



**Indian  
Auto LPG  
COALITION**

*Fuelling a greener future*

# Auto LPG in India: An Industry Roadmap

Economical, Cleaner, Viable,  
Alternative Automotive Fuel



**October 2016**

Prepared by:

 **MDRA**  
*People Who Make The Difference*  
Marketing & Development Research Associates

## About IAC

Indian Auto LPG Coalition (IAC) is the nodal body for the promotion of Auto LPG in India. Members of the Coalition include the Oil Sector PSUs, Private Auto LPG marketers, Kit Suppliers and Equipment manufacturers. The Coalition works very closely with the World LPG Association, Society of Indian Automobile Manufacturers, Automotive Research Association of India and International Center for Automotive Technology (iCAT).

IAC is also a member of “Central Motor Vehicle Rules - Technical Standing Committee” (**CMVR-TSC**) & “Standing Committee on Emission Legislation” (**SCOE**), **TED26** (Bureau of Indian Standards), Government of India.

## Mission

Promote LPG in an integrated manner, as an alternate, gaseous, environment friendly fuel by involving all stakeholders to bring a cost effective & safe auto fuel to Indian consumers, using the best global practices.



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## FOREWORD



The Auto LPG Sector in our country, spread across all geographic segments, plays a vital role for reducing pollution levels in major towns and cities of our Nation.

More than 26 million vehicles run on Auto LPG globally, supported by 71,000 plus LPG Filling Stations. Global Auto LPG consumption exceeds 26 MMT with South Korea leading the world in the usage of this clean auto fuel with sales of more than 4 MMT annually. More than 70 countries use Auto LPG in vehicles to help clean their urban air and clean environment. Among the key nations that have successfully adopted this green fuel for their transportation requirements are South Korea, Turkey, Poland, Japan, Australia, Italy, Mexico, USA, Russia & China.

In this context, India is still lagging behind at an yearly volume of about 0.33 MMT. Though the market clocked an annual growth of more than 30% during its peak in 2007-11, lack of adequate network has restricted further growth of the product.

On a positive side, recent initiatives by the Government of India like PAHAL, have helped restrict domestic LPG to genuine users only. This has definitely minimized illegal diversion of domestic LPG for automotive use by unscrupulous elements, which has helped the Auto LPG Industry to a large extent.

I am happy that IAC has come out with this roadmap for bringing Auto LPG as viable alternate automobile fuel in India involving various stakeholders in the industry.

I am sure this research study will be of immense value to the Auto LPG Industry to take forward and implement the recommendations and move towards the popularization of Auto LPG as a viable, alternate, clean automotive fuel.

**Y K Gupta**  
President  
Indian Auto LPG Coalition

## MESSAGE FROM DIRECTOR GENERAL



Having been deeply involved with the Auto LPG Industry since its inception in India, I am very happy to be able to present this roadmap on behalf of the coalition. Working in close collaboration with M/s Marketing & Development Research Associates, a detailed research was conducted across key Auto LPG markets nationwide including those geographies where Auto LPG has been present only feebly.

Detailed interaction was carried out with almost all stakeholder groups to include the policymakers, NGOs, fuel marketers, OEMs, kit suppliers and of course most importantly, the Auto LPG users. While our coalition has worked on several initiatives over the last decade and a half, yet preparation of this roadmap, together with the internal research report conducted by MDRA, is probably amongst the most important initiatives of the coalition. This roadmap is going to guide many of our future initiatives. Also, this comes at a time when Auto LPG saw a 17% growth last year in 2015. But for any unforeseen changes in the global energy trends, macro factors will continue to be supportive of Auto LPG growth in India.

I must also express my gratitude to the policymakers, NGOs and all our membership for their support in preparation of this roadmap. Inputs from the World LPG Association based out of Paris and European LPG Association, Brussels, have been a key reference for all the global statistics that you would see in this roadmap. And of course, a note of thanks to MDRA - Mr Abhishek Agrawal and his team, particularly Abnish, for being very supportive and interactive throughout the preparation of this roadmap.

I firmly believe that India, with an estimated ALPG vehicle population of 2.2 million vehicles, is, at a minimum, 1 million tonne market annually. I can say with certainty that the recent initiatives of Indian government on the subsidy administration front, particularly the direct cash transfer of subsidy and the success of 'Give It Up' campaign, will decisively change the landscape of Indian Auto LPG Industry. I am hopeful that this roadmap shall prove to be a useful reference for all stakeholders.

**Suyash Gupta**  
Director General  
Indian Auto LPG Coalition

## A NOTE FROM EXECUTIVE DIRECTOR, MDRA



There could not be more opportune time to conduct this study. The current government and various civic bodies have deepened their commitment and efforts towards pollution-free cities, which has never been so promising. India has shown serious march towards sustainable growth.

Through our two decades of studying consumer behaviour in India, we have deeply understood that an average consumer would not buy a vehicle that would just promise cleaner air. Through our numerous studies in automotive sector it has been proved that operating cost of the vehicle is one of the most important criteria while deciding for a vehicle and fuel choice.

In order to prepare an actionable roadmap for the industry, the first task was to correctly identify different stakeholders and their multiple roles in making any change in growth of Auto LPG in India.

The next logical step was to engage with those stakeholders and understand their knowledge, perception, attitude, behaviour and practices towards Auto LPG vis-à-vis other automotive fuels. After making a thorough understanding of perception & beliefs of all stakeholders, it was important to determine factors that affect off take of various fuels in automotive sector. Thereafter, scenarios were created artificially to prepare a plausible and actionable roadmap for growth of the sector.

In all, the study was conducted over a period of one year (July 2015 to June 2016) among 1500 plus automobile users and over 100 policy makers, industry experts and influencers. We are grateful to all the respondents for taking out time and responding to large number of questions. The members of the industry, particularly members of IAC were very supportive and contributed immensely by giving their valuable time at different occasions. We are thankful to the international community, especially WLPGA for responding to various queries. IAC President Mr. Y K Gupta must be thanked for his encouraging support to the project.

My special word of appreciation goes to Director General, IAC Mr. Suyash Gupta for his visionary approach and passionate involvement with deepest sense of commitment towards the cause of Auto LPG in India. I personally thank him for quick responses to intermittent requests related to operational aspects as well as for his strategic inputs in the study.

I have strong hope that this roadmap will be valuable to the industry and would serve as important reference. This also means more and more automobile users would sooner than later move towards a cleaner, economical and safer fuel that is immediate solution to urban pollution.

We wish all the best to the industry!

