



World Petroleum Council

FIPI

Federation of Indian Petroleum Industry



## REPORT OF THE WORKSHOP ON "Clean Fuels for Cooking & Transport: Social, Environment & Health Benefits"

WORKSHOP ON  
April 27-28  
**2017**

Organised by  
Federation of Indian Petroleum Industry  
in association with the World Petroleum Council

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# *Glimpse of the Workshop*



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# 27<sup>th</sup> April, 2017 Inaugural Session



Inaugural session: (L-R) Dr. R. K. Malhotra, Director General, FIPI; Dr. Pierce Riemer, Director General, World Petroleum Council; Mr. Christof van Aagt, Senior Energy Analyst, International Energy Forum; Mr. S. Rath, Director (E&P), FIPI.



“The refineries in India are now preparing to leap frog from BS IV to BS VI equivalent stage from April, 2020 which will help reduce in vehicle emissions. Even limited supply of BS VI fuel has been committed by some refineries to auto companies for testing purposes”

Dr. R K Malhotra, Director General, FIPI welcomed the eminent speakers, guests and participants. In his address, the steps being taken by the Government for increasing the reach of cleaner fuels to BPL families were highlighted. He mentioned about various government schemes like PAHAL (direct cash transfer), Give it Up (to give up LPG subsidy voluntarily), PMUY and how benefits obtained from schemes like Give It Up have worked towards providing cleaner fuels to rural India. He also highlighted about the supply of BS IV fuels in the entire country from April, 2017 which will reduce overall emission scenario from the transport sector. He also stated that the development of piped natural gas will help in shifting LPG used in urban areas to rural areas. He also highlighted different initiatives taken both for CNG & LNG as a transport fuel for road and railways.



Dr. Pierce Riemer, Director General, World Petroleum Council



Dr. R K Malhotra, Director General, FIPI

“Meeting future demand in a safe, socially and environmentally responsible manner will require massive investments, leading edge technology, high skilled human resources and superior ethical business practices”

Dr. Pierce Riemer, Director General, World Petroleum Council in his address mentioned that among fossil fuels natural gas will dominate. In his opening remarks he highlighted the activities which are carried out by World Petroleum Council. He mentioned that WPC are dealing with issues of energy poverty along with issues pertaining to technological, geo-political as well as cost uncertainty. He mentioned that during the workshop, WPC will be able to see the developments towards use of cleaner fuels in India and what industry can do to bring people out of energy poverty. He mentioned that WPC is looking towards innovative ways which are implemented in India, which can possibly be replicated in other parts of the world.



“The energy used in cooking and transport helps to define the health and prosperity of any society and determines prospects for equitable growth too”

Mr. Christof van Agt, Senior Energy Analyst, International Energy Forum, stated that in one of the recently concluded workshop by IEF, the outcome was to give emphasis on promoting a dialogue between producer & consumer along with bringing transparency to achieve shared goals. He said that with the GDP growth in India (~7%), India's energy demand will grow rapidly. He mentioned that the growth rate of oil products is already surpassing 4% and refinery capacity is already in place to accommodate more growth. He mentioned that IEF is proud to be associated with FIPI and WPC and the outcome of the workshop will be of great interest to them.



**Mr. Christof van Agt, Senior Energy Analyst,  
International Energy Forum**



**Mr. S Rath, Director (E&P), FIPI**

“Energy access in India has been recognized as a critical input for its sustainable development. Along with access of energy it is very important to note that such energy is clean and affordable for uplifting quality of life of people”

In the conclusion of inaugural session, Mr. S Rath, Director (E&P), FIPI gave the vote of thanks to the eminent speakers. In his address he distinguished the urban and rural population as 'energy rich' and 'energy poor'. He mentioned that both segments fall under the category of 'poor health' and strong measures need to be taken for health improvement. He mentioned that in order to sustain, the business entities and policy makers both have to think differently, adapt as per the requirement of consumers and realign business and policies with Social, Environment and Health benefits in mind.



