The background features several thick, wavy green lines that curve across the slide, creating a dynamic and modern aesthetic. The lines vary in shade from light to dark green and are layered to create a sense of depth and movement.

presentation on
dynamics of city gas distribution
PetroFed, New Delhi

Presentation covers

- ✓ gas consumption pattern
- ✓ GOI policy on CGD networks
- ✓ pipeline infrastructure & tariff impact on CGD networks
- ✓ key regulations for CGD networks
- ✓ typical CGD network
 - demand
 - investment profile
 - netback pricing & strategies
- ✓ impact of bidding processes
- ✓ regulatory compliance

gas consumption pattern

gas consumption - India *late but sure footed* on gas...

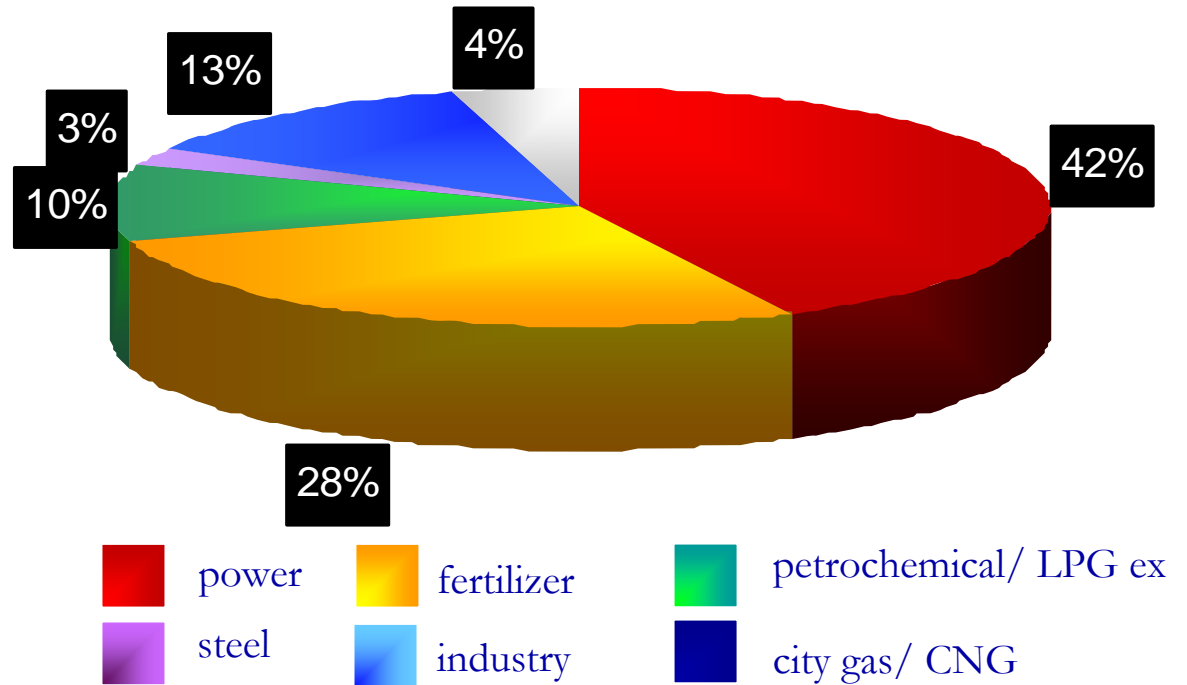
| | MMSCMD | | |
|---|-----------|-----------|-----------|
| sector | 2009-2010 | 2010-2011 | 2011-2012 |
| Power | 100 | 112 | 125 |
| Fertilizer | 52 | 79 | 79 |
| city gas | 14 | 15 | 16 |
| Industrial | 17 | 18 | 20 |
| petrochemicals/ refineries/ others/ internal consumption | 29 | 31 | 33 |
| sponge iron/ steel | 7 | 7 | 8 |
| total | 219 | 263 | 281 |

latest outlook as per eleventh plan document

current gas consumption patterns...

power & fertilizer prime consumers of gas (70%)

captive & industrial consumption at 30%



GOI policy on CGD networks

GOI policy on CGD networks...

GOI policy on natural gas pipelines & CGD networks of 2006 & gas allocation mechanism in vogue as of date implies-

- ✓ limited period marketing exclusivity for CGD networks
- ✓ non-extension of infrastructure status benefits to CGD networks
- ✓ restrictive segment-wise gas allocation for CGD networks
- ✓ gas to be sourced by CGD entities on commercial terms

current gas allocation mechanism...