**Abhishek Agrawal**  
Executive Director  
MDRA





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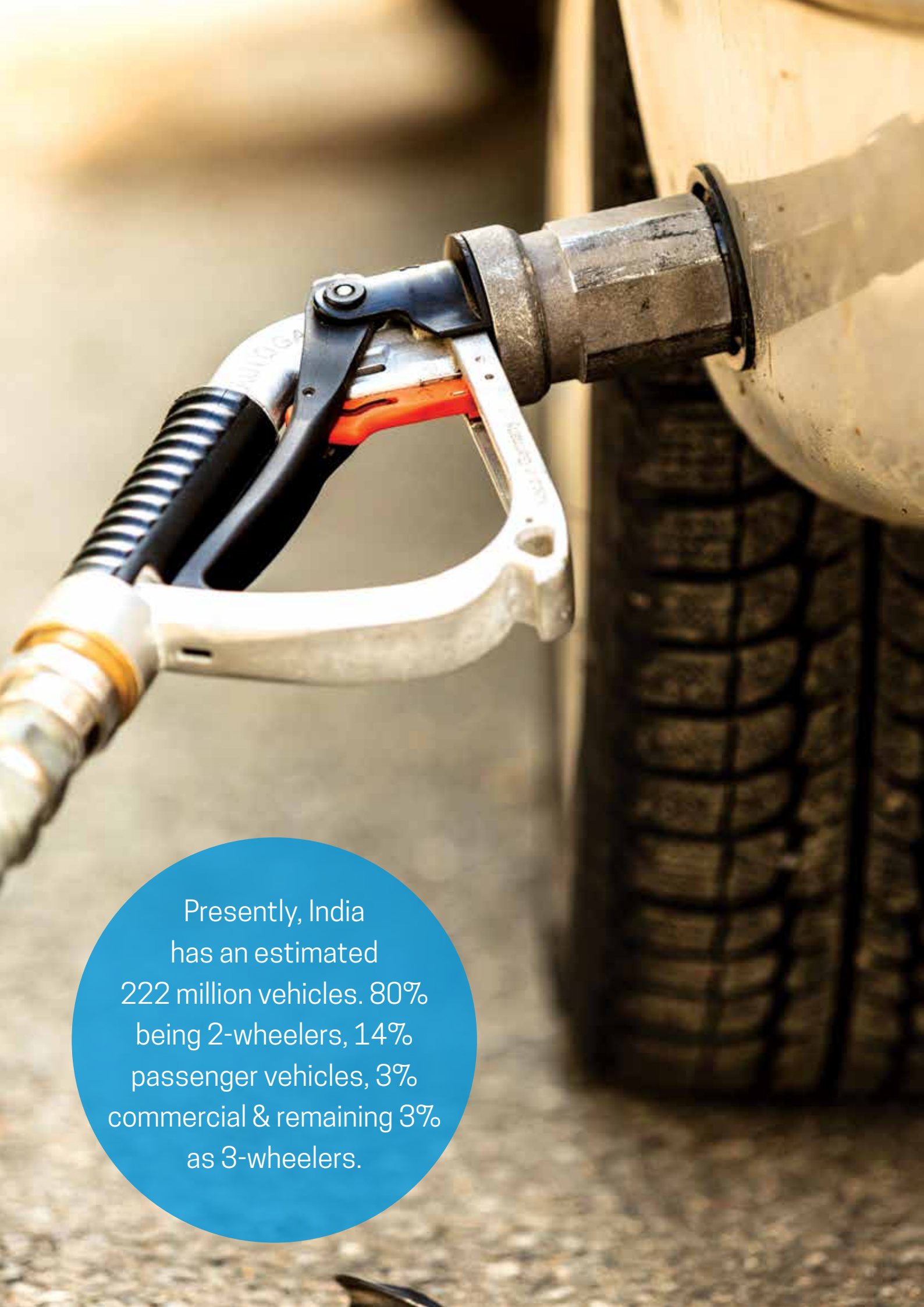
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Presently, India has an estimated 222 million vehicles. 80% being 2-wheelers, 14% passenger vehicles, 3% commercial & remaining 3% as 3-wheelers.



# 1. AUTO LPG: AN INTRODUCTION

## 1.1 Why Auto LPG?

### CLEAN

- CO<sub>2</sub> - 22% lower than Petrol\*
- NO<sub>x</sub> - 96 % lesser than Diesel, 68% lesser than Petrol<sup>#</sup>
- PM - 120 times lower emission than Diesel<sup>##</sup>

### ECONOMICAL

- Very Low Operating Expenses - Upto 50% lower costs than Petrol.
- Lower costs of LPG vehicles (OEM or Retro-fit) than CNG
- Lower investments in ALDS infrastructure & much lower installation time than for a CNG station

### CONVENIENT

- Compact & lighter fuel tanks; takes lesser trunk space (than CNG)
- OEM-fit LPG powered vehicles available. Easy retro-fitment; Zero-mile conversion in practice too
- Easily portable, transportable & faster re-fuelling – Not dependent on pipeline infrastructure

### AVAILABLE

- Global LPG production growing faster than demand (10 mMT in excess; 2015). Hence continuous availability of Auto LPG for the Indian subcontinent at very low, compelling prices in the foreseeable future
- Supply secured in long term with global gas glut on account of the advent of US Shale and US becoming one of the world's largest exporters of LPG, from being a net importer just a few years back.
- Auto LPG today is already available in more than 500 cities across India.
- Even globally there is huge ALDS network & coverage (more than 71,000 ALDS globally) and growing

### PROVEN

- Over 26 million vehicles run on Auto LPG globally – leading car manufacturers rely on it; Auto LPG being around 9% of global LPG consumption
- Proven reliability – used in ambulances, school buses, city buses, police vans, etc.
- Due to higher octane rating, generally engine life is longer

### SAFE

- Stringent Standards & Regulations in place
- Proven, impeccable safety record
- 7-8 bars pressure – lower pressure, hence lower risk

\* COM (2014) 617 Annexes - Methodology for the calculation and reporting of the lifecycle greenhouse gas intensity of fuels and energy by fuel suppliers.

<sup>#</sup> European Emissions Test Programme 2004.

<sup>##</sup> A Bridge to the Future" UK LP Gas Association Research Paper, September 2003



Autogas – LPG used as a transport fuel – is the most commonly used alternative automotive fuel in the world today. Global consumption of Autogas has been rising rapidly in recent years, reaching 26.4 million tonnes in 2014 – an increase of 5.1 Mt, or 24%, over the 2009 level. With over seventy thousand refueling stations, and more than 25 million Autogas vehicles in use around the world, it is truly a global success story.

**James Rockall**  
CEO and Managing Director  
World LPG Association (WLPGA)

## 1.2 What is Auto LPG?

Auto LPG is Liquefied Petroleum Gas used as an automotive fuel and known by various names across the globe. In United States, it is commonly known as Propane Autogas. In United Kingdom LPG and Autogas are used interchangeably, whereas in Spain the term GLP (Gas Licuado del Petróleo) is used for Auto LPG. In Asian countries, Autogas is not commonly recognized as a generic term, and the terms LPG or Auto LPG are more widely used by the people.

## 1.3 Auto LPG is a Clean Fuel

Of the many advantages of Auto LPG, the most significant is its contribution to improving air quality, particularly in urban areas, where air pollution poses a serious threat to human health and diminishes quality of life for all citizens. Auto LPG is the most effective option for converting the existing pool of petrol-fuelled cars and bikes into more environment friendly vehicles. It also provides tremendous opportunity to avoid usage of high polluting diesel-fuelled cars for personal and public transport.

In order to reduce carbon emissions, it is necessary to replace fuels emitting higher levels of carbon with alternate fuels that are not only more environment friendly, but also economical, convenient, reliable, safe and easily available. Auto LPG perfectly fits these criteria and hence has been promoted globally for many decades now.

**Auto LPG is the only alternate and viable immediate solution as it is already available in 500 cities and the network can be easily expanded to all other cities.**

- Non-urban emissions are lower than urban emissions for all fuels, but the improvement is greater for LPG and petrol than it is for diesel
- Zero particle emissions are reported for all of the LPG, CNG or E85 models

*Clearing the air: black carbon, climate policy and LP Gas*

**Auto LPG – 3<sup>rd</sup> Most Used Automotive Fuel Globally**



### Why cleaner automotive fuels.... a critical need for India?

- 13 out of 20 most polluted cities in world are from India – as per World Health Organization (WHO)
- Delhi tops the list of most polluted cities with 153 micrograms of PM 2.5 per cubic meter. According to WHO advisory PM 2.5 should not exceed 10 micrograms per cubic meter.
- Due to air pollution, half a million premature deaths happen every year in India
- Health cost of air pollution in India has been assessed at 3% of its GDP
- Air pollution is even more dangerous for children, especially below 6 yrs of age, as their respiratory rate is higher than adults. Children comprise of about 1/3rd of the population.