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## 27<sup>th</sup> April, 2017 Session – I



**Session Chairman** - Mr. M. A. Pathan, former Chairman, Indian Oil. (L-R) Mr. Rajeev Mathur, Managing Director, Mahanagar Gas Ltd; Mr. M. A. Pathan, former Chairman, Indian Oil; Dr. Ajay Mathur, DG, The Energy and Resource Institute (TERI); Mr. M. B. Dilip Rai, Dy. General Manager (LPG-OPS), IOCL

“India is a compelling market and it is need of the hour to promote essential infrastructure to support gas based economy. While government’s commitment towards development of same is ratified by its plan to extend the piped gas to 10 million houses over the next 05 years and doubling the length of natural gas pipeline to 30,000 kms”

This session was focused on access of clean fuel in urban and rural areas. The session was chaired by Mr. M. A. Pathan, former Chairman, Indian Oil. In his opening remarks he stated that with the drive of giving new LPG connections to rural India, the country has been able to achieve a distinguished number of 32.5 million new gas connections and surpassing Japan in terms of total LPG import.



**Mr. M. A. Pathan, former Chairman, Indian Oil**



# Policy interventions for promoting LPG in India



“ If there is a problem of availability of LPG fuel, it meant one has to stack fuels and one could not depend on LPG as a prime source of cooking fuel ”

Summary of his presentation is as follows:

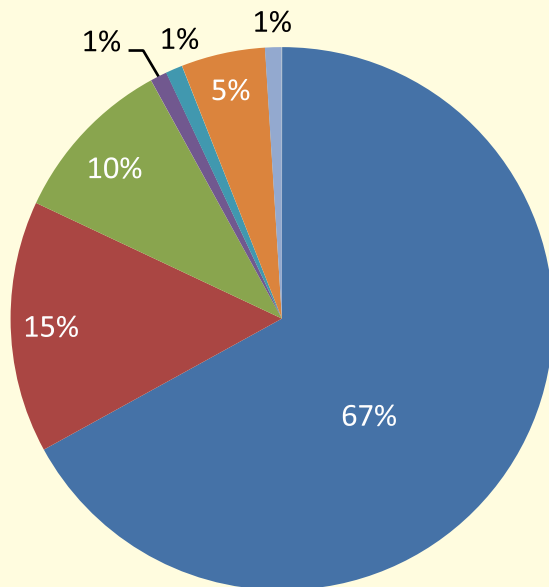
- Discussion on policy interventions to promote LPG in India while improving the efficiency in supply chain
- Existing policy push include PAHAL, PMUY and free trade of small size LPG cylinder
- In a survey conducted on factors impacting transition in cooking energy choice, it was found that efficient delivery system ranks third among other factors for use of LPG.
- Analysis revealed that timely delivery remains a concern with high distances & with cap on the number of refills by a distributor, even with increase in distributor base, delivery issues still prevails.
- Hub and spoke model is one way to address the issue along with creating franchisees to kirana stores / other vendors
- The recommendations include, promotion of composite cylinder, subsidize upfront high cost of cylinders and subsidy for 5kg cylinders should be given



**Mr. Ajay Mathur, Director General, TERI**

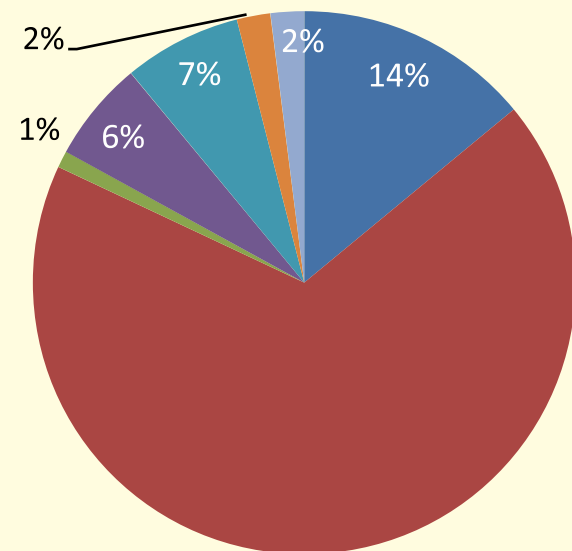


### Distribution of households by Primary source of energy for cooking - rural (%)



- Firewood & Chips
- Dung Cake
- No Cooking Arrangement
- coke/coal
- LPG
- Kerosene
- Other sources

### Distribution of households by Primary source of energy for cooking - urban (%)



- Firewood & Chips
- Dung Cake
- No Cooking Arrangement
- coke/coal
- LPG
- Kerosene
- Other sources

# Development of Natural Gas Distribution Infrastructure in Cities



“Gas pipeline density in developed countries like US is almost 10 times than what we have in India. There is enough opportunity for creation of pipeline infrastructure to reach all the cities in India”

Summary of his presentation is as follows:

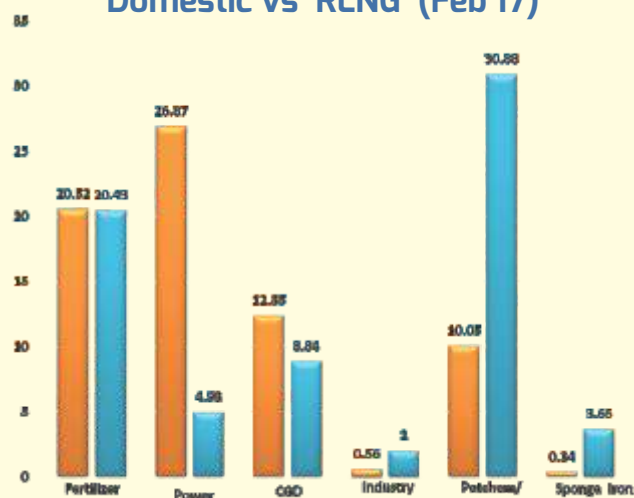
- The pipeline network in India is projected to grow from 16000 to 30000 kms (384 to 936 MMSCMD) and for LNG penetration development of regasification infrastructure is also required
- Initially due to skewed development of the trunk pipeline, there has been development of CGD networks only in limited areas which is near to the trunk pipeline
- New plans for development of gas pipeline i.e. Urja Ganga (Jagdishpur-Haldia-Bokaro-Dhamra pipeline) where CGD network development will take place in parallel to development of trunk pipeline.
- Government also have plans to develop Green Corridors along NH (~1800 km), with the current global LNG scenario gas availability in India will not be a problem
- Mr. Mathur mentioned that there are various enablers available for growth of natural gas in India and target is to connect 10 million households by 2019 and cover more than 228 cities for CGD
- Some key challenges still persist like single window clearances, non uniformity of tax structure, availability and price of land to setup CGD, long gestation period, exorbitant and unsustainable charges levied



Mr. Rajeev Mathur, Managing Director, MGL



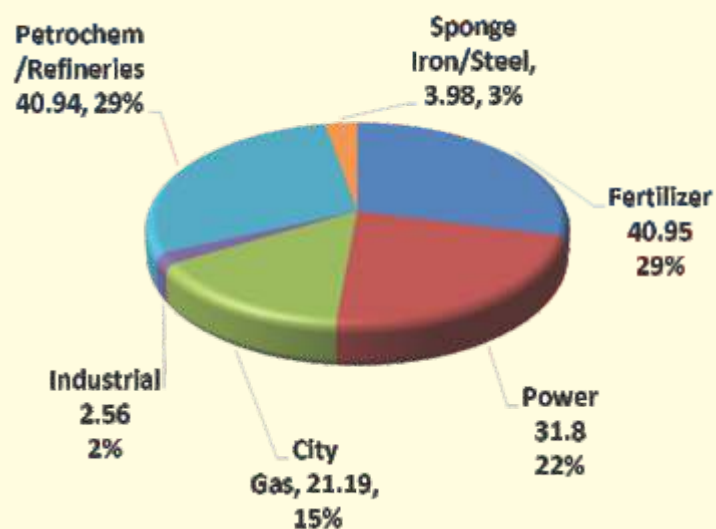
### Natural Gas Consumption: Domestic vs RLNG (Feb'17)



All figs in MMSCMD

■ Domestic Gas Consumption ■ RLNG Consumption

### Sectoral Consumption of NG, Feb'17



Total NG consumption = 141.42 MMSCMD

### Planned / Proposed green corridors

S. No.	Name of Corridor	Distance (Km)
1	Mumbai-Pune Expressway	150
2	Kanpur-Lucknow	90
3	Delhi- Meerut- Roorkee- Haridwar	208
4	Agra-Firozabad- Kanpur	280
5	Delhi – Mathura – Agra	206
6	Delhi – Chandigarh	250
7	Agra-Gwalior	120
8	Indore-Gwalior	500
	Total	~ 1800 km



# LPG Supply Chain Management



The summary of his presentation is as follows:

- Mr. Rai addressed that the scale of LPG supply chain management is to cater around 4 million customers on daily basis and 198 million in total with around 19000 distributors.
- During the presentation he highlighted on the contracts in practice to source LPG and increase of import of Propane to reduce the import bill
- He highlighted the problems associated with the distribution of LPG to isolated areas with transportation cost exceeding the cost of a LPG cylinder
- He highlighted various schemes / distribution channels which are being implemented:
  - Type of Distributor based on population of Market (Sheheri / Rurban / Gramin / Durgam Kshetriya Vitaraks).
  - Cylinders delivered to distributors from Bottling Plants.
  - Home delivery by distributors.
  - LPG Suvidha Kendra in Villages managed by DKV.
  - Urja Rath – Bottling at Rural Distributors godown.
  - Various modes of last mile delivery mechanisms.