- ✓ Gas for CGD networks - *low in overall pecking order*
- ✓ allocation - *restricted to domestic PNG & CNG segments*
 - volume ramp-up for CNG - dependent on govt. policy on *mandation*
 - aggregate domestic PNG volume - *extremely low*
 - industrial & commercial volumes mainstay of viability of CGD project to ensure cross subsidization - *no allocation*
 - CGD project requires sustained capex in low volume low margin business segments in initial stages to reap in returns typically after 5 years – *debt servicing* a challenge in absence of allocation for crucial high volume segments
 - affordable price of gas at city gate – an issue as end-pricing guided by *alternative fuel prices & VAT considerations*
- ✓ maybe extension of *uniform gas pricing policy under making* to CGD networks as well - a possible solution
- ✓ availability of GoI's *share of "profit gas"* in kind through small bidding lots exclusively for CGD entities – another possible option

Case for infrastructure status for CGD networks...

- ✓ due to limited marketing exclusivity extended to CGD networks, such infrastructure cannot be construed as public utilities & therefore can not upfront qualify for infrastructure status benefits
- ✓ GoI could still consider allowing extension of infrastructure status benefits as-
 - CGD network does require *designing of capacity over-build* over economic life of project (at least 25 years if not more) & investments are required on perpetual basis
 - marketing exclusivity restricted to initial 5 years period & thereafter infrastructure going to be *available on common carrier basis*, same way as envisaged for natural gas pipelines
 - heavy investments are required in CGD infrastructure for promoting switchover to domestic PNG and CNG & thus *promoting use of clean energy*
 - any benefit of infrastructure status helps in *reducing tariffs* & consumer only benefits in long-run as post-marketing exclusivity many shippers would use same network of pipelines to reach consumers at most competitive cost

Alternatively accelerated depreciation benefits being envisaged under DTC effective FY 2011-12 could be looked at for CGD Networks

impact of pipeline infrastructure

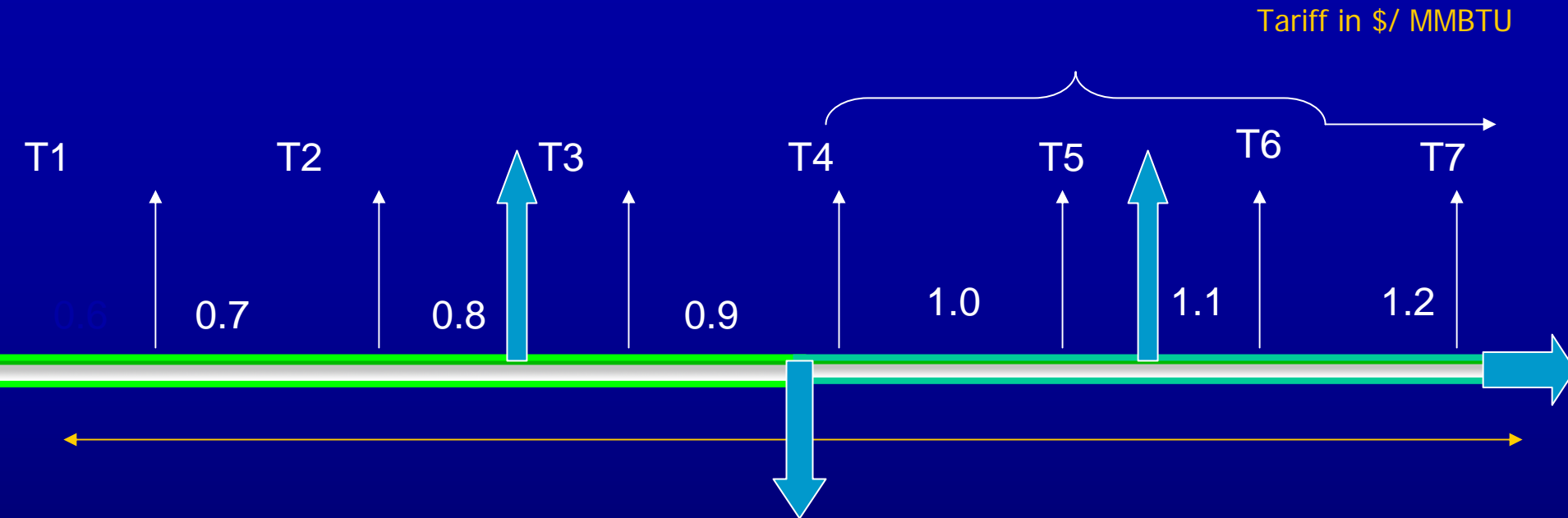
&

pipeline tariffs on CGD networks

pipeline infrastructure... existing & proposed



pipeline operations & tariff structure impacts CGD economics...



