CNG: Environmentalism vs Economics

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Introduction

Pollution has definitely been a curse on contemporary society and is a hot topic of debate at all levels. In the last decade, the importance of environment conservation has assumed great significance. People and institutions alike have been battling it out for a "cleaner, greener, world." Even in Delhi, the world's third most polluted city, the last couple of years have witnessed a greater devotion and awakening towards the protection of the environment. The strict application of the Euro norms and the drive for switchover to Compressed Natural Gas (CNG) as an alternative fuel are some of the examples of the endeavours made by the denizens of the capital towards creating a greater eco-friendly environment.

Pollution due to petroleum products used in transportation is an ever-increasing problem for Delhi and other metros. Pollution due to transportation can be divided into two main categories: air pollution and noise pollution. Some environmentalists also quote odour pollution as the third and major component.

Technical experts have suggested the use of CNG as an alternative fuel for automobiles. They have estimated that apart from being less hazardous, it is also environment friendly, can help in reducing the levels of pollutant emissions and is quite cost effective. But there are others who argue that mandating a single fuel over the consumers is anything but the solution. Besides, they say, there are other fuel options that are as good in terms of emissions and ecology and better in terms of feasibility and economics. One such fuel is Ultra Low Sulphur Diesel (ULSD). While some tests have shown that ULSD, when used with complementing engines, gives lesser emissions than CNG, others have shown just the opposite. The conclusion is that both are comparable fuels in terms of "emission merit."

Structure

This paper first takes a look at the ongoing debate and confusion in Delhi over CNG and looks at the health hazards caused by vehicular pollution in order to emphasise the importance of having a clean mass transport system. Then it impartially analyses the debate between CNG and ULSD to see if there is a clear winner and lists the chronology of the events that took place in Delhi. It also looks into the role and contribution of the Bhure Lal committee, analyses the popular choice and collective wisdom and committee's recommendations. Then there is the case study on natural gas consumers in Delhi and the paper ends with an analysis of the economics of mass conversion.

Hazards of Vehicular Pollution

It is important to understand what exactly happens when a gargantuan truck blows massive clouds of smoke into your car or when you feel suffocated by exhaust from other vehicles while traveling on a two wheeler. All these exhausts contain dangerous chemicals that can cause permanent and possibly life-threatening damage to your health.

Critical Pollutants and Health Effects

Auto exhaust contains the following pollutants:

- Sulphur Dioxide (SO_2)
- Nitrogen Dioxide (NOx)
- Carbon Monoxide (CO)
- Particulates—Diesel particulates and Sulphur particulates

- Polycyclic Aromatic Hydrocarbons (PAH)
- Volatile Organic Compounds like Benzene

Sulphur Dioxide: During combustion the sulphur combines with oxygen to form sulphur dioxide gas and fine particles, which are emitted into the atmosphere with other products of combustion. Exposure to sulphur dioxide causes mucosal edema of airways, reducing the mucociliary activity leading to increased cough, lower respiratory tract infection (LRTI) and bronchitis.

Nitrogen Dioxide: Nitrogen dioxide, the most toxic oxide of nitrogen is a deep lung irritant that damages the delicate cells of the lining of the lungs.

Carbon Monoxide: The symptoms of CO pollution are headache, dizziness, drowsiness and nausea. The body systems most affected are the ones most dependant on a steady supply of oxygen: the brain, the heart, and in women, the developing foetus.

Particulates: The health effects of particulate pollution include an aggravation of bronchitis with preexisting respiratory illness, small but significant change in lung tissue. Long-term exposure causes damage to lung tissue, which contributes to chronic respiratory disease, cancer, and premature illness and death.

Respirable Suspended Particulate Matter RSPM/PM_{10}: Annual average concentrations of RSPM ranges between 39% to 52% of the annual average concentrations of SPM. Annual average concentrations exceeded the NAAQS (National Ambient Air Quality Standards) (annual average 60 $\mu g/m^3$) during 1998, 1999 and 2000. Percentage violation of NAAQS (24-hourly average) was more than 80% in 1999 and 2000.

Benzene: Long-term exposure to benzene in air causes leukemia in human beings. Exposure to benzene is linked to genetic changes, increased proliferation of bone marrow cells and occurrence of certain chromosomal aberrations in humans and animals. The International Agency for Research on Cancer (IARC) has listed benzene as carcinogenic to humans. A number of noncancer health effects are associated with benzene exposure such as disorders of blood, harmful effects on bone marrow, anaemia and reduced abilities of blood to clot, damage to immune system and as a reproductive and development toxicant.[1]

Background

In Delhi, there has been a large debate over the comparative merits of ULSD and CNG: the reason being, there has been a misunderstanding as to what exactly is ULSD. Diesel that has 50 parts per million (ppm) sulphur content alone can be called ULSD. All the misunderstanding was caused by the Ministry of Petroleum and Natural Gas (MOPNG) officials going on press referring to diesel with 500 ppm sulphur as ULSD. The officials were in trouble as they were not in a position to meet the deadline set by Supreme Court. As a result, the impression they gave to the public was that of a conspiracy according to which the 500 ppm diesel, that is currently available in Delhi was being proclaimed as a clean fuel. The confusion apart, there has been tremendous debate, which was initiated by the investigation of Environment Protection and Control Authority (EPCA) as per the guidelines of the apex court. Also known as the Bhurelal committee by its chairman, the committee was asked to file a report on whether 10 ppm sulphur diesel can be considered clean fuel and what other fuels could be considered clean fuels, which were not harmful to the environment "or otherwise not injurious to public health." The investigation of the committee saw representations by various parties, which were preceded by in depth analysis of the benefits of both the fuels by various scientific research organisations. While some of them concentrated only on the scientific side, some others also analysed the social and politico-economical impacts of such a mandate. For a better understanding of the fuel scenario in Delhi and to understand the background of the

[1] Bhure Lal Committee report

ruling mandating CNG, it would be helpful to take a look at the arguments posed for and against both the fuels.