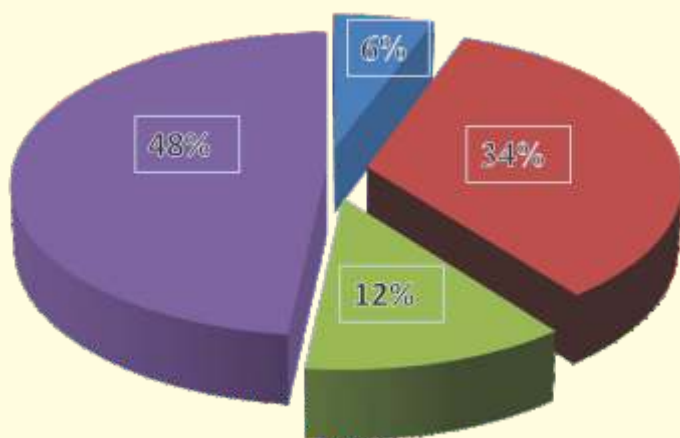


**Mr. Dilip Rai, Deputy General Manager, IOCL**



## LPG supply sources

### Percentage of Supply Sources



- Refinery (Pvt)
- Refinery (PSU)
- Fractionators
- Imports

**198 million**  
Customers across  
the country

**33 million**  
New connections  
released in year  
2016-17

27<sup>th</sup> April, 2017  
Session – II(a)



**Session Chairman** - Mr. Ashutosh Jindal, JS(M), MoP&NG and Mr. Prabhat Singh, MD & CEO, PLL.  
(L-R) Prof. Kirk R. Smith, Professor of Global Environmental Health, Director of the Global Health and Environment Programme, University of California, Berkeley; Mr. Ashutosh Jindal, JS(M), MoP&NG; Mr. Prabhat Singh, MD & CEO, PLL; Mr. Karthik Ganesan, Research Fellow, Council on Energy, Environment and Water



**Mr. Prabhat Singh, Managing Director & CEO, PLL**

“ Today it is a sunshine time for the gas industry as gas is available at cheaper prices and a consumer country like India should try and extract every bit of this advantage ”

Mr. Prabhat Singh in his opening remarks highlighted the importance of LNG as a new age fuel. He specified that the economic comparison of LNG with other fuels has to be taken by considering overall impact of fuel on health and environment.

Mr. Ashutosh Jindal in his closing remarks mentioned that industry as well as government should constantly realign its thoughts towards providing energy and should adapt to the changing environment. He highlighted the importance of car / vehicle sharing. He mentioned that if car sharing between 2 persons persist for long time, it results in 10 less cars purchased in the entire ecosystem which surely will help towards energy savings. He also stated the aggressiveness of the electric vehicles which is likely to get developed in near future. Industry need to adapt to the likely changes.