## 1.4 Auto LPG is Economical

Fuel economy (running cost/ km) is a prime factor affecting vehicle-buying decision in India. A cost calculation based on MDRA survey clearly demonstrates that the payback period for an Auto LPG vehicle is less than a year, as opposed to 3 years by diesel.

Fuel efficiency of vehicles			
Fuel type	Fuel efficiency (km/ litre/kg)*		Price in INR (as on October 1, 2016)
	4 - Wheelers	3 - Wheelers	DELHI
<b>Petrol</b>	14.3	20.0	64.72/- per litre
<b>Diesel</b>	18.5	25.2	52.61/- per litre
<b>Auto LPG</b>	13.38	23.51	32.29/- per litre
<b>CNG</b>	17.35	27.16	35.45/- per KG

Running cost and payback period for various fuels						
Fuel Type	Avg. Retro fitment Cost (in Rs)*	Running cost (in Rs) - Delhi	Daily running (in KM)	Daily cost (in Rs)	Daily Saving against Petrol car	Payback Period (in Months)
<b>Petrol</b>	-	4.53	50	226	-	-
<b>CNG</b>	28000	2.04	50	102	124	<b>7.5</b>
<b>Auto LPG</b>	17000	2.41	50	121	105	<b>5.4</b>
<b>Diesel</b>	100000	2.84	50	142	84	<b>39.6</b>

*For illustration only. Based on Ex-Showroom Price in Delhi of Car 1000 cc (Excluding finance cost)*

Auto LPG scores high when it comes to making a decision on capital cost of the vehicle. For an OEM-fitted vehicle, the cost is at least Rs 25000-30000 cheaper than a CNG vehicle (about 5% of total vehicle cost) and almost a lakh cheaper than a diesel vehicle. Similarly, Auto LPG is 40% cheaper than CNG retro fitment.



With effects of global warming so apparent now, moving to cleaner fuels is not a choice anymore. Auto LPG is clean, efficient, easy to handle and offers economic benefits as well. Hence an ideal fuel for a vehicle.

**Rajiv Chohan**  
President- Business Development  
Aegis Logistics Limited



### Vehicles in India

Presently, India has an estimated 222 million vehicles. 80% being 2-wheelers, 14% passenger vehicles, 3% commercial & remaining 3% as 3-wheelers.

At present, over 22 lakhs Auto LPG vehicles running in India.

3-wheelers in Kolkata, Bangalore & Jaipur are running mostly on Auto LPG as State Govt. has banned diesel auto rickshaws to ply.

Bangalore is the largest Auto LPG market in India – success attributed to strict execution of regulations and policies.

Govt. provided subsidy of Rs. 10,000/- to all old 2-stroke auto rickshaws to change to new 4-stroke ones.



## Convenient & Available

Auto LPG is transported as a liquid but has all the benefits of a gas

OEM LPG powered cars available; Retro-fitment is also easy. 89% of the global Auto LPG vehicles are after market conversions

Compact & lighter Auto LPG tanks; takes up lesser trunk space (than CNG)

Liquid fuel – Easily portable, transportable; easy & faster re-fuelling – Not dependent on pipeline infrastructure

LPG production growing faster than demand (10 mMT available in excess (in 2015))

ALDS network available in 500 plus cities of India

Auto LPG consumption in India has shot up by 17% to 330,000 tonnes in 2015-16

## 1.5 Auto LPG is Convenient

While a number of factory-fit Auto LPG vehicles are available across the world and in India, giving a wide range of options in terms of vehicle choice, any petrol car or bike can be easily and quickly retrofit with an Auto LPG kit. Auto LPG fuel tanks are compact and lighter than CNG and can be easily integrated in the car without loss of trunk space. It is easily portable, transportable—not dependent on pipeline infrastructure. Refuelling time for Auto LPG is similar to other conventional (petrol & diesel) fuels unlike CNG, which takes more time (5-10 mins) to refill primarily because of gaseous nature of CNG.

Zero Mile Conversion – Even in case of retro fitment at dealer end, the warranty period on the vehicle remains the same and thus becomes very convenient for car owners to convert their petrol cars to bi-fuel petrol-Auto LPG cars, if offered by the OEMs

## 1.6 Auto LPG can be made easily available – Everywhere

Auto LPG is a liquid fuel, which is easily available, carried through tankers. The pressure is much lower at 7- 8 bars. Though Auto LPG is currently available in 500 plus cities, it can be made quickly and easily available in all the cities in the country without any need of substantial investment in infrastructure. Erecting any Auto LPG dispensing station is cost effective and can be done in any existing fuel (petrol and diesel refuelling) station with a small investment.

In terms of vehicle availability, practically all petrol run two wheelers and four wheelers can be fitted with an Auto LPG kit.



Auto LPG - An environment friendly clean fuel, convenient to source and use with the highest standards of safety, offering an excellent cost advantage to the customer. A win-win situation for all – Nation, Customer, Retailer and Society at large.

**Bhupendrasinh Champavat**  
Head – Auto LPG, Reliance Industries Limited





## 1.7 Auto LPG is Proven & Versatile

Leading car manufacturers across the globe have several models of factory-fit Auto LPG vehicles. 7 of the 10 largest car manufacturers in the world produce LPG powered cars. Several developed nations have relied on Auto LPG vehicles to bring down pollution levels. Auto LPG is being used in school buses in USA, ambulances in Spain, city buses in Hong Kong and 2-wheelers in China. As Auto LPG cannot be adulterated, performance of LPG vehicles is more reliable than any other alternate fuels. High octane rating of Auto LPG increases the engine life of the vehicle.

Unlike some other fuels, Auto LPG is versatile – it can run 2-wheelers, 3-wheelers as well as 4-wheelers – from light vehicles to heavy vehicles.

### OEMs across the world producing Auto LPG vehicles



### Proven & Reliable

In Turkey, more than 40% of private cars now run on Auto LPG

In Italy, Auto LPG accounts for 43% of total LPG consumption and over 5% of total automotive-fuel demand in 2014. The number of Auto LPG vehicles in use has surged in recent years, reaching 2.04 million at end-2014. Most Auto LPG vehicles are converted gasoline-fuelled vehicles. 24 carmakers marketed Auto LPG models in Italy in 2014.

In South Korea, around 95% of the country's taxis run on Auto LPG, accounting for an estimated 40% of total Auto LPG consumption.

 In Europe, Autogas has been going through consistent growth over the years. While some countries have clearly established themselves as leaders in the recognition of LPG as a mainstream fuel, such as Turkey, Italy or Poland, we also see very rapid uptake in some countries that are only just starting embracing LPG and its many environmental and economic benefits, Spain and Greece for example. We currently have in Europe 45,000 stations serving over 14 million cars. This is itself a massive achievement, and we at AEGPL clearly see a lot more potential for the coming years. Discussions on supportive policies for alternative fuels such as LPG are ranking high on the agenda of authorities both at EU and national levels, and their continued support will be a crucial factor for the further development of Autogas.