Summary of Arguments For and Against CNG

There are roughly 15 arguments that exist for and against the advocacy of CNG as a better fuel against other environment-friendly fuels. This is a brief summary of those lengthy debates.

Argument 1: Ultra Low Sulphur Diesel is a clean fuel.

For ULSD: (A)

This argument is based on a London bus tested in Millbrook in 1996/1997 for the London transport buses. This study claims to have found that a Euro II diesel bus, running on Ultra Low Sulphur Diesel (ULSD, sulphur content of 0.005 per cent) and fitted with a continuously regenerating trap (CRT)—to control particulate emissions—achieves lower emissions than CNG buses.

Against ULSD: (A)

After publication this study has come under serious scrutiny by other agencies that have found it flawed in terms of the methodology used. Various experts commenting on the London bus study say that it compares apples with oranges and does not give full details on the condition of the bus that was tested. The International Association for Natural Gas Vehicles (IANGV) has criticised this report on the ground that the difference in particulate matter emissions "most probably originates from excessive oil consumption of the CNG bus used by London transport buses. No detailed information on the condition of the test vehicles is available."

For ULSD: (B)

Another study conducted in 1998, by an Expert Reference Group (ERG) set up in western Australia to recommend the best fuel for buses in Perth, concluded on the basis of a literature survey that ULSD (with 0.005 per cent sulphur) with a CRT is the best option from an environmental point of view. At the same time, the report on the basis of the same London bus study concludes that even diesel with a sulphur content of 500 ppm (0.05 per cent, that is, same quality as the diesel currently available in Delhi) and with an oxidation catalyst is better than CNG when it comes to particulate emissions.

Against ULSD: (B)

Another study done in March 2000, this time under the aegis of the Australian government has trashed the ERG's 1998 study. This new report entitled "Lifecycle Emissions Analysis of Alternative Fuels for Heavy Vehicles" by the Australian government's Council for Scientific and Industrial Research Organisation (CSIRO) clearly states, "We used a risk-weighted scoring system, based on estimates of human health risk to rank the fuels. On a life-cycle basis, the gaseous fuels (LPG and CNG) give the lowest contribution to air pollution on this criterion." Diesel is very low in the list of ten fuels they considered. The report has even questioned the method employed in the earlier 1998 study and says that the only data available for estimating emissions of vehicles using low sulphur diesel is based on only one London transport bus. This report argues that CNG is much cleaner than both low sulphur diesel and ULSD in terms of all pollutants except non-methane volatile organic compounds

Conclusion

There are more studies which show contradicting results and have been quoted depending on the stand taken by the concerned party. What holds promise for diesel vehicles is the application of state-of-the-art CRTs in combination with other catalytic converters and ultra low sulphur diesel with less than 50 ppm sulphur.

Argument 2: Particulate traps work with low sulphur diesel.

For

The Tata Engineering Locomotive Company (TELCO) in its submission to Environment Pollution (Prevention and Control) Authority (EPCA) says, "The equipment manufacturers have stated that their filters can be used up to 350 ppm sulphur diesel. But, filter efficiency will be low at higher sulphur content and will improve substantially as the sulphur level goes down." Some particulate filter manufacturers, Engelhard for instance, claim that their filters can work even on 500 ppm (0.05 per cent) sulphur diesel fuel. Emission test results from USEPA (United States Environmental Protection Agency) show that when a heavy-duty diesel engine fitted with CRT and diesel sulphur level is reduced from 150 ppm to 3 ppm, particulate matter dips by 96 per cent.

Against

For advanced after-treatment systems like CRT to be effective, diesel with minimal sulphur content, if not totally sulphur free, is essential. Moreover, this application is still limited and very expensive. Simple soot or particulate filters are inefficient when used along with high sulphur fuel and that advanced filters like the CRTS do not even work on high sulphur fuel. Information from Hong Kong shows that fitting diesel vehicles with low cost particulate traps has had very little impact. Fitting low cost particulate traps to 66,400 diesel vehicles weighing lower than four tonnes and run on 500 ppm (0.05 per cent) sulphur diesel has cut particulate emissions by only 7.5 per cent. Fitting catalysts into 83,000 diesel vehicles weighing more than four tonnes has lowered particulate emissions by only 13.2 per cent.

Argument 3: CNG vehicles emit more ultra fine particles than diesel.

For

Dinesh Mohan of Indian Institute of Technology, Delhi cites a European study that has revealed that CNG emits finer particles than diesel which have greater propensity to enter the lungs thereby making the CNG option that much more dangerous (*Business Standard*, May 21, 2001). A study done by the US-based Harvard Centre for Risk Analysis contends that CNG vehicles emit more ultra fine particles (also called nanoparticles) than diesel vehicles.