- ✓ tariff zones of 300 Kms length & 50 Kms width (on either side) & tariff uniform for all customers in each zone
- ✓ tariff for each successive zone higher or equal to preceding zones & *both ways (?)*
- ✓ capacity booked with variations resulting in imbalances & charges on daily basis
- ✓ imbalance clearance in a fortnight else transporter to clear
- ✓ over run costs- authorized & unauthorized
- ✓ access code governs pipeline & shipper behaviour

key regulations for CGD networks

downstream regulatory framework... well defined

Petroleum & Natural Gas Regulatory Board (PNGRB) set-up on October 1, 2007 under PNGRB Act, 2006 to:

- ✓ regulate refining, processing, storage, transportation, distribution, marketing & sale of petroleum, petroleum products & natural gas *excluding production of crude oil & natural gas*
- ✓ protect interests of consumers & entities engaged in specified activities relating to petroleum, petroleum products & natural gas
- ✓ ensure uninterrupted & adequate supply of petroleum, petroleum products & natural gas in all parts of country
- ✓ promote competitive markets

Act, *inter alia*, provides for legal framework for downstream oil & gas sector regulation & development of

- ✓ common carrier petroleum/natural gas pipelines &
- ✓ CGD networks

what is city gas distribution?

An integrated network of steel, PE/ MDPE pipelines including city gate, CNG stations & related infrastructure for supply of natural gas in identified geographical area (*) over economic life of project (25 years) to -

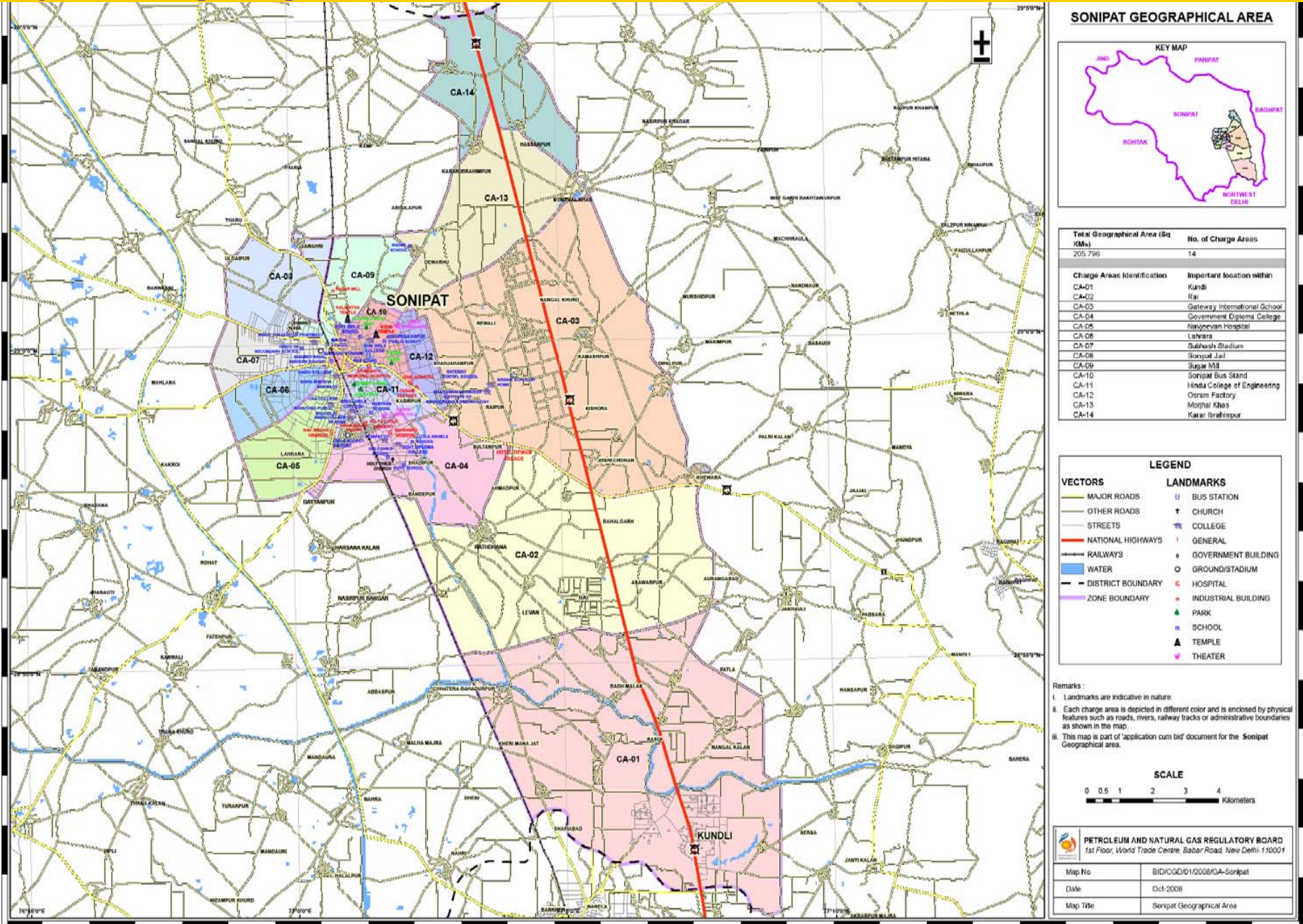
- ✓ automobiles as CNG &
- ✓ residential customers, industrial & commercial segments with volume requirement of < 50,000 SCMD as "piped gas"

