

Gas Pricing in Afghanistan

Gas Pricing Issues

World Bank
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Objective

- To consider which pricing principles could realistically be implemented in Afghanistan in the near, medium, and long term

Units

Metric	English
1 m ³	35.315 ft ³
30 billion m ³ (CM)	1.06 tcf
\$100/'000 m ³	\$2.83/'000 cf
M	1,000
MM	1 million = 1,000,000
\$100/MCM	\$2.83/MCF ~ \$2.83/MMBtu
1 MMBtu	1.06 GJ, 293 kWh, 252,000 kcal
Afg 1/m ³	\$0.58/MCF at \$1 = Afg 49

Natural gas composition

Methane	Dominant component, gas at room temperature
Ethane	Gas at room temperature
Propane	LPG component
Butanes	LPG component
Water	Should be removed
Nitrogen	
CO ₂	Should be removed
H ₂ S	Should be removed

Energy content

- Basic rule of thumb: 1,000 ft³ or 1 MCF = 1 MMBtu
- Energy content of treated gas \neq energy content of produced gas
- Need to know gas composition

Energy content

Higher heating value
(HHV) in MMBtu/MCF

Methane

1.0

Ethane

1.7

Propane

2.5

Butanes

3.2

Example of energy content

Produced gas

N ₂	1.8%
CO ₂	4.5%
H ₂ S	2.7%
Methane	88%
Ethane	2.0%
Propane	1.0%

0.94 MMBtu/MCF

Treated gas

N ₂	1.9%
Methane	94.8%
Ethane	2.2%
Propane	1.1%

1.0 MMBtu/MCF

But 1080 cf of produced gas is needed for 1000 cf of treated gas

Efficiency

- **Productive efficiency**: products or services of a given standard are produced at lowest cost. Can be promoted through competition, third-party access, and price regulation.
- **Allocative efficiency**: prices reflect underlying economic costs so that gas is allocated to its highest value use
- **Dynamic efficiency**: innovation and improvement introduced as improved technologies become available.

Efficient pricing policy

- Separate pricing of production, transmission (T), distribution (D), and retail
- Prices to reflect and enable recovery of prudently incurred costs (next slide)
- Policy ensures quality of service (reliable supply and quality)
- Built-in incentives for efficiency improvement
- **Simple and easy to administer**

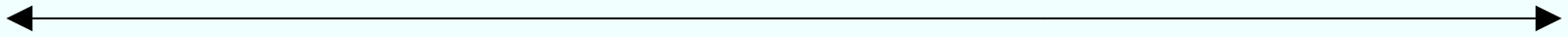
Concepts related to efficiency

- Prudently incurred costs
 - No gold-plating (spend more than necessary to meet the target standards)
 - No over-investment (example: over-size pipeline in the absence of clear demand)
- Economic purchase obligation
 - Bargain for better prices, seek alternative lower cost suppliers, not take excessive risk in price hedging strategy
- Regulatory asset
 - Asset recognized for regulatory purposes and excludes costs that are not “prudently incurred”

End-user price

Lower bound

Upper bound



Total unit cost:
Cost of production
+ gas treatment +
transmission +
distribution +
future expansion + depletion premium

Prices of
substituting
fuels

Ceilings on gas price

- Alternatives for consumers
 - Power sector: Electricity generation from hydro, coal, heavy fuel oil, diesel
 - Energy from coal, heating oil, electricity, LPG, kerosene, purchased wood
- Not fuel price alone
 - Lower working capital because no need for storage
 - Higher efficiency
 - No impurities
 - No expensive pollution control devices

Ceilings on gas price

- Alternatives for consumers
 - Example: Coal at \$15/ton is cheaper than gas at \$1.50/MMBtu, but coal power plants are more expensive & less efficient, potentially making electricity generated from coal more expensive than that from gas
 - If alternatives are cheaper and their supply is unconstrained, then gas may not be purchased