Against

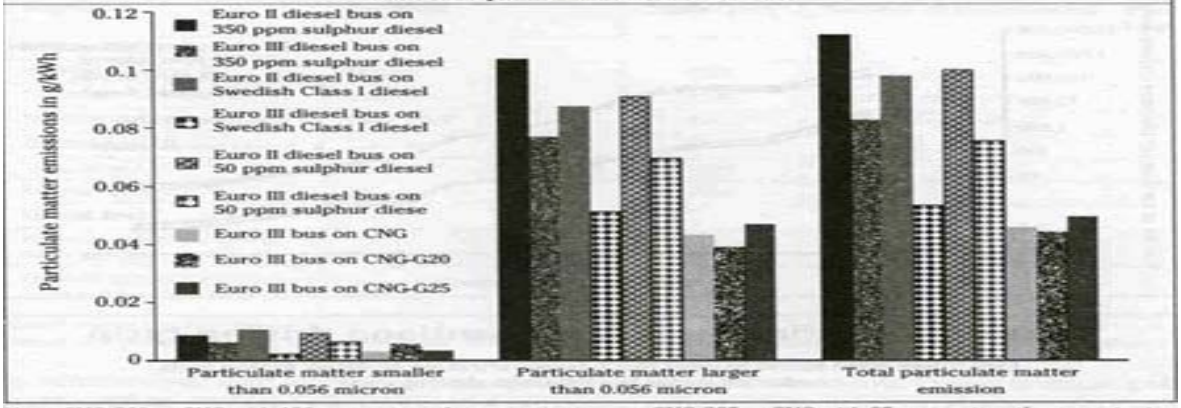
Across the world, scientific studies have established that particulate matter from diesel exhaust is extremely toxic. It comprises tiny particles coated with extremely toxic chemicals called PAH, some of which are known to be the most potent carcinogens. Compared with diesel vehicles, CNG vehicles emit negligible amount of particles.

Conclusion

The graph below shows that CNG buses emit more ultra fine particles than diesel buses.

Graph 2: Ultrafine emissions

Recent tests conducted in the UK found that CNG buses emitted marginally higher ultrafine particles than diesel buses



Note: CNG-G20 — CNG with 100 per cent methane content CNG-G25 — CNG with 85 per cent methane content

Source: Anon 2001, Summary Report, Department of Environment and Transport for the Regions/Society for Motor Manufacturers and Traders/CONCAWE, *mimeo*.

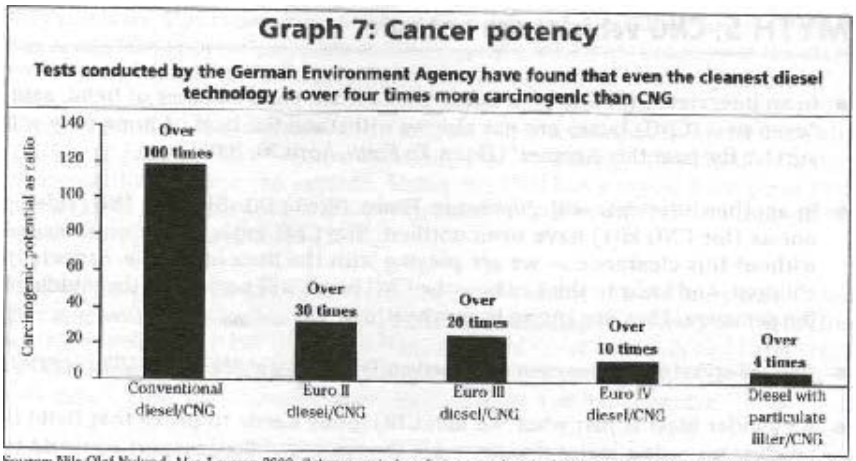
Argument 4: CNG causes cancer.

For

There has been widespread propaganda that CNG is carcinogenic and advocates of CNG condemn and deny this vehemently. Narendra Nath, Industry minister of Delhi, said that the people he met at the explosion site told him that, CNG is carcinogenic (*The Indian Express*, April 7, 2001).

Against

Conventional diesel is 100 times more, Euro II diesel 30 times more, Euro III diesel 20 times more and Euro IV diesel ten times more carcinogenic than CNG. Emissions from the cleanest diesel vehicles, equipped with particulate filters and running on best quality diesel fuel are still four times more carcinogenic than CNG.



Source: Nils-Olof Nylund, Alex Lawson 2000, *Exhaust emissions from natural gas vehicles*, Issues related to engine performance, exhaust emissions and environmental impacts, a report prepared for the IANGV technical committee, p 29.

Argument 5: It is dangerous to attempt a conversion of such massive proportions.

For

"There is no city in the world that has even one-tenth of the number of 10,000 buses targeted in Delhi, using CNG," said R K Pachauri, Director, TERI in the *Hindustan Times*, April 8, 2001.

Against

Public transport in Delhi was asked to move to CNG in the perspective of the extremely high levels of toxic pollutants in the city in the ambient air. No city in the world has been found with particulate matter pollution as high as that of Delhi.

But another reason why a large fleet of buses have not yet been made the target of mandatory alternative fuel regulations in European and US cities is because of lesser number of buses in those cities, lesser intensity of bus use and comparatively lesser relative contribution of buses to air pollution.