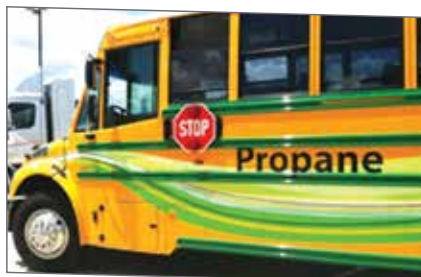


**Samuel Maubanc**  
General Manager –European LPG Association (AEGPL)

## Auto LPG Buses plying in different countries



Airport shuttle buses run on LPG in Arizona, United States



LPG school bus in United States



Toyota LPG bus in China

## Auto LPG taxis plying in different countries



ALPG taxi in Britain



Ford Falcon LPG car in Australia



LPG powered taxi station in Honduras



ALPG taxi in Australia



ALPG taxi in Turkey



ALPG taxi in Japan

## Racing cars plying on Auto LPG



Custom OEM LPG kit installed Range Rover



A Turkish company fitted LPG to a super car  
Demonstrated that LPG is suitable for any vehicle



Ferrari Modena filling LPG, Bangkok Supercars  
run on LPG in Thailand

## Integrated LPG tank saving boot



Opel cars come with an integrated LPG tank  
saving boot space



Auto LPG Two Wheeler in China



The US police department has adopted flexi-fuel  
vehicles to save up to 30 percent on vehicle running costs



## Auto LPG refilling stations in various countries



ALDS in France



ALDS in New Zealand



ALDS in UK

## Auto LPG Test Laboratory



ALPG kit test laboratory in Italy



ALPG kit test laboratory in Italy



Opel cars come with an integrated LPG tank saving boot space

## 1.8 Auto LPG is Safe

Strict standards and regulations have been set for Auto LPG use by experts in recognized organizations such as – The European Union and National Governments. What is more, all its components are thoroughly tested by independent laboratories before they enter the market.

Apart from LPG being used as safe automotive fuel, it has multiple applications as exceptional energy source – for cooking, heating, power generation and farming, to name a few.

## Auto LPG is Safe

**Stringent Standards & Regulations in place.**

**7-8 bars pressure – lower pressure, hence lower risk.**

**Proven, impeccable safety record.  
Widely used by Governments and Private Sectors**

**Used by Taxis, Police cars, Ambulances, Driving schools, Rental cars and even in racing cars.**



“ Few studies have been done in the country to draw a comparison with respect to emission level among different fuels – Petrol, Diesel, CNG and Auto LPG. The Auto LPG industry should take initiative to test a vehicle under BS-IV norms and compare the emission level of Auto LPG vehicle with other fuels. The exercise will help Government to understand how Auto LPG is better than other fossil fuels on emission. This will give a strong proposition for the Government to lay focus on Auto LPG as alternate clean fuel.”

**Anumita Roy Chowdhury**  
Executive Director- Research & Advocacy, CSE







## 2. AUTO LPG: GLOBAL SCENARIO

### 2.1 A Snapshot

26.4 Mn MT

Total Auto LPG global consumption in 2014

**Most used** Alternate fuel  
powering 26 Million vehicles

Comes from –  
Extraction of Natural gas 60%  
By-product from refinery 40%

### Top 5 Consumers

- 1 South Korea
- 2 Turkey
- 3 Russia
- 4 Poland
- 5 Italy

Account for 48% of global consumption

71000  
filling  
stations

Auto LPG  
accounted for  
around 9% of  
Global Consumption  
of LPG


CO<sub>2</sub> emission -  
22% lower than petrol  
NO<sub>x</sub> emission -  
96% lower than Diesel and  
68% lower than Petrol  
120 times  
lower PM emission  
than Diesel

### Vehicles across all categories

- School buses in USA    ● Ambulances in Spain
- City buses in Hong Kong    ● 2-wheelers in China
- 95% of all taxis in South Korea    ● 40% of all private vehicles in Turkey

## 2.2 How is Auto LPG Promoted Globally?

Auto LPG promoted as clean and economical fuel in following ways:



**The Turkish Autogas** market has experienced a spectacular growth since 1996. Today, 4.3 million cars run on LPG, which represent 40% of the country's total automobiles. The market grew steadily over the years, reached 3.1 million tonnes in 2015 with an annual increase of 9% and with a 5% CAGR over the last 6 years. Turkish Autogas car park is the largest one, and third in the World in terms of consumption.

The major reason behind this success is the net economical advantage of Autogas against gasoline; which is nearly 35%. Although there is no incentive given by the government, just taxes on Autogas are relatively lower, having an indirect effect on sales and conversions in the market.

Another important reason about the success is the convenience of Autogas; which the customers can reach it in the 2/3rd of the gasoline stations. Conversion network is very strong in Turkey and the conversion prices are affordable, that's why nearly 200K conversions were made every year.

**Ercument Polat**  
Marketing Director, Aygaz

How is Auto LPG Promoted Globally?	
Fiscal Incentives	
<b>on Fuel</b> <ul style="list-style-type: none"><li>Excise duty exemption/ low</li><li>Lower/ no import duty</li></ul>	<b>on Vehicles</b> <ul style="list-style-type: none"><li>Lower/ no vehicle tax</li><li>Fiscal grants for purchase of AFVs</li><li>Lower annual vehicle road taxes</li><li>Subsidies to OEMs/ Dealers/ Retrofitters</li></ul>
Regulation	
<b>Auto gas mandatory</b> <ul style="list-style-type: none"><li>Rationing of Roads &amp; fuels</li></ul>	<b>Environmental restrictions</b> <ul style="list-style-type: none"><li>Emission norms</li></ul>

### Key measures taken to Promote Auto LPG Globally

There are extensive range of options at the policymakers' level within the normal policy-toolbox to promote the supply and use of alternative fuels, including Auto LPG. The main approaches that governments in many successful Auto LPG countries have adopted – (a) providing financial incentives to the stakeholders and (b) design regulatory framework. Other measures include support for technology development and public awareness programs in a few countries to promote Auto LPG usage.

## 3 Key Success factors for Auto LPG



## Fiscal/ Financial

### On fuel

- Excise-duty exemption
- No/ lower import duty
- Tax credits for investment in distribution infrastructure by opening of more ALDS

### On vehicles

- Road tax exemption or rebate
- Vehicle sales-tax exemption or income/ profit tax credit
- Grants/ tax credits for alternate fuel vehicles conversions/ acquisitions
- Exemption from parking/ road use charges
- Subsidies to OEMs/ Dealers/ Retrofitters

## Regulatory

- Mandatory sale/ purchase requirements for public and private fleets (with enforcement)
- Standards to harmonize refueling facilities
- Vehicle conversion standards
- Coherent and appropriate health and safety regulations
- Environmental restrictions
- Emission norms
- Rationing of roads and fuel