(*) geographical area shall be decided by PNGRB based on principle of contiguity (economics by geography) through open seasons process

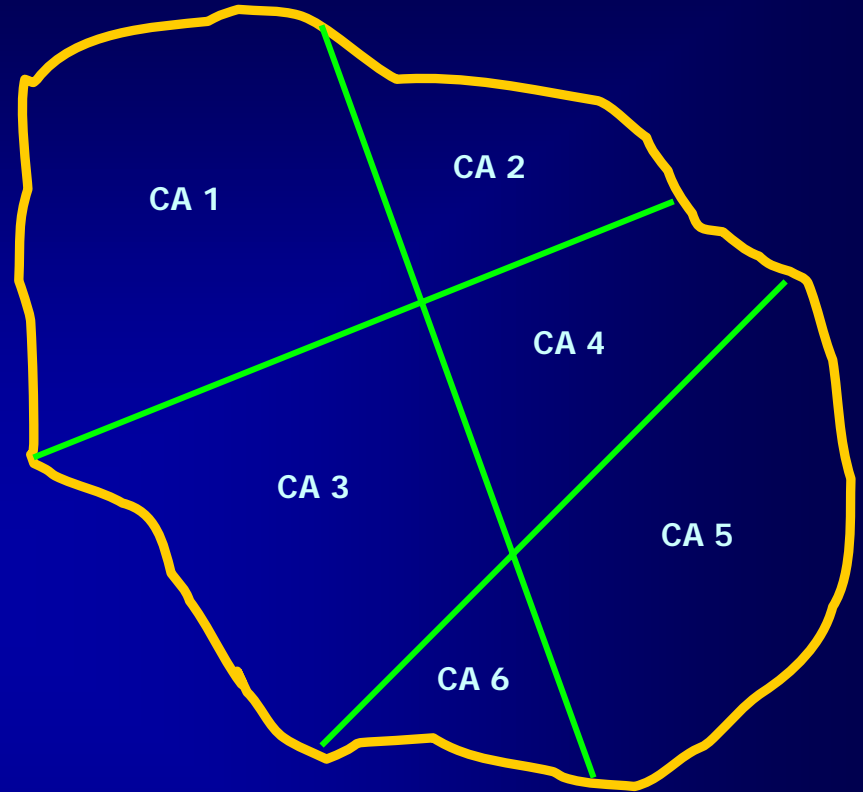
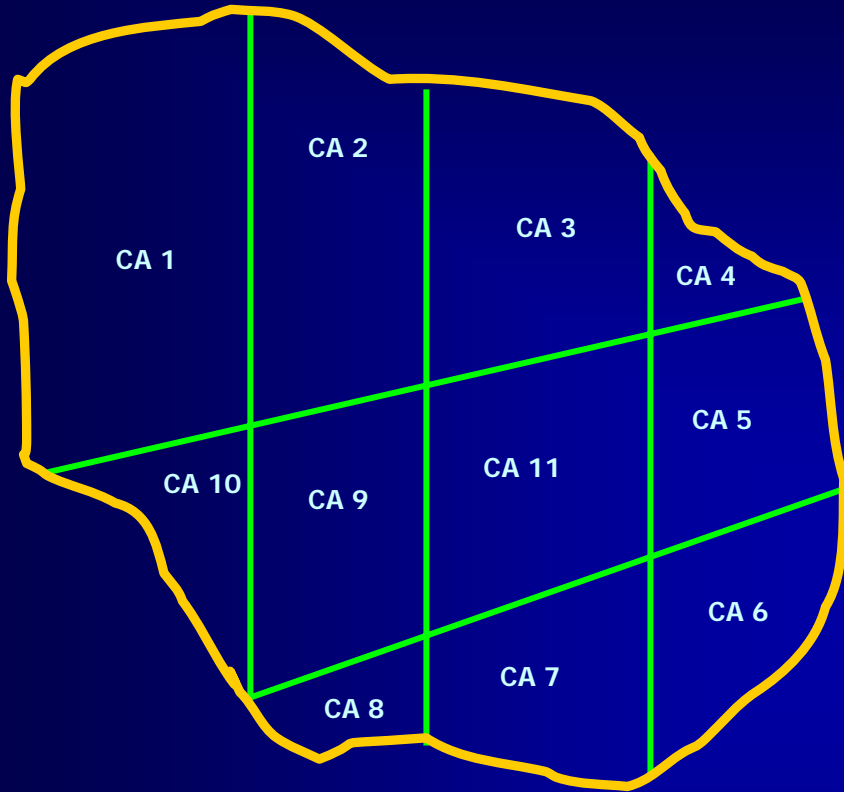
CGD network (#) is further divided into charge areas, where each charge area is a convenient *sub-set network of pipelines to reach all individual customers*