Argument 6: CNG will inhibit introduction of better engine technology in the future.

For

The trouble with a complete switch is that Delhi would be saddled with today's technology for years instead of phased modernisation, which can be ensured by phasing out a proportion of vehicles every year.[2]

[2] *Business Standard,* May 21, 2001.

Against

Moving to CNG will not only help us to get emission results comparable to Euro IV norms, it will also straightaway reduce cancer risk from diesel vehicles significantly. Since CNG is a cleaner fuel, it is possible to meet much tighter standards within a short time frame and make a quantum leap.

It is unfortunate that though CNG technology can help to meet much tighter emissions standards, existing emissions regulations for CNG vehicles are extremely flawed. The present emission regulations for CNG vehicles do not recognise that CNG is an inherently clean fuel. Therefore, it has not been possible to get the best out of the CNG strategy.

Argument 8: CNG prices should be hiked to recover the costs of investment.

For

Both Ram Naik and A K Dey, Managing Director of Indraprastha Gas Limited, have issued statements to the press that CNG prices would have to be hiked to recover the cost of investment. On July 26, 2001, *The Times of India* reported Ram Naik saying that the cost of CNG would be substantially higher than diesel when the requirement would be met through liquefied natural gas (LNG) imports. IGL has made large investments for setting up CNG stations and is incurring loss in Delhi.

Shortly after taking over office, A K Dey had made a presentation before the union minister of petroleum and natural gas, Ram Naik, wherein he had advocated an increase in the price of compressed natural gas (July 23, 2001, *The Statesman*.).

Against

IGL is making profit from the very first year of its operation and only recently an excise duty has been slapped on it to raise revenue. The annual report of IGL shows that the company has been making profit right from the first year. It is showing profits even after taking depreciation and payment of taxes into account. IGL showed a profit of about Rs 35 lac in the year 2000 and has shown a profit of more than Rs one crore in 2001.

Argument 9: CNG buses are much more expensive than diesel buses.

For

The union minister of petroleum and natural gas states that dependence on a single fuel for the public transport system is not desirable, he said the higher initial and subsequent maintenance cost of CNG vehicles, and substantially higher prices of CNG compared to diesel also has to be considered.[3]

Against

While capital costs compared to diesel will go up in case of CNG, operational costs will go down because of the lower fuel cost of CNG as compared to petrol or diesel.

The maintenance costs of CNG vehicles are lower. The use of CNG extends engine life, primarily because it is a gaseous fuel. The cost of CNG conversion can be recovered in just about three years. It is important to include health costs while estimating cost effectiveness of the CNG strategy. A Swedish study comparing CNG trucks with diesel trucks running on 10 ppm (0.001 per cent) sulphur diesel (the best diesel in the world) with a CRT found that when public health and environmental costs were included, the costs of running a CNG truck was

[3] *The Hindustan Times,* July 26, 2001.

much lower.

Argument 10: The CNG strategy will hurt the poor the most.

For

Has anyone spared a thought for the many taxi and autorickshaw owners who simply have no means either to buy a new vehicle or convert their existing ones? Of course not.[4] Who considers the price paid and still to be paid by the office-goers, workers, auto drivers, schoolchildren, the handicapped and the self-employed?[5]

Against

Financial incentives are a must for the CNG strategy to work. The federal government in the US provides 80 per cent of the cost of a basic transit bus and 90 per cent of the incremental cost of a bus running on alternative fuel. The state government should subsidise the capital cost of CNG-mode public transport vehicles without incurring any charge on its existing budget.

Which is a Better Fuel?

It is difficult to reach a conclusion after going through the lengthy arguments as to which is a better fuel in terms of emission and environmental benefits. Both have their pros and cons and the debate is still on within the international scientific community as to which one is a clear winner. But it seems we did not have time. We did not bother to consider all the available options or to conduct feasibility tests or to set safety standards or to analyse the supply and demand of natural gas or to consider the adaptability of CNG-run vehicles to Delhi roads. One fine morning, the Supreme Court understood that the pollution levels were alarming and that we should do something. The immediate culprit was of course vehicular pollution and suddenly on July 28, 1998 came an order that the total passenger bus fleet of Delhi be increased from the then figure of about 6,000 to 10,000 by April 1, 2001 and the entire city bus fleet be converted to CNG. That was the beginning of an unprecedented havoc that continues to date. Sleepless nights, endless queues, fights between drivers and administrative mayhem followed. The Supreme Court came up with further orders hoping to provide a temporary solution but ended up creating sleepless nights for more and more people.

A look at the chronology of the events is interesting.

The Calendar of Events

On July 28, 1998, in an unprecedented development, the Supreme Court (SC) ruled that the total passenger bus fleet of Delhi be increased from the then figure of about 6,000 to 10,000 by April 1, 2001 and the entire city bus fleet be converted to CNG. The objective was to expand the city's public transport system and also to control pollution. To deal with pollution from petrol-driven vehicles, the SC ordered the exclusive sale of unleaded and low benzene petrol and advanced improved Euro II vehicular standards by almost five years. By August 2001, Delhi had the largest fleet of CNG buses in the world. There were 2,394 buses, over 27,000 autos and 14,000 other vehicles running on CNG.