**Mr. Ashutosh Jindal, Joint Secretary, MoP&NG**



# Health Impact of a Switchover to Clean Cooking Fuels

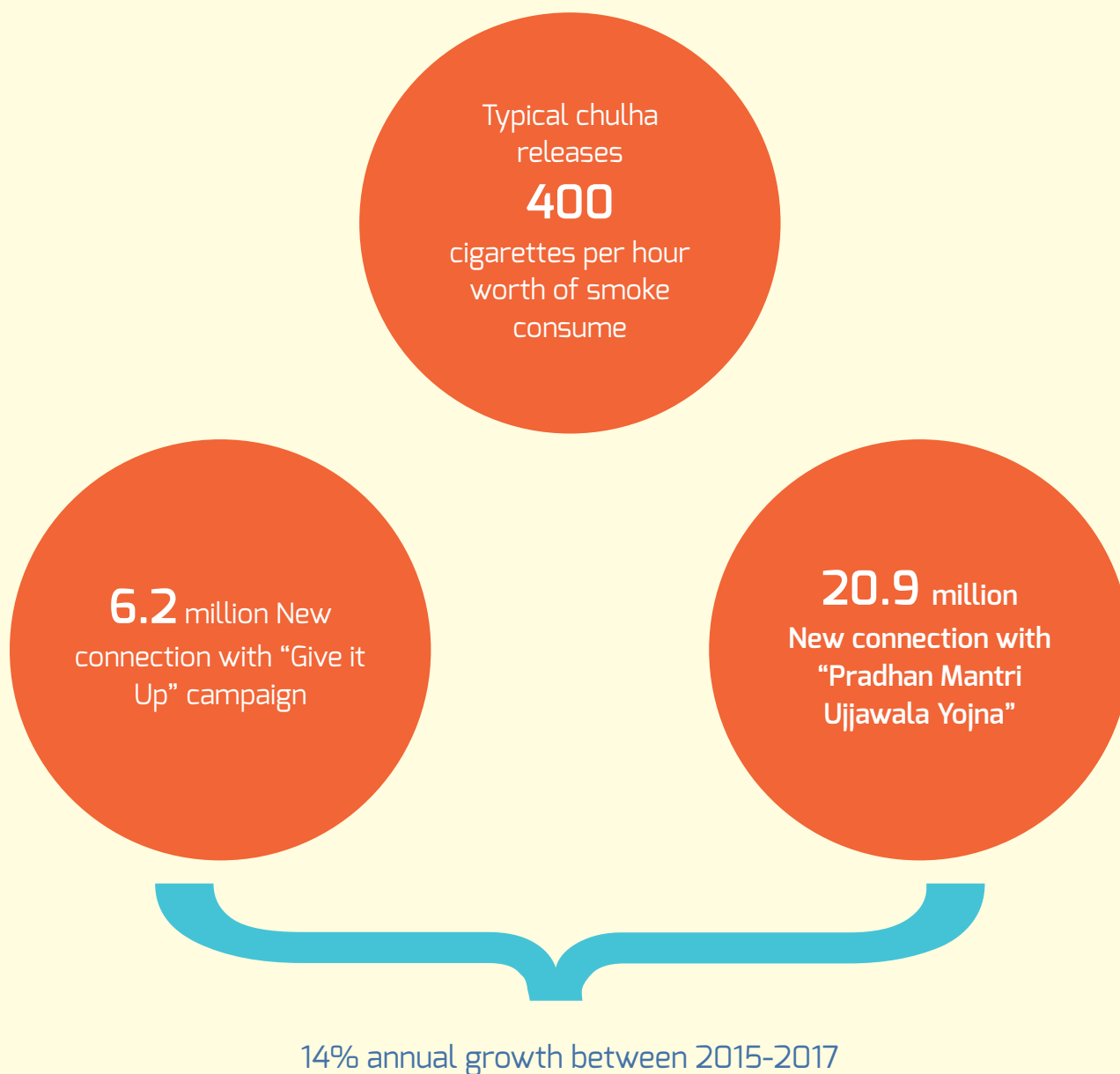


**Prof. Kirk R. Smith, University of California Berkeley**

“The current program is focused on BPL families but there are many who are not qualified for BPL are still using Biomass, as a next step they need to be promoted to LPG too”

Summary of his presentation is as follows:

- Highlighted the impact on health with the use of conventional chulha.
- Difference in energy efficiency of the conventional chulha (15%) against the LPG stove (65%)
- Since 1990 to 2013 around ~700 million people are relying on solid fuels in India with percentage decreasing but the absolute number remaining constant
- The government of India schemes i.e. Give-it-Up and PMUY have led to increase in customer base with a growth rate of around 14% which has doubled in last 3 years.
- Since PNG customers give up their LPG the total clean fuel growth is even higher and with PAHAL and other initiatives, India has reduced some 40 million duplicate or ghost connections which is an important achievement
- For way ahead, new version of PMUY to Ujjwala-Mamta program, which promote LPG distribution to pregnant women



