et al., 2009). Meanwhile, wellhead prices provide a reliable indicator for the revenue stream that should pay for natural gas production investments. In 2009, natural gas prices declined but annually averaged wellhead gas prices have seen two previous epochs of upward price hiking in the past 40 years (Fig. 3). A further, third price hike epoch is now needed to provide a sustainable floor for wellhead prices that must pay for unconventional gas production. Such a price hike would restore free cash flow and mitigate the growing concerns about the sustainability of the US natural gas business model.

But the quick restoration of wellhead prices and sustained rise above breakeven levels seems unlikely. World energy prices are currently depressed and the oversupply of indigenous natural gas is only in part due to unconventional gas that now embody the US upstream natural gas industry. The other part is due to simultaneous price pressure from the ambitious LNG landing programmes (Foss, 2007) led by the US mid and downstream transmission providers and energy utilities.

Incentives and drive for more LNG landing capacity on the US East and West coasts are, like unconventional gas production itself, also a consequence of the US natural gas security of supply policies (NCEP, 2003; NARUC, 2005). LNG imports are produced from low cost acreage in hydrocarbon regions remote from the world's major consumption markets. The added cost of liquefaction, LNG carrier transport overseas, and re-gasification adds about 3 \$/Mcf to the wellhead price (Hartley and Medlock, 2006). LNG imports, at premium prices paid for at US LNG landing terminals over domestic supply, are frequently kept at bay and re-sold overseas. And although US East and West coast re-gasification terminal capacity remains underutilized, LNG imports have not helped to lift domestic gas prices. A forthcoming study (Weijermars, 2010c) has computed that both gas systems, i.e., landed LNG and domestically produced natural gas, compete mostly on well-

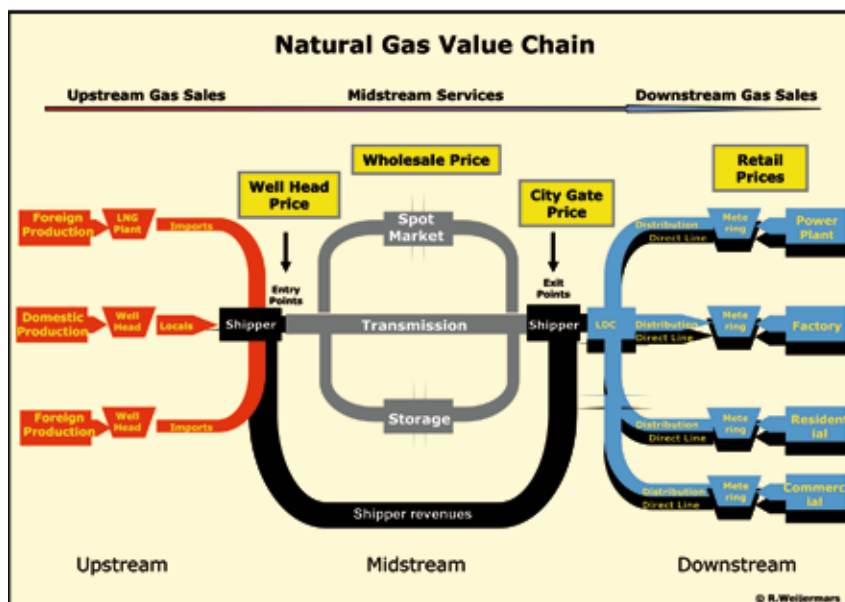


Figure 4 Natural gas value chain model (after Weijermars, 2010b). City gate and retail prices are regulated. Wholesale prices are spot market (NYMEX) and differ only fractionally from wellhead prices when averaged over time, due to efficiency in the US natural gas infrastructure system.

head price efficiency in their respective production regions, as the costs of getting the gas from wellhead to the retail customer are similar for both systems, at about 3 \$/Mcf.

Price effects of regulation

A new insight from the value chain analysis portrayed in Figure 4 (Weijermars, 2010b) is that, whether world energy markets rise or fall, none of the price volatility is absorbed by the mid and downstream energy segments. In fact, any price reduction is entirely leveraged back to the wellhead, as a consequence of effective price regulation in the mid and downstream segments. Retail prices may rise or drop in response to the global energy demand and supply balance, but regulation ensures the US mid and downstream transport and distribution assets and services are always paid for (Fig. 4).