When the deadline for converting the entire public passenger transport fleet to CNG expired, all parties concerned approached the SC to air their grievances—schools, private bus operators and auto drivers' unions. The Court, in its order of March 26, gave a conditional extension to commercial transporters to run diesel vehicles till September 30, 2001. The extension was given on the condition that the operators would obtain special permits issued by the Delhi

[4] *The Times of India*, March 28, 2001.
[5] *The Indian Express,* May 3, 2001.

administration on the basis that the operators had placed orders to replace their diesel vehicle with CNG.

The Court directed the Environment Pollution (Prevention and Control) Authority (EPCA)—known as the Bhure Lal committee, after its chairperson, Bhure Lal—to file a report on whether ten ppm sulphur diesel can be considered clean fuel and which other fuels could be considered "clean," that which were not harmful to the environment "or otherwise not injurious to public health."

Delhi chief minister, Sheila Dikshit and union minister of petroleum and natural gas, Ram Naik, met and decided that that they cannot run the city's transport on one fuel, as any accident in the pipeline will bring the entire transport in Delhi to a standstill. They decided to ask EPCA to recommend that diesel with 0.05 percent sulphur is world standard clean fuel and should be accepted in place of CNG.

May: Private CNG buses hit the roads
There were reports of clashes between diesel and CNG bus staff as they both competed for passengers on the roads. As more and more CNG buses hit the roads, queues began to grow at filling stations. Indraprastha Gas Limited (IGL) officials kept saying that the problem will be solved soon.

June: The Delhi government said that the non-availability of gas could lead to another transport crisis. It filed an affidavit in the court saying the September 30 deadline cannot be met, as MPNG (Ministry of Petroleum and Natural Gas) is not supplying adequate CNG. IGL promised to install booster compressors at its daughter stations (stations without any compressors) and convert them to daughter-boosters (stations with compressors) by September, which would reduce lines.

July: Media reports of heart-rending stories of how nights are spent at CNG stations in the sweltering heat were by now common. Drivers do not see their children, do not sleep, do not bathe. Lines stretch for 2-3 km and there is still no action. "I think I will leave my photo at home for my family to remember me. The court can pass orders. But what about us," a bus driver was quoted saying.

August 5: Five people are injured as a TELCO CNG bus catches fire. Safety norms for CNG vehicles became the hot topic. Next day in the Parliament, members say CNG technology is not safe or viable. Naik tells Parliament that it will take 4-5 years to increase CNG supply beyond the existing capacity to meet Delhi's vehicle needs. "No more gas is available physically."

August 16: Dinesh Mohan, Henry Ford professor at IIT-Delhi, releases a study. He says pollution levels will go up if the SC order is implemented. "Contrary to popular perception CNG will not reduce pollution. It will lead to more carbon monoxide (CO), hydrocarbons and nitrogen oxides (NOx) emissions as compared to 500 ppm Sulphur diesel."

August 17: Affidavits are filed in court. Delhi government wants the Court to allow low sulphur diesel, but it qualifies that this is only till CNG supply becomes adequate. Wants the September 30 deadline to be extended. Union government seeks a ban on conversion of private vehicles to CNG. It requests the court that Euro II compliant diesel buses be allowed in Delhi. "Now CNG and diesel options are almost comparable, both having their own merits, with CNG buses having marginal advantage in respect to particulate matter emissions," says the Oil and Gas ministry.

The Court holds firm, rejects all affidavits, but is annoyed at the long queues and inadequate supply. "We have been repeatedly told that supply is adequate and that IGL is prepared to meet future demands. Even today we are informed that there is no shortage of CNG to meet the present demand as also the future demand to implement the orders. The Court says, "there appears to be mishandling of the CNG supply issue." The next hearing was scheduled for September 21 by which time the Court said, "We hope we shall be informed that proper remedial steps have been taken and there are no queues of autos and buses and other vehicles waiting to get CNG at the filling stations."

But the hope did not last much. Even today, the plight of the drivers continues. And as if this was not enough, the impact of ignoring the economics of mass conversion is inevitably coming to the forefront.

The Bhure Lal Committee

The Honorable Supreme Court vide its order dated March 26, 2001 directed as below:

> During the course of argument, it was contended before us that low sulphur diesel should be regarded as a clean fuel and buses be permitted to run on that. It was submitted that in some other countries ultra low sulphur diesel that has sulphur content of not more than 0.001 per cent is now available. We direct the Bhure Lal Committee to examine this question and permit the parties to submit their written representations to the committee in this behalf. The committee may submit a report to this court in that behalf as also indicate as to which fuel can be regarded as "clean fuel," which does not cause pollution or is otherwise injurious to health.