(#) concept similar to Local Development Zone (LDZ) in developed economies

typical geographical area of a proposed CGD network



geographical area demarcation...regulatory challenge



✓ *objectivity* in earmarking geographical area & carving of charge areas would decide

- quickness in infrastructure built-up
- ability to service customers
- investment levels

- service obligations
- competition post-exclusivity

would eventually guide *viability of CGD network, corresponding bidding interest as well as protection of consumer interest...*

regulations for CGD network - likely impact...

regulated activities

- ✓ tariff for common carrier (CC) gas pipelines
- ✓ tariff for CGD network
- ✓ online compression charge for CNG
- ✓ access to:
 - CC natural gas pipelines from day 1
 - CGD network post-exclusivity (5 years)
- ✓ service obligations

non-regulated activities

- ✓ dispensing of CNG
- ✓ selling prices

- ✓ entities expected to be aggressive in each round of bidding during next few years, consolidate in medium-term before CGD market becomes competitive
- ✓ affiliate code of conduct to regulate "*affiliate behaviour*" in short-term
- ✓ transmission & distribution activities to get "*unbundled*" in medium term
- ✓ producer-driven market likely to become shipper driven in medium-term

credible joint consortiums expected to quickly occupy geographical areas contiguous to existing & proposed pipelines

bidding criteria...simple

Two-part bidding process: technical & financial bidding

technical Criteria: entity on its own or through a JV is

- 1) technically capable of *laying & building* CGD network:
 - a) has laid or intends to lay through technically competent firms either hydrocarbon pipeline of 300 Km length or CGD network; or
 - b) has a credible plan to lay CGD network & technically qualified manpower

- 2) technically capable of *operating & maintaining* CGD network:
 - a) has experience of > one year in O&M of CGD network; or
 - b) intends to operate & maintain CGD network on its own or through appropriate technical assistance agreement; or
 - c) has adequate technically qualified manpower

bidding criteria...contd.

technical criteria

- 3) entity has adequate combined net worth (linked to population of CGD network ranging from Rs.5 crore for population < 1 Lakh & Rs.150 crore for population > 50 Lakh) for a single CGD network
- 4) entity undertakes to become company on grant of authorization
- 5) credible plan to source natural gas for CGD network
- 6) agrees to furnish bid bond in form of bank guarantee (ranging from Rs.50 Lakh to Rs.5 crore based on population): to be retained till submission of performance bond after grant of authorization

technical
criteria:
*important
hurdle to be
crossed*

exclusivity period...

physical exclusivity

- ✓ physical exclusivity of 25 years is allowed to entity to lay, build, operate or expand CGD network
 - no other entity can lay physical network during such period in geographical area
 - authorized entity to necessarily provide adequate infrastructure to meet demand
- ✓ marketing exclusivity provided for integrated development of CGD network
- ✓ incentive for authorized entity to quickly develop market
- ✓ competition post-exclusivity

marketing exclusivity

- ✓ exemption from purview of common carriage or contract carriage in initial 5 years post-authorization
 - no other entity can market in GA
 - post-exclusivity, authorized entity must provide network on common carrier or contract carrier basis on payment of network charge & online compression charge for CNG

financial bidding criteria...

| financial bid criteria | weights | |
|---|---------|---|
| 1) lowness of PV of network tariff <i>over economic life of 25 years</i> | 40% | network tariff is tariff attributed to pipelines in CGD network (including up to Last Mile Connectivity: riser to burner tip of PNG domestic household) |
| 2) lowness of PV of online compression charge for CNG <i>over economic life of 25 years</i> | 10% | online compression charge attributed to charge for compression of CNG & recoverable in addition to network tariff from CNG consumers only |
| 3) highness of PV of inch-kilometer of steel pipelines in CGD network <i>during period of exclusivity</i> | 20% | inch-Kilometer implies sigma of product of outer diameter of steel pipelines over their respective distances in CGD network & is required upfront (before end of exclusivity) |
| 4) highness of PV of PNG domestic connections to be bid <i>during period of exclusivity</i> | 30% | PNG domestic connections bid each year of exclusivity period. Post-exclusivity PNG domestic connections on demand |