While regulation was meant to avoid excessive price inflation in the mid and downstream segments servicing a captive consumer market, regulation also provides a stable floor for returns on investment. A detailed value chain analysis (Weijermars, 2010c) has established that the five-year cost average for gas delivery via the US mid-

stream and downstream natural gas system comes down to an all-in tariff of 3 \$/Mcf; this tariff was closer to 2 \$/Mcf at the beginning of the past decade (Fig. 5). Price regulation ensures that utility companies have a rate-making mechanism that facilitates recovery of most of their costs plus a fair return on investments, but their returns remained extremely slim over the past decade as a result of stern regulation (Olson, 2009; Weijermars and Olson, 2010).

Unlike the price regulation for mid and downstream energy utility companies, the US upstream energy segment was deregulated in 1989 (Dahl, 2003). The Decontrol Act of 1989 enabled both up and downward price competition for wellhead production, which until then had been effectively price-capped by the US Phillips Court ruling of 1954. Ironically, any change in global energy prices is now hitting directly back at the US wellhead price, as a consequence of mid and downstream price regulation in conjunction with upstream wellhead price deregulation.

Arguments for wellhead price-floor regulation

A fundamental question addressed here is whether the US government can be

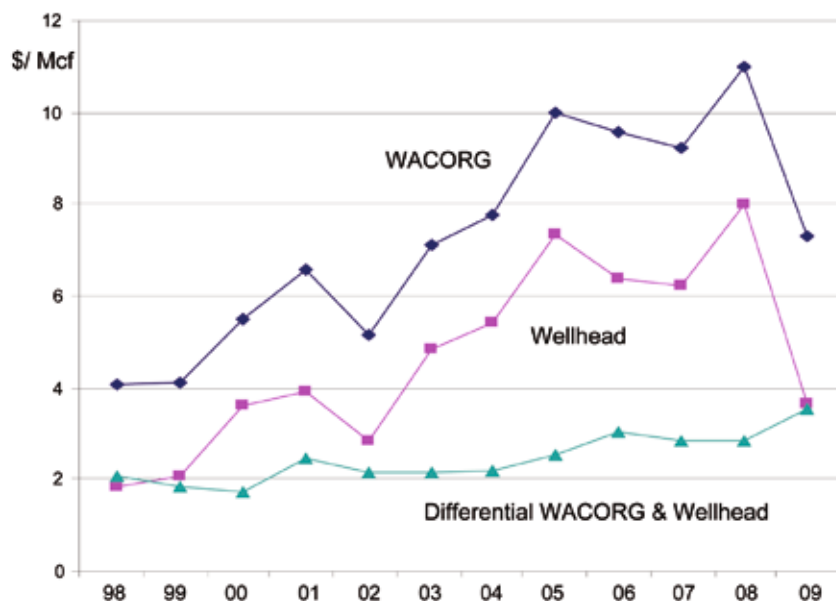


Figure 5 Weighted average cost of retail gas (WACORG) middles the traditional price spread between residential, commercial, industrial, and power station consumers of natural gas. The price differential between WACORG and wellhead pays for assets and services in the mid and downstream segments of the US natural gas value chain system. Data cover study period 1998 to 2009.

expected to continue the granting of generous tax credits for unconventional gas producers. Sovereign debt rating pressures urge governments worldwide to take austerity measures in order to balance their fiscal budgets. In any case, the current generous short-term gas rebate for consumers, if not amended, will lead to a rapid decline in the US natural gas business as production becomes progressively sub-economic. Expecting additional fiscal stimulus for the natural gas energy sector is not realistic in times where government needs to be prudent about balancing fiscal budgets to avoid sovereign default. A premature life-cycle decline of natural gas resources is cer-

tainly costly too. Valued at approximately \$6 trillion (based on 10 times 2008 annual revenue in US gas value chain), a loss of capital investments in the US natural gas business would be economically in-efficient.

Why then not let consumers pay for the energy they get and charge a fair price for the natural gas they consume? That could be achieved by introducing a floor for wellhead prices that ensures break-even for the average company.