The matter again came up for hearing on 27 April, 2001 when the Ministry of Petroleum and Natural Gas submitted IA Number 116 to seek modifications of the order, dated 26 March, 2001 and after hearing the Supreme Court passed the following order:

> "We do not think that any modification is required to be made in our earlier order. We however, wish to clarify that our order, dated 26 March, 2001 has to be read along with our order, dated 28 July, 1998.
>
> Insofar as other pleas raised in this application as regards "clean fuels" are concerned, we direct that a copy of this application be sent to the Bhure Lal Committee for its examination. By our order, dated March 26, 2001 we had directed Bhure Lal Committee to submit a report to this Court regarding clean fuels. Harish N Salve, learned Solicitor General submits that Bhure Lal Committee has construed that order to imply as if it is required to submit a report only on the question whether low sulphur diesel can be regarded as a clean fuel.
>
> Our order dated 26 March, 2001 is explicitly clear in this behalf. The Bhure Lal Committee has been asked to submit a report not only with regard to whether low sulphur diesel can be regarded as a clean fuel but also to indicate as to which fuel can be regarded as clean fuel, as does not cause pollution or is otherwise not injurious to health. We expect the report on all these issues. The report has not been submitted by Bhure Lal Committee so far. An extension of time is sought for. Four weeks further time is granted for the purpose.
>
> It shall be open to the interested parties to make their representation directly before Bhure Lal Committee in support of their pleas as to what can be regarded as a clean fuel, which does not cause pollution and is otherwise not injurious to health, to assist the Committee to formulate its report."

The Bhure Lal Committee received presentations from eleven concerned parties. Below is a list of what each party has recommended or wanted the Supreme Court to follow. These parties represent all sectors that have something to do with natural gas. And precisely for that reason, these representations reflect popular will or what may be more accurately called "collective wisdom." Below is a table of what each party thought was the best solution to the problem that they were confronted with.

The Recommendations of Various Agencies to EPCA

Ministry of Petroleum and Natural Gas (MPNG)
500 ppm sulphur diesel in combination with Euro II engine technology.

Oil companies
The quality of fuel in the National Capital Region (NCR) is comparable with best in the world. 500 ppm sulphur diesel is clean fuel.

Society of Indian Automobile Manufacturers (SIAM)
The availability of ULSD (10 ppm) allows the fitment of particulate traps. Euro II engine, when it runs on ultra low sulphur diesel (10 ppm) with electronic controls and after-treatment device including particulate traps, will be as good as a CNG engine as far as particulate emissions are concerned.

Tata Engineering (TELCO)
500 ppm sulphur diesel would definitely qualify as a "clean fuel." Soot filters will work with 350 ppm sulphur diesel.

Ashok Leyland
For the soot filters (particulate trap) to be effective, sulphur content in diesel should be 150 ppm.

Delhi Transport Corporation (DTC)
All Inter-State route buses, including those of DTC, may be allowed to ply with 500 ppm sulphur diesel.

Indian Tourist Transporters' Association
Allow 500 ppm sulphur diesel which is now available in Delhi.

Delhi Contract Bus Association
500 ppm sulphur diesel be allowed.

DTC Private Bus Operators Welfare Association
Fuel available in the city (500 ppm sulphur) may be declared as clean fuel.

Indian Association of Tour Operators
500 ppm sulphur diesel may be considered as cleaner fuel.

Tata Energy Research Institute (TERI)
New Euro II compliant diesel buses with Diesel Oxidation Catalyst (DOC) with 500 ppm sulphur diesel be allowed.

It is significant to note that the representations covered all the fields from ministry to industry to research institutes to transport corporations and bus operators associations. And not a single representation supported the implementation of CNG as a viable option. From this I am in no means suggesting that important decisions should all be implemented according to public opinion (though political theory says so). The representation by TERI sounds most convincing when they recommend "New Euro II compliant diesel buses with Diesel Oxidation Catalyst (DOC) with 500 ppm sulphur diesel" till internal refineries produce ULSD and manufacturers

shift to better emission standards. But it does not really seem that Bhure Lal committee has quite considered these presentations when one takes a look at the recommendations they made after "considering all the presentations."

Recommendations

- The hydrocarbon fuels are inherently polluting and hence such fuels cannot be regarded as "clean fuels" and totally non-injurious to health. The effort is to constantly improve the fuel and engine technology of automobiles to reduce the effect. However, among these fuels, CNG, LPG and Propane can be regarded as environmentally acceptable fuels in the NCT of Delhi as explained in the preceding paragraphs.
- To get better emission control in petrol-driven vehicles, it is necessary to improve fuel quality, as explained in preceding paragraphs, use catalytic convertors and ensure that fuel is not adulterated.
- In view of the special measures needed for pollution control in the NCT of Delhi, low sulphur diesel with 0.05% (500 ppm) sulphur cannot be regarded as an environmentally acceptable fuel.
- In the context of NCT of Delhi, there is need to bring public passenger transport (city buses, autos, taxis) as early as possible on CNG. For vehicles which cannot be converted to CNG for practical reasons, 0.05 percent sulphur diesel may be permitted as a Transitional Fuel for a limited period of time to be kept as short as possible for public health reasons.
- Ultra-low sulphur diesel (with 0.001% sulphur) and low PAH content in combination with Continuously Regenerating Traps (CRT) and catalytic convertors can be regarded as environmentally acceptable fuel in the NCT of Delhi provided it does not get adulterated with low quality diesel or other adulterants. However, it is not available.
- The government should make plans to promote all environmentally acceptable fuels for the National Capital Region as also plans to improve quality of other fuels with the relevant exhaust treatment devices and engine technology so that different options can compete in the market. This should be coordinated by the Ministry of Environment and Forests along with the concerned ministries i.e. Ministry of Road Transport & Highways, Ministry of Petroleum & Natural Gas and Chief Controller of Explosives.
- MPNG should provide an adequate and enhanced allocation of natural gas for Delhi's transport sector and this allocation should keep pace with the growing demand (MPNG).
- Current infrastructure for CNG distribution should be strengthened and increased from its total 71 dispensing stations including 38 daughter stations, as on July 2001 to 90 dispensing stations by December 2001, all consisting of mother/on-line stations and daughter-booster stations, with a proper distribution across the city. IGL should ensure gas pressure of more than 200 bars in all the CNG stations (MPNG and IGL).
- Plans for future distribution infrastructure should be set into motion to ensure that it stays ahead of the growing demand and takes into account the turn around time of vehicles at the dispensing stations (MPNG and IGL).
- As taxis and autos are on dual fuel mode, contingency plans to deal with the eventuality of disruption in gas supply for buses should be prepared and a plan of action should be filed in the Honourable Supreme Court. (MPNG and IGL)
- The date for stopping all diesel operations by commercial passenger transport in the city may be extended beyond September 30, 2001 by the amount of time it reasonably takes for delivery of chassis and bodies. The bus manufacturers may be asked to furnish their production schedule for the orders placed. Those who still continue to ply on diesel beyond