PV : present value at 14% discount rate

performance bond & service obligations...

performance Bond-

- ❑ proviso to ensure during construction & operation phase
 - ✓ bind entity to bid parameters post-authorization
 - ✓ adherence to technical & safety standards/ specifications
 - ✓ compliance with terms & conditions & service obligations
- ❑ encashable & provision for top-up within 15 days of part or full encashment
- ❑ perpetual violations may lead to cancellation of authorization

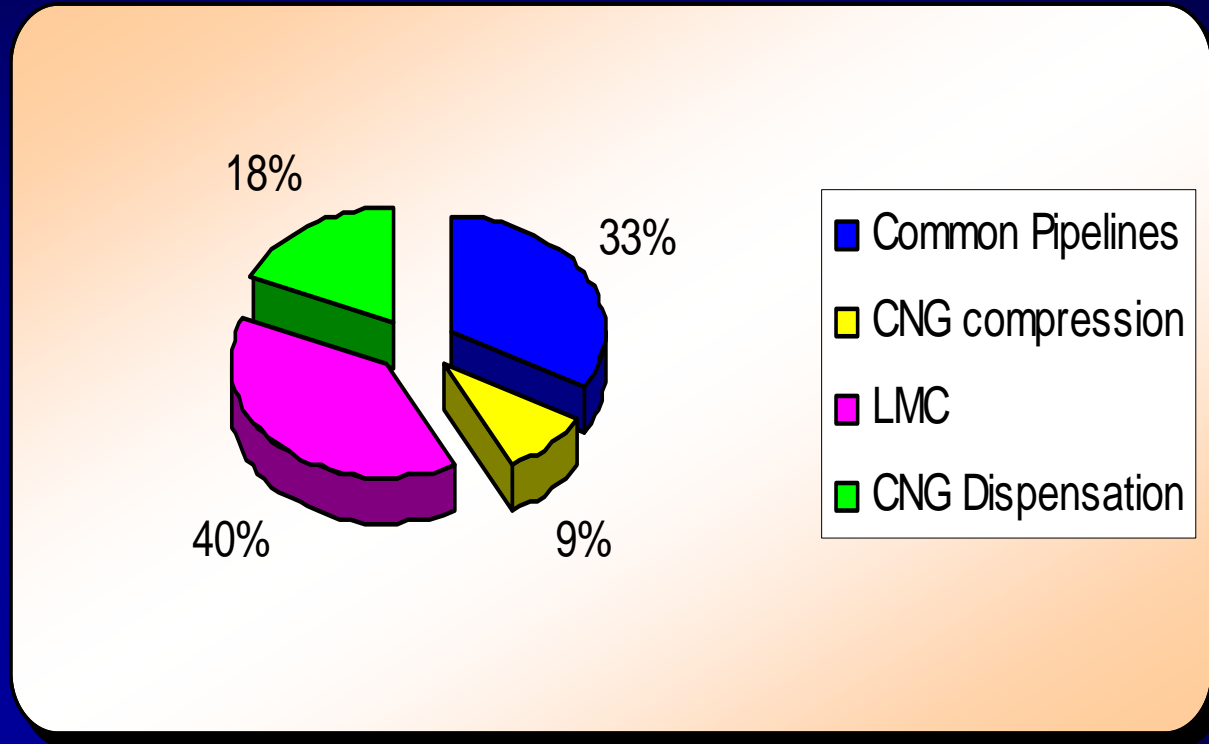
service obligations-

- ❑ number of connections bid becomes obligation
- ❑ no revision in network tariff & compression charge for CNG allowed during economic life
- ❑ infrastructure to be adequate to meet demand
- ❑ adhere to quality of service standards
- ❑ commission project within agreed time schedule
- ❑ comply with affiliate code of conduct & ensure accounting segregation

typical CGD network

investment in typical CGD network...

| medium CGD Network | |
|--------------------|---------|
| Rs. Crore | |
| common pipelines | 60 |
| CNG compression | 17-20 |
| LMC | 70-80 |
| CNG dispensation | 33-40 |
| total | 180-200 |



- ✓ higher sized CGD network capex – Rs.300+ crore
- ✓ typically 70 to 75% of investment shall be during exclusivity period
- ✓ greater area of CGD network generally implies higher investments in LMC & CNG dispensation
- ✓ typical debt-equity structure is 70:30 with overall PIRR of 20% plus
- ✓ yet... due diligence of project risks & competition is must

typical demand profile in small CGD network...