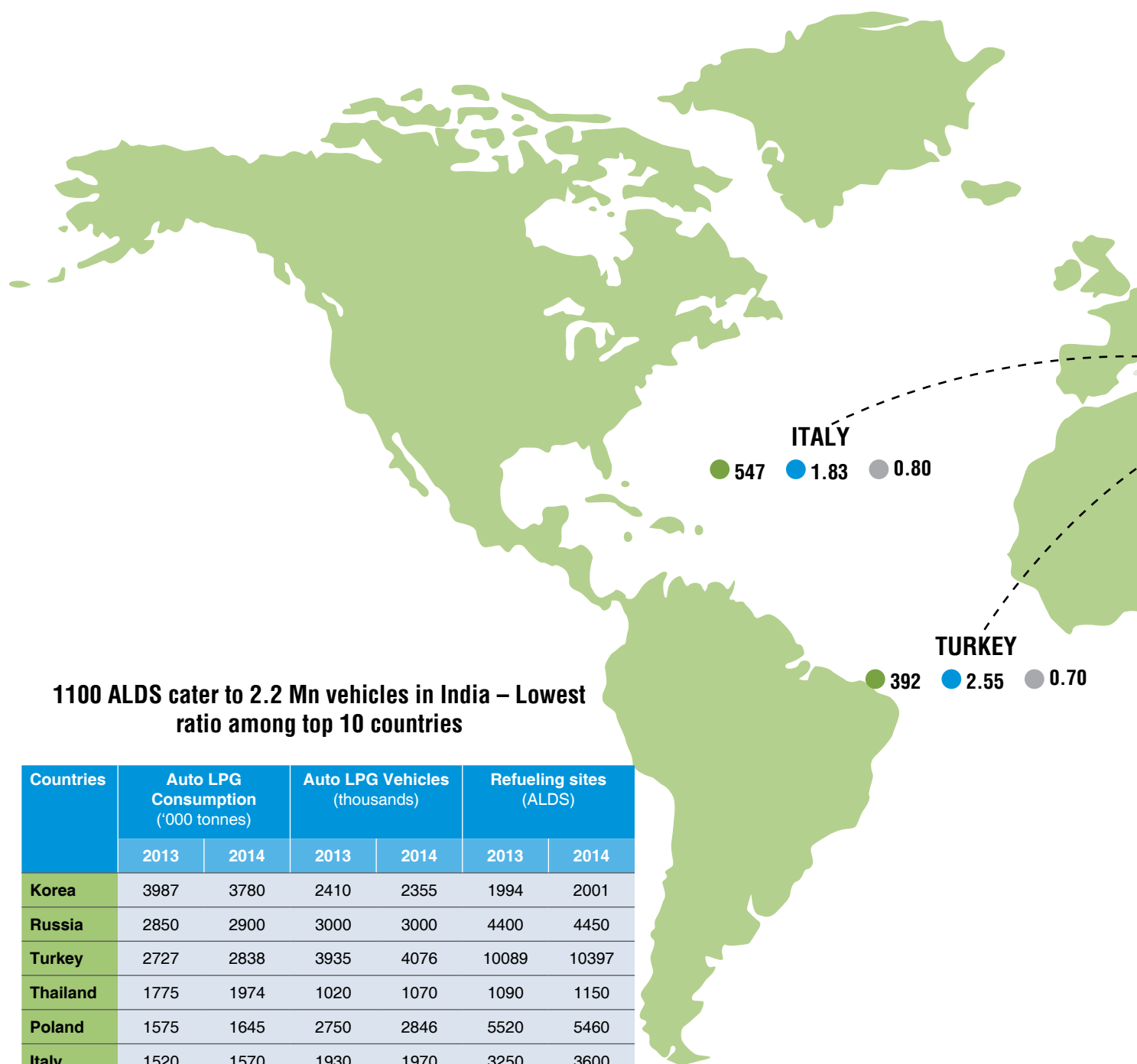
## Other Measures

- Government own-use of Alternate Fuel Vehicles (AFVs)
- Information dissemination and public awareness campaigns
- Voluntary agreements with OEMs to develop and market AFV technologies
- Direct funding for research, development, demonstration and deployment of AFVs



## 2.3 Global Demand & Usage Pattern

- No. of vehicles / ALDS
- No. of ALDS/ per thousand vehicle
- Annual Consumption per vehicle (tonnes)



**1100 ALDS cater to 2.2 Mn vehicles in India – Lowest ratio among top 10 countries**

Countries	Auto LPG Consumption ('000 tonnes)		Auto LPG Vehicles (thousands)		Refueling sites (ALDS)	
	2013	2014	2013	2014	2013	2014
Korea	3987	3780	2410	2355	1994	2001
Russia	2850	2900	3000	3000	4400	4450
Turkey	2727	2838	3935	4076	10089	10397
Thailand	1775	1974	1020	1070	1090	1150
Poland	1575	1645	2750	2846	5520	5460
Italy	1520	1570	1930	1970	3250	3600
Japan	980	1123	234	226	1517	1503
Australia	813	725	490	470	3703	3600
India	317	282	2200	2200	-	1100



About 60% of current ALPG users in India are dissatisfied with the availability of ALDS\*



map not to scale

\* MDRA Survey

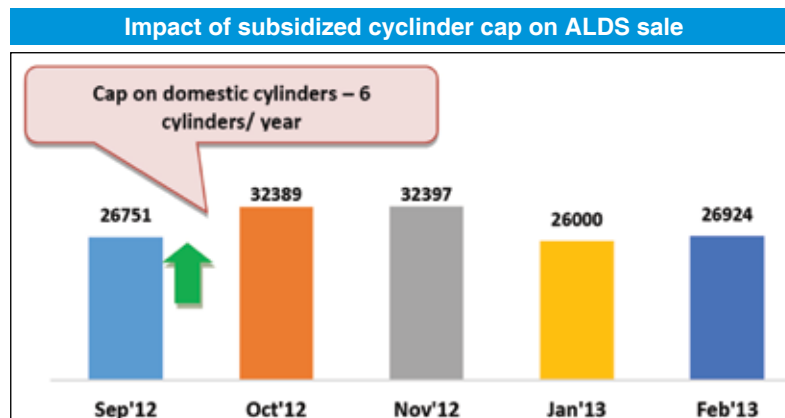
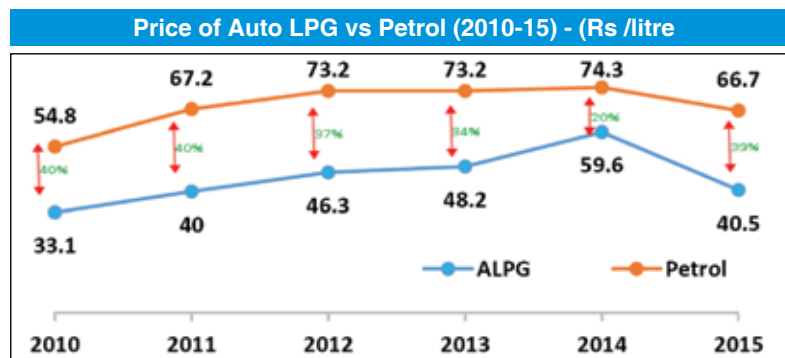


## 3. AUTO LPG: INDIAN CONTEXT

### 3.1 Historical

LPG as an automotive fuel was notified in India in 2000 and in one and a half decades of its existence, it has seen many ups and downs. The key reasons for Auto LPG not becoming hugely successful in India are –

- Narrowing price differential between petrol and Auto LPG in the first half of this decade
- Significant diversion of subsidized domestic LPG cylinders
- Low awareness about LPG as automotive fuel
- LPG primarily perceived as “fuel for cooking” by policymakers
- Un regulated retro fitment of Auto LPG kits
- Inadequate number & coverage of ALDS



### Auto LPG in India

- 2000** Sale of LPG as Auto fuel first notified
- 2003** Bajaj launched LPG 3-wheeler
- 2004** Maruti launched OMNI LPG
- 2006** Maruti launched Wagon R Duo  
Bajaj Auto LPG 2-wheeler launched  
Atul Auto LPG 3-wheeler launched
- 2008** TATA launched LPG version of Indica  
HM launched Cedia LPG  
Hyundai launched Auto LPG Santro  
TVS launched LPG version of 3-wheeler
- 2009** GM launched Spark and Beat (LPG)
- 2012** Major OEMs discontinued Auto LPG variants due to lack of demand  
Hyundai still continuing with Auto LPG variants (Eon, i10) in some markets

*Almost all largest & popular OEMs have relied on ALPG however, forced to discontinue production due to insufficient demand.*

Diversion from cooking LPG has been a major deterrent for ALPG sales – substantiated with a 22 % increase in ALPG sales when the cap of 6 cylinders was introduced in Sept 2012 that too only in 15 days. After increasing cap limit to 9 cylinders in Jan 2013, drop in sales of ALPG observed.