that date may be allowed to do so, for a further period of three months, in the interest of the commuting public, but should be fined heavily and punitively. (GNCTD)

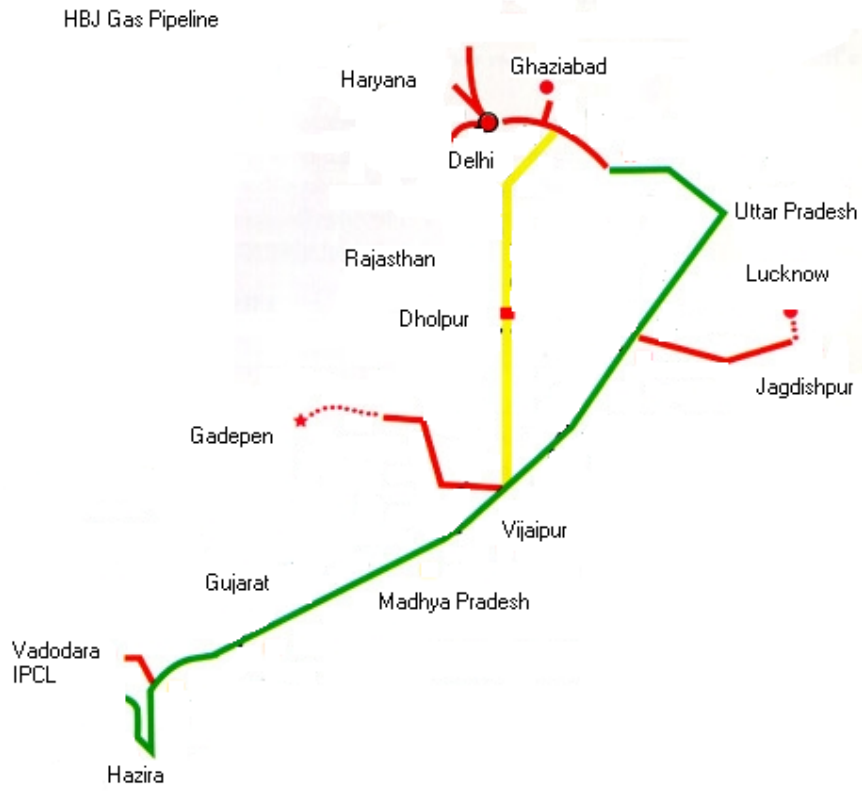
- Buses, taxis and auto rickshaws plying on Stage Carriage and Chartered Carriage permits given for Delhi be covered by the CNG order. This would limit the movement of chartered buses on intercity routes on temporary permits. This requirement can be met by chartered buses on tourist permits, meant legitimately for plying interstate routes (GNCTD).
- In order to prevent Chartered Carriage bus operators taking advantage of this loophole, and begin converting to Tourist Permits, or obtaining Inter-State Stage Carriage Permits, a ceiling be put on the number of Tourist Permits given by the State Transport Authority, equivalent to 1.5 times the normal annual growth rate of this category for the last five years (which we think would be reasonable to take care of those who currently ply mainly on interstate routes on temporary permits) (GNCTD).
- The GNCTD should implement the July 28, 1998 order of the Hon'ble Supreme Court to speedily build new Inter-State Bus Terminals (ISBTs) in the North and Southwest to avoid pollution due to entry of inter-state buses in a time bound manner. This point is strongly emphasised because the entry of inter-state buses defeats the intent of the order (GNCTD).
- Financial incentives should be provided to bus operators purchasing new OEM and retrofitted CNG buses in the form of sales tax and excise tax exemption and low-interest loans with the subsidies ideally recovered from enhanced road taxes on private vehicles like cars and scooters and tax on diesel (Ministry of Finance, Government of India and GNCTD).
- An integrated plan to achieve clean air, which includes a comprehensive plan of action for controlling vehicular pollution whose components are described in paragraph five above should be prepared within a defined period of time and adopted. The Ministry of Environment and Forests should co-ordinate this effort along with concerned Central Ministries and with GNCTD.

The Case of Natural Gas Consumers in Delhi

There is always an inherent debate between science and economics, between the scientifically best solution to a problem and the most economically sound solution. If a committee of scientists were asked to come up with the best material to build a car, they would probably come up with platinum. We know how sound an option it is to mandate platinum cars following the recommendations of the committee. Similar is the mandatory conversion of public transport vehicles in Delhi initiated by the Supreme Court. All those who were involved with the conversion were guided by blind environmentalism sans the economics of mass conversion to a single fuel.