The solution outlined here advocates the abandonment of tax credits, succeeded by the introduction of a wellhead commodity price-floor in the downstream retail rate-making mecha-

nism. Price regulation in the US now occurs entirely in the mid and downstream energy sectors, as the Wellhead Decontrol Act of 1989 removed all price regulation from the upstream sector. However, downstream retail price regulation could easily be adjusted such as to set retail prices that account for a wellhead break-even price. This concept is entirely different from the past US wellhead price regulation system. Instead of capping wellhead prices as was the case in the Phillips decision of 1954, the introduction of a minimum commodity price in the retail rate-making mechanism should ensure upstream break-even prices for natural gas operators. The Wellhead Decontrol Act was useful when introduced in 1989, but market conditions have changed and security of supply arguably mandates the introduction of wellhead price-floor regulation.

Such a measure can be taken swiftly and can use historic WACORG spreads (Fig. 5) to determine what rate applies to which type of consumer to ensure the wellhead price-floor will be honoured. Using the commonly quoted 8 \$/Mcf well-head break-even price would result in a WACORG of 11 \$/Mcf; a 12 year trailing spread analysis of the different consumer groups then provides the respective retail prices (Table 1). In reality the break-even price at the wellhead, would need to be based on a weighted average price of gas imports, conventional indigenous gas and unconventional indigenous gas. Such a system is not complex and could be audited by

Reference Break-even Scenario US unconventional gas	Spread over WACORG (12 Y mean)	Retail Price for well-head breakeven (\$/Mcf)	Reference Prices 2009 (\$/Mcf)	Reference Prices 2008 (\$/Mcf)
WACORG	0%	11.00	7.32	10.90
Residential users	+45%	15.96	11.79	13.89
Commercial users	+24%	13.61	9.75	12.23
Industrial users	-19%	8.88	5.27	9.67
Power stations	-26%	8.15	4.89	9.26
Wellhead price	-	8.00	3.71	7.96

Table 1 Mean spread of retail prices over WACORG.

the US Department of Energy (DOE/EIA), supported by an improved well-performance data base monitored by a consortium of the leading US geoscience institutions (e.g., Bureau of Economic Geology at UT Austin, Colorado School of Mines, and Texas A&M). An authorized institution is required to establish the annually averaged break-even price used to set the wellhead price-floor, required for the downstream retail price rate-making. This proposition ensures consumers of natural gas pay a fair price for natural gas production and utility services.

The adoption of such a system is indeed fair as consumers will then receive an energy bill accounting for costs of the full value chain and spares the US tax payers. Investors in the upstream gas companies will still be subject to risks and rewards associated with outperforming the market in the energy peer group. When markets continue to function efficiently, the wellhead price floor should come down over time, as natural gas companies learn to bring down break-even cost. Natural gas producers have an incentive to do so, because they want to increase their profit margins to satisfy shareholders – even when price floor regulation guarantees break-even in principle. Some companies will operate in basins that have lower gathering costs and may consistently benefit from a differential between their break-even cost and that of others. But remember, a wellhead price floor gives no monetary presents to any party, but only sets a minimum price for the commodity while still leaving room for efficient companies to increase profit margins over competitors.

Conclusions

The wellhead price-floor mechanism suggested here may seem a revolutionary concept at first sight. However, this proposition deserves a fair trial. The following arguments justify its careful consideration:

- The current costly system of US tax credits for natural gas development can be rescinded.
- Downstream and midstream segments already receive a regulated price-floor for assets and services.
- Regulators have a statutory obligation to establish an even and fair risk profile in a regulated industry.
- All risk is presently levied to the upstream segment, so establishing a price floor for wellhead production is fair.
- Gas consumers would pay a fair and reasonable minimum price for their gas consumption.
- Imminent bankruptcies of companies with persistent liquidity problems can be averted.
- Basin to basin competition on a global scale will continue unabated.

The alternative of doing nothing about the decade long cash flow problems in the unconventional gas business, until now relieved by tax credits and speculative investors, has the following downside:

- Security of US energy supply is seriously threatened when the unconventional gas cash flow crisis persists and leads to inevitable insolvencies that may diminish the 50% volume output share currently served by unconventional producers.
- The investor community, already growing wary of risky energy projects, may turn their backs on the sector altogether.
- The Clean Energy Act's envisioned switch of power stations from dirty coal to clean gas is seriously jeopardized when production from unconventional gas fields stays sub-economic and perishes.

Unconventional gas development projects are now under study in many countries. The US unconventional gas industry has paved the way with an impressive track record in petrophysical characterization and well completion engineering in unconventional source rocks. Serious doubts about wellhead break-even cost could put the sustained success of such unconventional gas development projects at peril. The recommendations formulated in this study

may help to avoid costly failures in the US and elsewhere.

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