## Opportunities for Auto LPG in India

- Possibility of lower taxes on LPG under proposed GST bill thereby meaning that the differential with Petrol could be even higher than 50%. Auto LPG could be cheaper than Petrol by almost 55-60%.
- Several new LPG terminals coming up along the Indian Coastline, thereby assuring continued and enough availability for the coming years.
- Reduction/ removal of subsidy on domestic LPG/ Pahal scheme/ "Give it up" campaign
- Global supplies to remain high in foreseeable future at competitive prices – global excess of at least 10 mMT of LPG, thereby meaning continued lower prices.
- Auto LPG is the only viable fuel for 2-wheelers. It is game changer that Industry needs to actively pursue.
- Govt key focus on cleaner fuels and plans to implement BS-VI norms by 2020
- Recent study findings suggested CNG contains harmful nano-particles. Also, CNG engine emits more greenhouse gases than diesel.
- CNG available in limited cities, spreading at slow pace
- Industry's consolidated approach in creating awareness among consumers across the country will have positive impact.
- Several leading private companies are coming up with Auto LPG dispensing stations in the country. Will ensure quick spread of the fuel and easy availability.
- Regulation (restrictions/ enforcement, etc.) by state transport departments/ cities/ courts (e.g. Bangalore, Jaipur, Kolkata, etc.)
- Heavy Duty Vehicles (HDVs) such as – Buses & trucks may be potential users. Diesel fumigation technology can be adopted to fuel HDVs
- Low penetration & non-saturated markets
- Complete deregulation of fuel prices

## 3.2 Opportunities

India is at a crucial juncture and no other time would be as good as NOW to make Auto LPG hugely successful in India. Many opportunities lie ahead:

**Regulation:** The future of Auto LPG depends on the regulation by Governments or judicial orders. Auto LPG penetration is high in cities like Bangalore, Kolkata, etc., mainly due to government mandates. Therefore, going forward, government regulations and/ or court orders can boost Auto LPG market in cities with low/ no CNG network.

**DBTL/Pahal scheme/ Give-it-up campaign:** DBTL & Pahal scheme will decrease diversion which further increase Auto LPG consumption

**Two wheelers may be game changer:** Two wheelers account for nearly 80% of the total vehicles in India. Per km running cost can be reduced with the usage of Auto LPG in two wheelers. OEMs like Bajaj have already introduced Auto LPG two wheelers (Platina) in 2006. As installing CNG kit is not feasible in two wheelers, LPG is the only alternate fuel and hence this segment promises huge potential.

**Global supplies to remain high in foreseeable future at competitive prices:** Supply of LPG will not be an issue in near future as global production capacity of LPG is growing at a faster rate and in 2014, nearly 10 mMT of LPG was available in excess. Stability of constant supply is an important factor for the industry to promote Auto LPG.

**Future Smart Cities:** Government's thrust is on developing smart cities with integrated urban planning for infrastructure and smart mobility. The list of 20 smart cities shortlisted by government – most of the cities are covered with Auto LPG network – a big opportunity to penetrate.

**Industry initiative to improve kit certification process:** Auto LPG conversion kit scan ensure that unscrupulous players are weeded out from the market and quality improves, resulting in confidence building of customers.

**Heavy Duty Vehicles (HDVs) may be potential users:** Auto LPG can be used in Heavy Duty Vehicles as LPG fuelled heavy vehicles are running in many parts of the world (e.g. Toyota "Costar" bus running in Hong Kong, school buses in the US, ambulances in Spain etc.). Indian Auto LPG industry needs to and will continue to work towards –

- OE LPG heavy duty engines
- Bi-fuel
- LPG diesel fumigation technology for HDVs

**Auto LPG availability to increase:** Several leading private companies are coming up with Auto LPG dispensing stations, which will increase the availability of the fuel and will help to boost customer confidence. The increased confidence level among customers can be a proposition for OEMs to come up with Auto LPG models in the market.

**Govt. focus on cleaner fuel:** State governments are putting much emphasis on cleaner fuels to reduce pollution levels. Recent road rationing (odd-even experiment in Delhi), and banning of diesel vehicles in Delhi showcase the rising importance of green fuels. Among green fuels, Auto LPG can be the immediate solution for implementation needs as it is easy-to-transport and needs less back-end infrastructure setup.



**Ensuring to increase Auto LPG awareness among customers:**

Industry's consolidated approach in raising awareness among consumers across the country will have a positive impact. Such campaigns are bound to increase the awareness about Auto LPG among ministries & general public.

**More LPG terminals coming up:** A new LPG terminal is coming up in Kerala with the investment of Rs. 217 crore to facilitate the import of LPG. On completion, the terminal will have the capacity to handle around 6 lakh tonnes of LPG annually. Much more terminals on the coastline are already under construction.

**CNG available in limited cities, spreading at slow pace:** Today, only 46 Indian cities are covered by CNG network. As per PNGRB, there are plans to add 45 new cities to the network taking the total to 91; still a long way from covering the 2000 plus cities/ towns in the country. On the contrary, Auto LPG covers 500 cities and is easily transportable to any city without involving huge infrastructure cost on pipeline network. Auto LPG is a viable proposition in tier II and III cities as well. These cities are untapped by any alternate fuel and offer huge opportunity to Auto LPG.

**Recent study findings suggested CNG contains harmful nano-particles:** As CNG is a competitive clean fuel to Auto LPG, this finding would certainly help in positioning itself as a viable alternative.

**Govt. plans to implement BS-VI norms by 2020:** Government's plan to bypass BS-V and to implement BS VI norms in the country by 2020 will involve much investment in petrol and diesel to meet the said emission norms. Auto LPG will stand in an advantageous position as the present emission norms of Auto LPG are much in line with BS-VI norms and will need very less investment in meeting those norms.

Auto LPG remains the most viable fuel particularly on account of the issues being faced by other alternate fuels, for example – with Electric Vehicles (high cost of ownership and low penetration of EV-charging infrastructure), with Ethanol (insufficient production capacity & its hygroscopic property), with Biofuels (high cost of production), Hybrids (high cost) and with Hydrogen (high storage and production cost).



The environment of two major cities, "Bangalore – The Garden City" and "Hyderabad – The City of Pearls" have immensely benefitted from Auto LPG. Lakhs of Auto LPG vehicles have turned these cities "Cleaner" and "Greener" with the help of this promising fuel.

**Sasi Chemmenkottil**  
Vice President (Marketing & Sales), LPG Division,  
Total Oil India Pvt. Ltd.

## OEM vehicles available in India



Hyundai i10



Hyundai EON



Bajaj Autorickshaw



Hyundai Santro Xing



Chevrolet Beat



TVS Autorickshaw







## 4. WAY FORWARD

### 4.1 Actionable for Stakeholders

It can be concluded that Auto LPG is a viable alternative fuel and most suitable immediate solution to urban pollution especially for Particulate Matters (PM) emission. It has the potential to radically change and bring about a sustainable urban mobility solution. Need of the hour, however, is coming together of all stakeholders and put well-directed, committed efforts.

While some measure scan be adopted immediately, some might be done in medium to long term.