The environmental benefits of Compressed Natural Gas (CNG) are debatable as we saw in the initial part of this report. Dr R K Pachauri, Director, TERI, says that there is enough evidence available abroad that Ultra Low Sulphur Diesel (ULSD) is a better option than CNG in terms of environment albeit other factors. In case of CNG, no feasibility test was done, no safety standards were set, the fuel's adaptability to Delhi roads was not considered, the massive costs involved in the mass conversion were thoroughly ignored and most important of all, the supply and demand of natural gas in the country was overlooked. The glaring effects of ignoring the economics of mass conversion are now inevitably coming to the forefront.

The Hazira-Bijaipur-Jagdishpur pipeline is the heart of natural gas distribution in the country. The 36 inches, 2,300 km long pipeline has the capacity to pump 33.4 million standard cubic meters per day (SCMPD). This is entirely dependent on natural gas from internal oil fields. Core industries like transport, power, fertiliser also depend on this pipeline for fuel.



The alternate option for these industries is oil, which is almost thrice as expensive as gas.

INDUSTRY	**ALLOCATION** (SCM in millions)
TRANSPORT	0.6
POWER	15.4
FERTILISERS (PUBLIC SECTOR)	8.5
FERTILISERS (PRIVATE SECTOR)	7.7
OTHER INDUSTRIES	4.2
TOTAL	**36.4**

After the Supreme Court verdict following the Bhure Lal Committee report, there were long queues and extensive reports on the plight of the drivers, which caught the attention of the apex court. The court asked the IGL officials for an explanation and the comfortable explanation was lack of supply of natural gas. This led to a Supreme Court directive to Gas Authority of India Limited (GAIL) to give priority to transport and power sector in Delhi. As a result, a reallocation was effected and Delhi Vidyut Board, Pragati power plant and IGL were allocated 8.5, 17.5 and 20 lac SCM (Standard Cubic Metres) per day. Of these, only DVB is utilising the entire allocation. The remaining two as of now are using only 8 lacs SCM per day. This means 21.5 lacs SCM gas is left unused everyday. This increased allocation came at the cost of about 17 firms, across glass, ceramics, sanitary ware, food and electronics that consume natural gas. Haryana Sheet Glass, the single largest consumer of natural gas uses 1,60,000 lacs SCM per day. After the reallocation, as they have to use oil, they suffer a loss of Rs two crore every month. Not different is the plight of 16 others. The collective demand of these industries is 7,61,502 lacs SCMPD, which is only about one-third of the gas that is left unused by Pragati power and IGL. They both do not have the infrastructure to use the allotted gas. It is estimated that the infrastructure required to use the allotted gas will be in place only

by March 2003. By then the 17 firms providing direct and indirect employment to lacs of people will have closed down. But the unemployed will at least be breathing fresh air.

In addition to closing the tap for the 17 firms, GAIL had to impose a 10% cut in the allocation for fertiliser and power industry, the largest consumers of natural gas in the country. This cut will mean the rise in price of fertilisers and power throughout the country; the implication of which is that Delhi'ites are supposed to breathe fresh air at the expense of the entire country. One fails to understand the rationale behind such decisions. We always knew that a big difference between supply and demand could not be overcome with arbitrary decisions.

All efforts to increase supply of natural gas by the government seem to be failing. The lukewarm response from the Bangladesh government and the Indo-Pak tension at the border has almost nullified the prospects of the proposed pipelines. The only remaining option is to import Liquefied Natural Gas (LNG). Private entrepreneurs are hesitating to enter the field despite the increasing demand due to the highhandedness of the government. Government announces action plans but, probably due to huge initial investment, seems to be having second thoughts. If that is the case, it should no longer delay stepping out from the business and encourage private companies to do the job. The only place in the country today, where there is no natural gas is Gujarat. Reason? The Gujarat Gas Company is importing LNG. It is high time eyes opened.

Yet another problem of conversion into a single fuel is that as the entire supply depends on a single source (HBJ pipeline), the event of any failure in the pipeline would definitely prove to be disastrous. The entire transportation would come to a standstill, which would create unimaginable chaos and loss to the tune of crores. This deserves special attention in the wake of intelligence reports of terrorists planning attacks on the crucial pipeline.

It is now very clear that the apex court had unilaterally focused on environment without considering the economics of mass conversion. One arbitrary, economically unsound decision naturally had to be followed by other arbitrary pronouncements for temporary relief. But the damage is done. A permanent cure will obviously take time. The law of unintended consequences applies here appropriately. What is even more disgusting is that we always had ULSD that is equally good an option if not better. Tests conducted across the globe suggest that ULSD has lesser emissions and is absolutely adaptable to Indian road conditions. All this was obviously known even while Bhure Lal Committee was in the process of investigation. What remains unanswered is why CNG was favoured against all odds.

We are at the verge of another impending disaster: the mandatory mass conversion of all other metros and "polluted" towns following the noble example of Delhi. Several public interest litigations are already pending in state high courts demanding single fuel on the basis of the SC ruling in Delhi. The chaos in the industrial sector that would follow such an event is unimaginable. One can only hope that high court judges would not be as obtuse about the economics of mass conversion.