Examples

- LPG

\$300/ton \Rightarrow \$6.4/MMBtu, \$650 \Rightarrow \$13.8/MMBtu

- Diesel

Afg 10/liter \Rightarrow \$ 4.1/MMBtu,

Afg 25/liter \Rightarrow \$10.2/MMBtu

- Fuel oil

\$15/bbl \Rightarrow \$2.4/MMBtu, \$25 \Rightarrow \$4.0/MMBtu

- Electricity

2.3 US ¢/kWh \Rightarrow \$ 6.7/MMBtu,

5 ¢/kWh \Rightarrow \$14.6/MMBtu

Ceilings on gas price

- Competitiveness of end-products
 - Even if there are no cheaper alternatives, if the prices of end products manufactured using gas are not competitive, the manufacturing will not take place in a competitive market

Consider power imports

- Electricity at 2.3 US ¢/kWh
- Combined cycle power plant, 50% efficiency

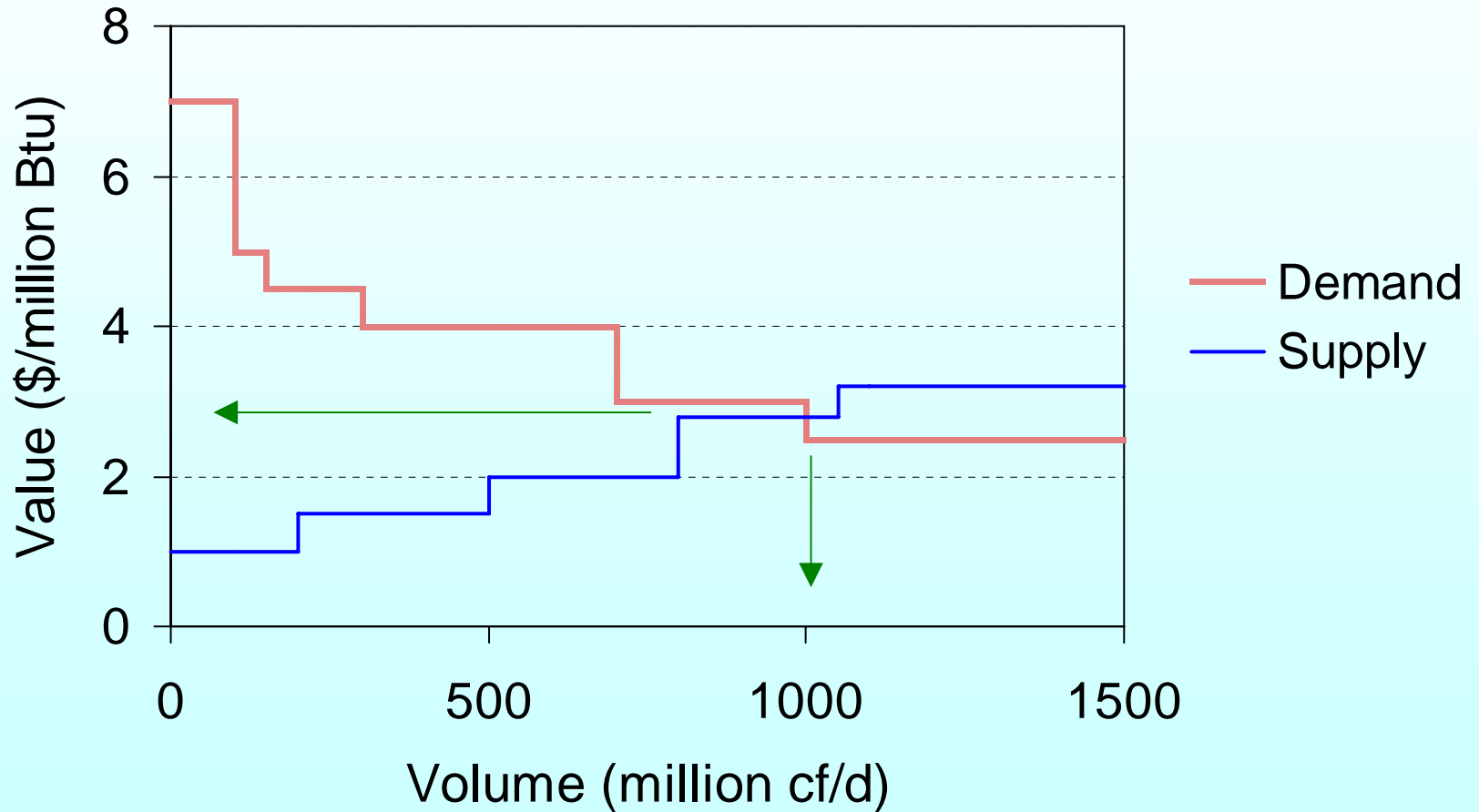
Plant capital Gas price at plant gate to
match 2.3 ¢/kWh