The plan of action has been grouped according to key stakeholders in the industry.

#### A. Policy Makers

##### Short term

- State governments to mandate usage of cleaner fuels (Auto LPG, where it is available) in public transport (taxi, auto, etc.)
- Auto LPG to be treated equivalent to CNG in all regulations/enforcement related to environmental emission
- There should be a clear auto fuel policy on Auto LPG
- Checking diversion of domestic LPG cylinders for automotive usage
- During road rationing experiments, Auto LPG vehicles should also be exempted

##### Medium term

- PESO to ensure more checking centres to facilitate hassle free checking procedures for cylinders
- RTOs to ensure that retrofitting process should not be done through boot space - as it is illegal and dangerous. The retrofitters should make a hole/point on the body of the car for refilling


##### Long term

- Clean fuel to be mandatory in all upcoming Smart Cities as public transport fuel
- Stringent measures to be taken with respect to checking procedures involved with kits/ cylinders – and no renewal by RTO to be permitted without proper checking

#### Policy Makers-Verbatim

“LPG is a clean and safe fuel, as it is used in domestic cooking also – so it will be good as automotive fuel”

“Customer should be given choice of fuel”



Clear skies and green grass if we start using Auto LPG.



**Ajay Kumar**  
CEO, SHV Energy Pvt. Ltd.



## LPG Marketers - Verbatim

“OEM-fitted LPG vehicles more preferred by consumers than retrofitted ones”

“Subsidy on domestic LPG is provided by the Central Government, hence state governments least concerned on checking diversion of cylinders”

“Electric-run rickshaws are close competitors to LPG-run 3-wheelers”

“Auto LPG unloading restrictions by PESO during night time forces pump shut-down during peak day hours (while filling station reservoirs)”

## Kit Manufacturers - Verbatim

“Auto LPG is a clean fuel – carbon content of Auto LPG is much lesser than CNG and it is not inflammable”

“OEMs can tie up with kit manufacturers directly”



**Auto LPG with OEMs**

has a very recent success story with more than one hundred thousand BS II & III ALPG Wagon R cars being sold in India. Need of the hour is to create keen interests amongst OEMs in India for them to promote several ALPG models in the BS IV OBD 2/ upcoming BS VI Emission norms in the country.

**Shishir Agrawal**  
Managing Director – CLH Gaseous Fuel Applications Pvt. Ltd.

## B. LPG Marketers

### Short term

- Ensure delta to be consistent at 50% against petrol & at least 40% at all times
- Clear signage of Auto LPG to be visible at refuelling stations
- Educate customers on economic, environmental & other advantages of Auto LPG – Aggressive Promotional campaigns
- At ALDS, there should be separate bay for private vehicles – Negative psychological effect in the mind of customers if private vehicles stand in the same queue with that of three wheelers

### Medium term

- Explore small cities close to big cities – untapped market and low possibility of CNG network in those pockets in near future will pave way for Auto LPG
- Ensure ALDS availability in all cities, which are not covered under current /planned CGD network
- Boost customer confidence on Auto LPG pricing – “to be consistent”
- Liaison with local civic bodies/ ULBs to mandate use of clean fuel in commercial vehicles

### Long term

- Invest in setting up ALDS network – availability of Auto LPG station is a big issue
- Invest in technology to ensure Auto LPG complies with BS-VI norms without significant increase in price
- Ensure adequate infrastructure (terminals) for LPG import
- Dedicated ALDS for filling-up two wheelers

## C. Kit Manufacturers

### Short term

- Retrofitters to stop selling small electric pumps to facilitate refilling of auto tank from domestic LPG cylinders
- Ensure proper supply chain and sell only to authorized distributors – to ensure quality
- Appropriate fitting of kit to be ensured by quality fitters
- Educate vehicle owners on advantages of Auto LPG
- Bring in mechanism to offer longer warranty on kits to boost customer confidence
- Ensure RTO authorised retrofitters availability in all major cities

### Medium term

- Inspection to be connected with insurance – Insurance companies should not be allowed to insure with lack of proper inspection certificates
- Tie-up with OEMs for zero-mile conversion at dealer end

**Long term**

- Promote two wheelers for Auto LPG retrofitment by – a) educating customers on benefits and b) collaborating with NBFCs such as Bajaj Allianz at low interest & quick financing
- Innovate so that re-fuelling is easier in four wheelers (without opening boot)

**D. Vehicle Manufacturers (OEMs)****Short term**

- Tie up with kit manufacturers in installing kits in the vehicles at dealers point for ensuring zero-mile conversion – as customers have more TRUST value with OEMs
- Launch two wheelers in Auto LPG variant
- Long term planning for HDVs to run on Auto LPG - as it is successful in many countries like US, Hong Kong etc.
- Auto LPG vehicles to be readily available across country
- More Auto LPG variants to be available in the market with all latest features
- More dissemination of information regarding ALPG plans

**Medium term**

- Engage with their counterpart in other countries to obtain latest vehicle technology being used in their countries

**Long term**

- Invest in R&D for Auto LPG technology upgradation for vehicles


**OEMs - Verbatim**

“We are ready to launch Auto LPG models, provided the demand is generated”

“Initial cost and Running cost of vehicle are key drivers for consumers to go for alternate mode of fuel”

“Currently no incentive from Government – need rebate of 3-4% in excise duty”

“If there is any traction in demand – then can develop Auto LPG vehicles”



**Auto LPG –**  
The only Fuel to make  
Green India.

**Amit Shah**  
Managing Director, Ace Gas Conversions Pvt Ltd



**Solution for Pollution.**

**M. Karthigayan**  
Chief Executive Officer, KR Fuels

**4.2 360 Degree Approach**





**AUTO  
GAS**  
**1** KM



# 5. BENEFIT STATEMENT

## 5.1 For Policy Makers

This is a demonstration of how adopting Auto LPG, even as a transitional fuel, can help pollution control in India.

### The need

India has the highest number of polluted cities (13 out of 20) as per WHO latest report. In India, Delhi tops the global list with 153 micrograms of PM<sub>2.5</sub> per cubic meter. According to WHO advisory, PM<sub>2.5</sub> should not exceed 10 micrograms per cubic meter. Due to air pollution, half a million premature deaths happen every year nearly in India. Health cost of air pollution in India is 3% of GDP.

International Agency for Research on Cancer (IARC), which is a part of World Health Organization (WHO), has classified diesel engine exhaust as carcinogenic to humans, based on sufficient evidence that exposure is associated with an increased risk for lung cancer.

The study established that diesel exhaust – a major cause of lung cancer, also has a positive association with an increased risk of bladder cancer. In a country, where a large number of people are exposed to diesel exhaust in everyday life through different modes of transport – this finding is a serious concern.

Hence, this creates a dual need to curb pollution and undoubtedly, the Indian transport sector needs to step into a greener zone with cleaner fuel alternatives and that too immediately. CNG and Auto LPG are the commonly available alternate fuel types in the country.

### CNG – A Promise Forever

While CNG is a good promise, actual availability could take a long time. CNG has limited transportability, as it has to be transported through pipelines. Moreover, setting up such distribution network requires huge investment and is time consuming to set up. However, Auto LPG can be readily transported in cylinders and tankers, which make it easier to distribute countrywide. Therefore, Auto LPG can also be promoted as a transitional fuel and can be put into use while CNG network is being developed.

### How could Govt. promote Auto LPG?

- Making ALPG mandatory for all commercial vehicles in high polluting cities.
- Subsidies on ALPG OEM vehicles
- Subsidies on conversion for ALPG
- Tax waivers on fuel
- Tax waivers on equipment
- Government's mandating own use of only gaseous fuel vehicles.