## LNG as an Automotive Fuel



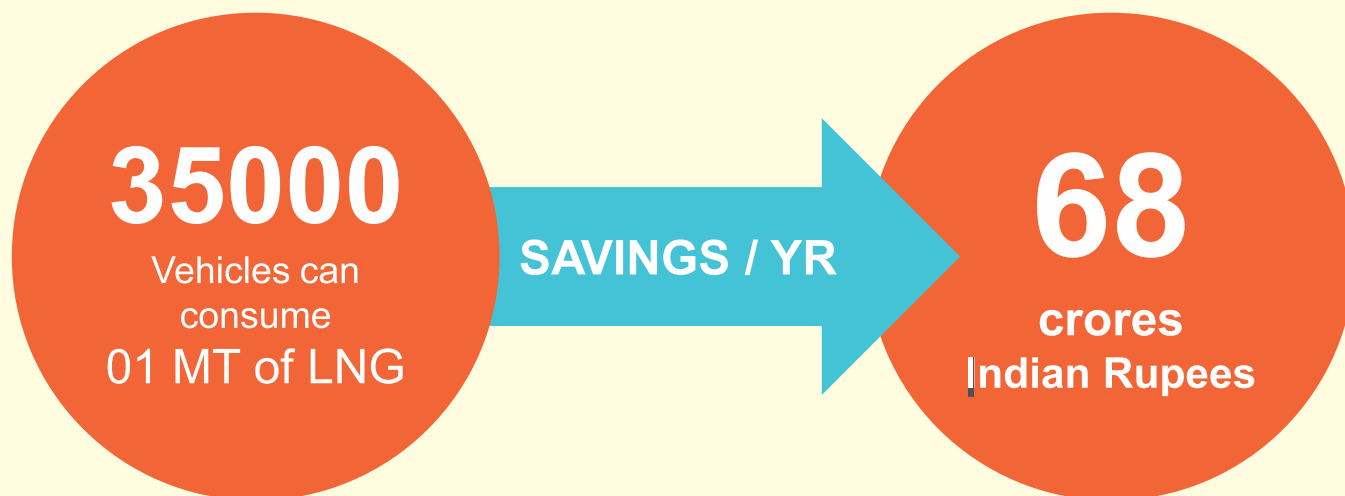
“Even in terms of 50\$/barrel of crude oil and 13% slope of LNG which is available, we have an arbitrage of nearly around 2-2.5 billion USD if we replace 10% of crude from the current consumption pattern. With this arbitrage we have to see how to make best use of it”

Summary of his presentation is as follows:

- Application of LNG as a fuel which can be used in Rail, Road and Maritime
- LNG as Automotive Fuel with a case study of China where LNG truck fleet rose from 70,000 (2012) to 300,000 (2015) and success stories of Europe and America
- Economics of use of Diesel v/s LNG and as per the analysis the potential savings varied between 42% and 25% depending on price of crude.
- The emissions level with use of LNG is far low as compared to the BIS – VI norms for diesel as a fuel
- PLL is planning to develop a pilot route with 20 LNG fuelling stations and ply 100 trucks on Delhi-Mumbai corridor and Kochi-Mangalore corridor
- Launch of India's First LNG bus took place in 2016
- The recommendations include role of government – to act as an enabler by having policies and regulations which help in moving forward this program in swift mode.
- Savings in oil subsidy to form basis to part fund the infrastructure investment.



**Mr. Prabhat Singh, Managing Director & CEO, PLL**



S. No	Parameters	BIS – IV norms (g/km)	BIS -VI norms (g/km)	Percentage difference BIS IV & BIS VI	NG Emissions (g/km)
1	CO	0.50	0.50	0%	0.22
2	NOx	0.25	0.06	76%	0.25
3	PM	0.025	0.005	80%	0.0029

*Emissions standards*



# Making Transportation Cleaner India's Options



“ Incidentally only 5% of the fuel that is burnt in your car is actually carrying the passenger, the rest of it is carrying the vehicle. Who we are moving here, the car or the person sitting in the car. We have to think about it ”

Summary of his presentation is as follows:

- The presentation highlighted the issues of urban pollution in India & a comparison of Tier 1, Tier 2 and Tier 3 cities was shown
- As per the analysis by CEEW, Diesel and Petrol contribute 29% of pollution with Coal standing at 26.1%
- In India Corporate Average Fuel Consumption (CAFC) is lowest when compared globally.
- He suggested solutions for higher utilisation of fuel grade ethanol
- Electric vehicles with improvement of battery technology have a very high potential of growth but development of charging infrastructure remains a question
- As per the analysis, the tune of taxation from petroleum products is around USD 47 billion in India however the same is not being utilised for development of infrastructure / public transport
- He talked about imposition of taxes in name of pricing carbon and measures to channel the funds to promote cleaner transportation and the need of a roadmap for channelizing such funds.