| segment/ year | demand mix | | | | | driving factors |
|-------------------|------------|------------|------------|------------|------------|--|
| | 3 | 4 | 5 | 6 | 7 | |
| Domestic | 7% | 10% | 11% | 9% | 8% | vertical versus horizontal spread, density/ sq. km & willingness to pay upfront deposit of Rs.5,000 |
| Commercial | 5% | 5% | 5% | 5% | 5% | Hotels, mess, canteen & restaurants |
| Industrial | 74% | 62% | 57% | 56% | 55% | as replacement of FO, LDO & HSD |
| Transport | 14% | 22% | 27% | 29% | 32% | mandatory conversion to clean fuels, CNG kit costs, bus population & traffic pattern |
| MMSCMD | 0.10 | 0.13 | 0.17 | 0.21 | 0.23 | <input type="checkbox"/> demand typically takes 5 to 6 years to double & stabilizes thereafter <input type="checkbox"/> regulations require gas tie-up of at least 50% each year's estimated demand during exclusivity period |
| Y-to-Y growth | | 33% | 34% | 23% | 14% | |

- ✓ rapid industrialization & growth due to gas availability to SMEs' & distributed power solutions (gas-based micro CHP) further boosts demand
- ✓ highly dependent on industrial PNG off- take in initial years
- ✓ CNG segment grows fast
- ✓ balanced sales mix 55%:45% in 7th year or so

gas & product pricing strategies...

in nascent stages of development of CGD Networks, product pricing strategies expected to be guided by netback pricing

✓ given gas price at city gate

✓ price of alternative fuels

✓ reasonable return on investments

✓ marketing margin

R-LNG at current levels unviable in long-run

skewed petroleum product pricing reaps-in better gas product prices, till VAT loss is sought to be re-cooped

function of hurdle PIRR rate, post-exclusivity commitments

ability to source gas on competitive terms- post marketing exclusivity, affiliate code of conduct provisions coupled with unbundling would effect bundled price advantage

internal price pooling - to subsidies & cross-subsidies end-product prices possible way-out

✓ commercial demand least + low investments + highest margins

✓ domestic demand low + huge capex + low/negative margins

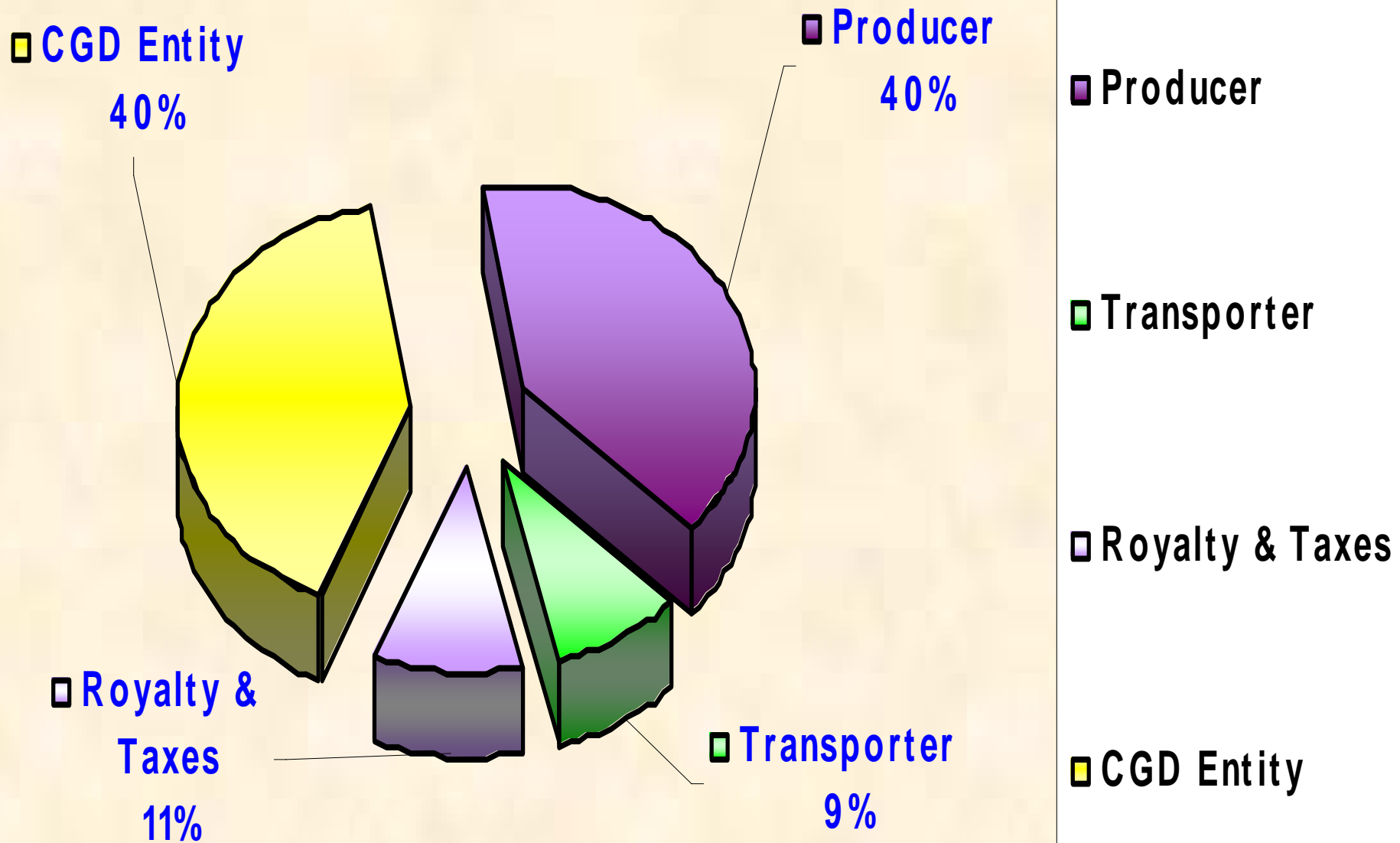
✓ Industrial demand high + low capex + high margins