### Why should Govt. promote Auto LPG?

#### Central Govt

- Auto LPG is clean, economical, convenient, proven & safe fuel
- To ensure no impact on availability of LPG as cooking gas, make mandatory to use only imported LPG at ALDS
- Unburnt hydrocarbons (methane) is a serious issue
- Particulate Matters (PM<sub>2.5</sub>) emission level is reported substantially high in most of the cities of India, including metros

#### State Govt

- Installation of CNG network is very time consuming & extremely cost prohibitive
- ALPG can be promoted as cleaner viable transitional fuel

## 5.2 For OEMs

**Auto LPG as economical, widely available fuel** – Running cost per km of vehicle is prime concern during key decisions related to vehicle purchase and usage in India. A significant proportion of sale of diesel and CNG vehicles are due to their lower running cost. As diesel is getting pricier due to deregulation and is also getting an image of “polluting” fuel and CNG infrastructure is not present in many cities, Auto LPG could be marketed as an economical fuel to tap “leaking customers” who do not want to run their vehicles on expensive petrol. Total vehicle sales could be increased by tapping such potential vehicle-owners who have low budget on operating cost. Assurance of lower prices on account of significant global LPG supply glut.

**Carcinogenic Diesel as an automotive fuel being phased out globally and in India by Courts and NGT** – The recent directive of NGT to de-register all diesel vehicles which are more than 10 years old in Delhi clearly shows Govt. approach towards tackling pollution in Delhi. Eventually, commercial vehicles do not have much option except to opt for gaseous fuels. Auto LPG being economical and environment friendly fuel is best suited to be used in vehicle to control air pollution. Conversion of petrol vehicles to Auto LPG would considerably reduce air pollution caused by vehicular emissions.

**CNG, not so clean:** Media and government attention is catching up with known CNG issues in terms of much higher NO<sub>x</sub> emissions, unburnt hydrocarbons issue, CNG (Methane) being a Greenhouse gas and the very recent key issue of nano particles raised by CSIR in its studies.

**Euro VI compliant** – Auto LPG vehicles are already BS-VI compliant and hence very low investment required for commencing production of Auto LPG vehicles.

**Can ramp up production very quickly in association with the industry** – Availability of ALDS in the country is lesser than petrol and diesel refilling stations however, setting up an Auto LPG dispensing station is much easier and quicker than any other gaseous fuels due to the inherent properties of LPG being portable and no major infrastructural changes required to build a refilling station. Existing petrol & diesel dispensing station premises can be used for putting up an ALDS.

**Tap 2-wheelers market** – The fence-sitters (e.g. students, blue-collar workers, etc.), with low disposable income could be attracted to own a 2-wheeler running on Auto LPG as this would effectively be cheaper than using a public transport.

**Globally OEMs producing Auto LPG vehicles (refer to chapter 1 for further detail)** – Auto LPG is the third most popular automotive fuel in the world and widely used as a ‘green’ fuel, as it substantially reduces CO<sub>2</sub> exhaust emissions. A number of automobile manufacturers like Ford, Fiat, Toyota, Renault, General Motors, Hyundai, Volkswagen, Volvo, Skoda, Dacia and many more are manufacturing Auto LPG OEM models across the world. Technologies and knowhow can be taken by Indian companies from their global counterparts to improve market share.

**Other alternative ‘Drawing Board’ fuels** – Most other alternative fuels, except for electric, have been on the drawing board for decades and will continue to be so, on account of impracticality of implementation. While Electric has seen some traction, well to wheel emissions need to be considered when considering real environmental impact.

**Marketing as bi-fuel vehicle** – As Auto LPG vehicles are normally bi-fuel that run on petrol too, it would be easier to attract new customer segments to experiment with this fuel by communicating the benefits of Auto LPG while alleviating any fear regarding “what-to-do” in case of unavailability of Auto LPG or uncertainty about its price in long term.

**Selling to “space-conscious” buyers** – Customers not willing to compromise on boot space while wanting an economical fuel, can be identified and easily be pursued to go for Auto LPG vehicle giving them comfort of more space with lesser running cost. They can be informed that average tank size of Auto LPG is less than half that occupied by other gaseous fuels.

**Part of armoury against EVs and Hydrogen fuels** – Those OEMs lacking Electric vehicle/ hydrogen fuel technology can use Auto LPG vehicle as a part of their armoury against them as Auto LPG is also a clean fuel.



## Abbreviations

<b>2-W</b>	Two Wheelers
<b>3-W</b>	Three Wheelers
<b>4-W</b>	Four Wheelers
<b>AFV</b>	Alternate Fuel Vehicle
<b>ALPG</b>	Auto Liquefied Petroleum Gas
<b>ARAI</b>	Automotive Research Association of India
<b>CAGR</b>	Compounded Annual Growth Rate
<b>CGD</b>	City Gas Distribution
<b>CNG</b>	Compressed Natural Gas
<b>CO<sub>2</sub></b>	Carbon Dioxide
<b>CSIR</b>	Council of Scientific and Industrial Research
<b>E85</b>	Ethanol 85%
<b>EV</b>	Electrical Vehicle
<b>FAME</b>	Faster Adoption and Manufacturing of Hybrid and Electric vehicles
<b>GDP</b>	Gross Domestic Product
<b>GOI</b>	Government of India
<b>HDV</b>	Heavy Duty Vehicles
<b>IAC</b>	Indian Auto LPG Coalition
<b>KABP</b>	Knowledge Attitude Behaviour & Practices
<b>KM</b>	Kilometres
<b>LDV</b>	Light Duty Vehicles
<b>LPG</b>	Liquefied Petroleum Gas
<b>Ltr</b>	Litres
<b>mMT</b>	Million Metric Tonne
<b>NEMMP</b>	National Electric Mobility Mission Plan
<b>NGT</b>	National Green Tribunal
<b>NMT</b>	Non-Motorised Transport
<b>NO<sub>x</sub></b>	Nitrogen Dioxide/ Trioxide
<b>OEM</b>	Original Equipment Manufacturer
<b>PM</b>	Particulate Matters
<b>PNGRB</b>	Petroleum and Natural Gas Regulatory Board
<b>PPAC</b>	Petroleum Planning & Analysis Cell
<b>SIAM</b>	Society of Indian Automobile Manufacturers
<b>USAID</b>	United States Agency for International Development
<b>WLPGA</b>	World LPG Association

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## About MDRA

Marketing and Development Research Associates (MDRA) is a premier marketing research and consulting organization in India with focus on quantitative and qualitative research. MDRA provides strategic business planning solutions based on research findings and historical data analyses of our clients' business.

Over the years, MDRA has strived to help organizations bring vital market data into their strategic planning processes in order to improve customer satisfaction and enhance competitive advantage. MDRA research provides an in-depth insight, which helps companies in knowing the market and their customers better.



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## Genesis of the roadmap

MDRA in association with IAC conducted a research study to "Prepare a Roadmap for bringing Auto LPG as Viable Alternative Automotive fuel in India". To conduct the study, a robust mix of exploratory and descriptive research methodologies were followed to get a holistic view of the industry and to understand the problem areas to work on. This Roadmap is a call for immediate action by all relevant stakeholders committed to securing a more sustainable future for India and its citizens. 1496 vehicle owners/users were surveyed across 18 cities of India to understand their perception, knowledge, attitude and behavior towards various fuels available in India. In addition, 85 key stakeholders were interviewed to take their perspective about Auto LPG.

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