**Mr. Karthik Ganesan, CEEW**



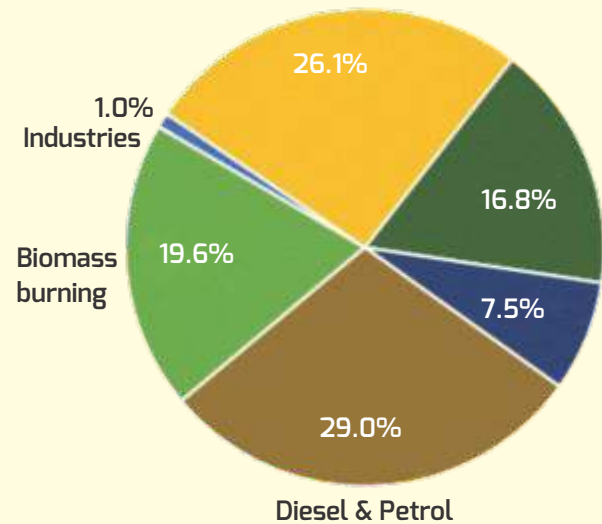
**40%**

Of market price of  
gasoline / petrol  
and diesel  
represents tax

**\$47  
billion**

Overall taxes from  
petroleum  
products in last  
fiscal

**Subsidy offered for consumption of  
petroleum products merely USD 4 billion**



Pollution – Percentage share

## 27<sup>th</sup> April, 2017 Session – II(b)



**Session Chairman** – Dr. Anjan Ray, Director, CSIR-Indian Institute of Petroleum.  
(L-R) Dr. Amit Kumar, Professor, Department of Mechanical Engineering, University of Alberta;  
Dr. Anjan Ray, Director, CSIR-Indian Institute of Petroleum.; Mr. Abhishek Jain, Senior Programme  
Lead, Council on Energy, Environment and Water;

Dr. Anjan Ray in his opening remarks mentioned that the speakers should try and address the issue of 'how to measure effectiveness and sustainability of the different government programs which are being implemented.' As the measurement is a key indicator about the success of a specific program and hence need to be adequately covered in program design. .



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## LPG for clean cooking energy access

“ Unless there is a bottom up demand for the fuel, the sustained use of LPG will not going to happen ”

Summary of his presentation is as follows:

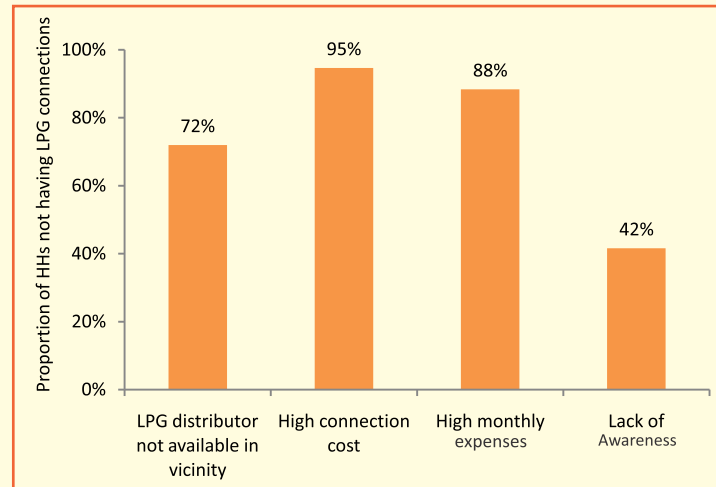
- With schemes like Give it Up and PMUY, although there is an increase in number of LPG connections but sustained use of LPG with these new connections is a question which need to be addressed.
- An analysis of cash spend for different fuels in regions was done and derived a conclusion that households using LPG spend less when energy efficiency is considered
- The research include that in rural areas over 1/3rd households do not believe (or are unaware) that using LPG instead of the chulha will have positive health benefits
- To implement sustained use of LPG we have to leverage trustworthy information channels
- It was emphasized that apart from MoP&NG, other ministries should also assist in increasing LPG penetration in rural areas
- As a next step the target should be on developing LPG penetration with the left-out consumer groups i.e. Urban poor, Rural SECC non-BPL along with improvement of distribution of LPG and last mile delivery in rural areas