✓ CNG demand dependent on mandation + high capex + moderate margins

typical netbacks in gas value chain: *wellhead to burner tip...*

| | \$/ MMBTU | Rs./ SCM | Sales mix |
|---|-----------|----------|-----------|
| Netback for producer | 4.33 | 7.40 | |
| Royalty | 0.43 | 0.74 | |
| Wellhead price | 4.76 | 8.14 | |
| Transmission cost (Transporter's Netback) | 1.00 | 1.71 | |
| VAT | 0.72 | 1.23 | |
| Price at city gate | 6.48 | 11.09 | |
| CGD Network tariff | | 4.00 | |
| Online compression charge for CNG | | 3.00 | |
| Weighted Average Netback for CGD entity (at 90% of current RSP) | | 7.61 | |
| PNG domestic | | 0.38 | 5% |
| PNG Commercial | | 11.86 | 10% |
| PNG industrial | | 3.55 | 55% |
| CNG | | 14.84 | 30% |
| RSP of Alternative products | | | |
| LPG domestic | | 17.18 | |
| LPG commercial | | 29.94 | |
| FO | | 20.71 | |
| Diesel | | 36.59 | |
| Assuming domestic gas supply in a medium sized CGD network | | | |

typical netbacks in gas value chain: *wellhead to burner tip...*



impact of bidding processes

impacts of bidding processes...

If it is important to win a bid...

yet *more important* is to-

- ✓ meet bid commitments
- ✓ comply with service obligations
- ✓ invest in network development in perpetuity
- ✓ earn reasonable ROI over economic life of project considering
 - perpetual obligation to invest in network development
 - loss of market share (say ~50%) post marketing exclusivity to competition
 - absorb price shocks (gas price volatility & VAT shocks)
 - long-term commitments

regulatory compliance mechanisms

regulatory compliance mechanisms...

Bidding stage

- ✓ bid should be ethical-compare actual bid parameters with that in DFR & internal benchmarks
- ✓ unviable/ irrational/ connivance in bid –
 - bid/ bid process liable to be rejected
 - entity may be black-listed & debarred from future biddings

Pre-commissioning stage

- ✓ periodic data filing & comparisons by third party accredited agencies of actual progress against physical milestones bid
- ✓ stiff penalties leading to encashment of performance bond – may lead to cancellation of authorization
- ✓ L-2 & other bidders - a natural check mechanism

Post-commissioning stage

- ✓ data filing & analysis as before..
- ✓ network availability on common carrier basis - pressure to retain market share
- ✓ affiliate code of conduct & unbundling provisions to ensure competition
- ✓ LMC on demand to ensure network penetration & commitments to invest
- ✓ provisions for loss of physical exclusivity a barrier to unethical bidding

bidding rounds along existing/ proposed pipeline routes...

first round

Kota
Sonapat
Meerut
Kakinada
Mathura
Dewas

second round

Shahdol
Chandigarh
Ghaziabad
Rajahmundry
Yanam
Varanasi

third round might include

Bhavnagar
Dahej
Jamnagar
Nashik
Aurangabad
Sholapur
Jabalpur
Jullunder
Ludhiana
Maybe suo-motu...
Ambala
Panipat
Karnal

successive bidding rounds expected to cover many cities in next 2-3 years - *important to have convergence between technical & commercial issues with regulatory compliance to ensure seamless gas mapping of India...*

thanks

views expressed in personal capacity & may not necessarily be that of BPCL

comments are welcome: duggalvj@gmail.com / duggalv@bharatpetroleum.in