\$/kW	US\$/MMBtu	Afg/m ³
600	1.5	2.1
800	1.0	1.4
1000	0.5	0.7

Market-based gas prices

- Demand curve: what different categories of consumers are prepared to pay after taking into account alternative fuels and their life-cycle costs
- Supply curve: what suppliers are prepared to sell gas for in an efficient regime (prudently incurred costs, realistic assessment of market demand, etc.)
- Intersection of demand and supply curves

Economic price of gas



Regulating prices

- Two most commonly used mechanisms are RoR (rate of return) and price caps
- RoR allows a predetermined rate of return on capital (Pakistan, US in the past)
- Price cap, or “incentive based”, regulation sets a ceiling on price movements for a set period and allows the firm to determine its own prices within limits (Argentina, Australia, US, UK)

Rate of return

- Based on regulatory asset, capital base that is used for calculating RoR
- Firm sets prices to achieve regulated RoR
- Main benefit: promotes investment
- Main disadvantage: once RoR is set, little incentive to improve efficiency

Price caps

- Usually based on RPI–X or RPI–X–K
RPI = retail price index
X = efficiency improvement factor
K = planned capital expenditure factor
- Annual revenue allowance or maximum prices are set
- Periodic review, 3 to 5 years
- Firm is allowed to keep any additional profits arising from efficiency gains that exceed those assumed
- Consumer share in benefits of efficiency gains
- K factor (example: Argentina) allows for investment, including steps taken to improve system efficiency, safety or reliability and expansion

Direct pricing in downstream gas

- Both require considerable resource commitment by regulator and can impose high compliance costs on regulated business
- If small market, cost and complexity of direct price regulation may not outweigh benefits
- Useful to set up regulatory (as opposed to financial) accounts in all cases

Upstream gas

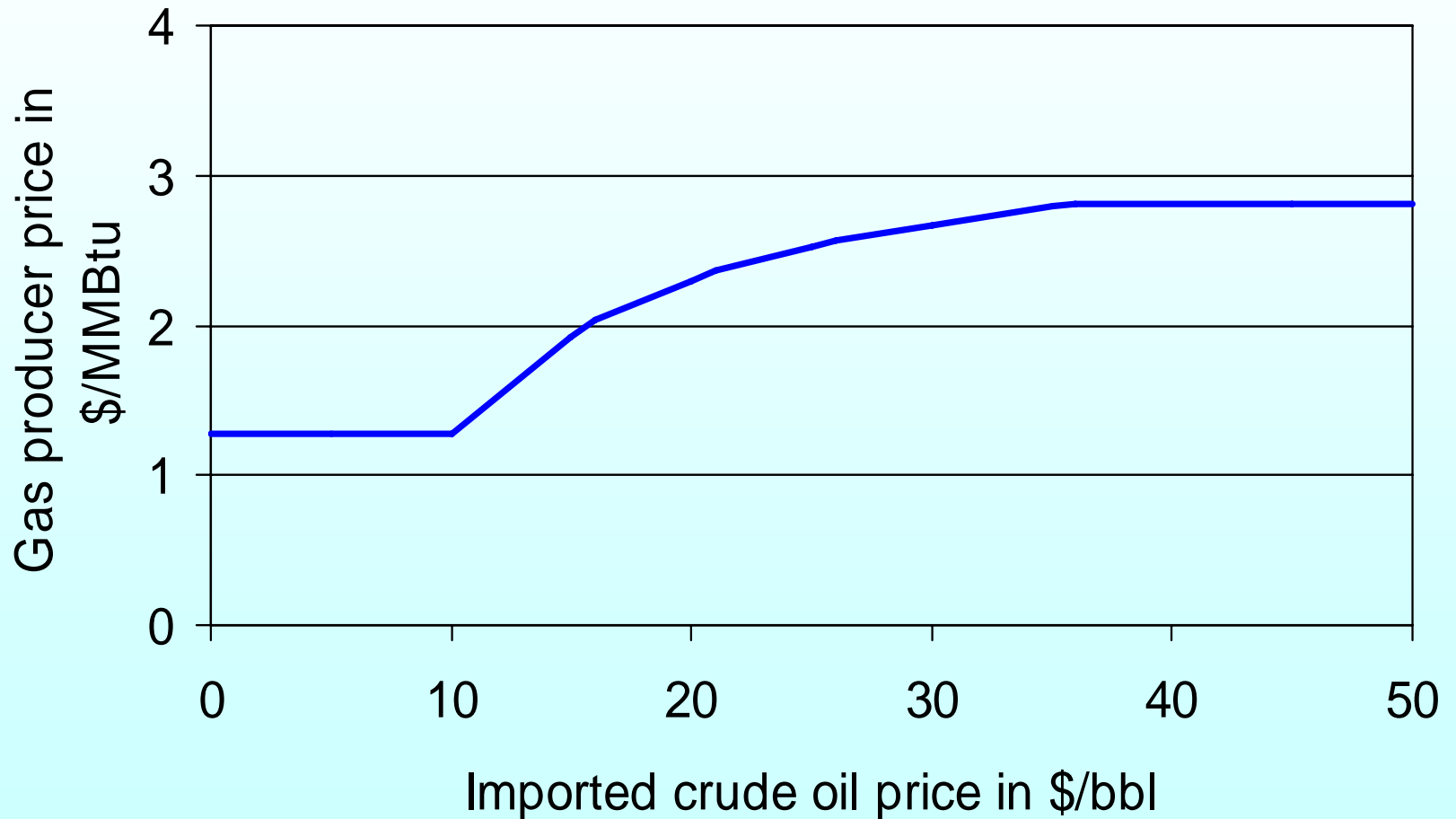
- No need for direct regulation
- Some governments set pricing formulas to attract investors (Pakistan, Egypt)

Wellhead gas pricing: example from Pakistan

- Gas is substituting fuel oil (mainly power generation)
- Gas price based on fuel oil, which is in turn based on imported crude oil price
- Formula: Take 65.5%, 72.5%, or 77.5% of “effective oil price” depending on gas field profitability

Price band (\$/bbl)	Effective oil price (\$/bbl)
< 10	10, floor price
10–16	same as oil price
16.01–21	$16 + 0.5 \times (\text{oil price} - 15)$
21.01–26	$16 + 0.5 \times (21 - 16) + 0.3 \times (\text{oil price} - 21)$
26.01–36	$16 + 0.5 \times (21 - 16) + 0.3 \times (26 - 21) + 0.2 \times (\text{oil price} - 26)$
>36	22, ceiling price

Gas prices paid to producers in Pakistan



Note: Taking 72.5% of the effective oil price

T&D tariff issues

- Tariffs or their principles require government approval
- Types of tariffs
 - Distance-related
 - Postal stamp (same for all)
 - Zoning
 - Affected by entry and exit points (for a complex network)

Obstacles to investment

- No history of proper payments at prices that enable cost-recovery
- Future demand uncertain and possibly low
 - Analysis of gas market in the north
- Doubts about creditworthiness of major consumers
- Exchange rate volatility
 - Argentina in 2002

Different approaches

- Long-term contracts with take or pay
- Penalties for non-delivery
- All tariffs determined in US\$ and converted to local currency when customer is billed

Issues

- Should wellhead prices be left to negotiation or should pricing formulas be set?
- What is the optimal balance between proper economic regulation based on international industry practice and keeping administrative burden to a reasonable level?
- If gas shortage, how should gas be allocated among competing consumers?
- Who are likely creditworthy large consumers?
- How can service be expanded to small consumers?
- How can T&D be best developed?

Immediate issues

- Address inadequate current revenue
 - How much should prices be adjusted upward and on what basis?
 - How can non-payments be addressed?
- Identify one or more creditworthy large-volume consumers with predictable demand
 - Basis of increased gas production
- Incrementally expand supply to other consumers in the north
 - Metering, billing, bill collection