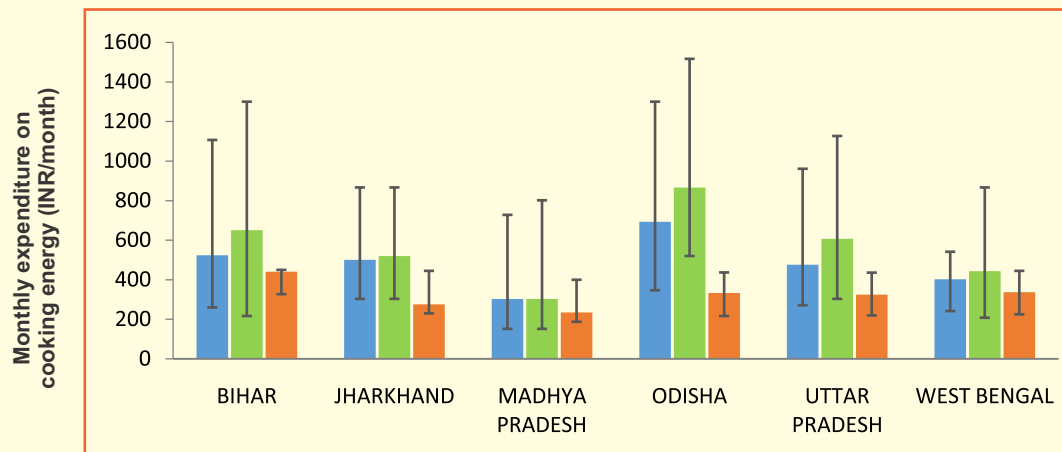
Mr. Abhishek Jain, CEEW



## Barriers to getting LPG connection?



## Monthly expenditure on cooking energy for households reporting real outlay



- All households spending some real cash for cooking energy
- All household spending cash, but not on LPG
- All household using only LPG



## A Systems Level Assessment of Biofuels and Hybrid Electric Vehicles for Transportation Sector

Summary of his presentation is as follows

- Canada's GHG emission reduction target to 30% from 2005 level to 2030 and have carbon tax both at Federal level and provincial level in Alberta.
- Along with challenges to assess the GHG mitigation the presentation was focused on how science based comprehensive information is available for decision makers to develop policies for GHG mitigation
- Presentation highlighted about LEAP model used in studying energy environment problems
- In the analyses presented, 24 different energy saving options were assessed with potential use of ethanol and biodiesel in passenger vehicles and vehicles for freight respectively
- With the use of ethanol and biodiesel, a potential reduction of GHG emissions by 1-2 MT/year in transportation sector
- Different schemes of biofuels integration with transportation sector was also discussed.



**Dr. Amit Kumar, University of Alberta**



# 28<sup>th</sup> April, 2017

## Session – III



**Session Chairman** - Dr. Y. B. Ramakrishna, Chairman, Working Group on Bio Fuels, MoP&NG, Govt. of India

(L-R) Dr. Y. B. Ramakrishna; Mr. Jitendra Goyal, General Manager, Product Design & Development Division, Toyota Kirloskar Motor Pvt. Ltd.; Dr. Anirudh Gautam, General Manager, Rolling Stock Division, RITES (Research Designs & Standards Organization), Lucknow

“Renewable Sector is not a competitor to Petroleum Sector, the kind of efforts which are going on in Renewable Sector is complementing the work that has been done by the Petroleum Sector. The directions of government are very clear for petroleum companies to realign their strategy of becoming an energy company”

This session was focused on transport fuel like bio fuels along with technology changes which are being implemented in the automotive sector. The emission targets in automotive sector to achieve Zero Emission as well as technology changes in Indian Railways were discussed in the session.



**Dr. Y B Ramakrishna, Chairman,  
Working Group on Bio Fuels, MoP&NG**



## Outlook of bio fuels for use in transport sector



**Dr. Y B Ramakrishna, Chairman,  
Working Group on Bio Fuels, MoP&NG**

“OMC’s like MRPL & NRL will be setting up 12 commercial 2G Ethanol plants and private investors will invest in setting up 16 commercial Ethanol plants with total installed capacity of 1.5 to 2.0 billion liters per annum. New capacities will lead to increase in blending rate from current 4% to 10%”

Summary of his presentation is as follows:

- The policies on bio-fuels in India were adopted in 2009 with a National target to achieve 20% blending by 2017 for both bio diesel and bio ethanol.
- Statistics show that only 4.3% ethanol blending achieved in year 2016
- With current policy regime, concerns on achieving even 10% blending target through molasses route.
- Use of agriculture residues for generation of ethanol will need a viable and robust bio mass supply chain with Bio mass aggregation, densification, processing, storage infrastructure in place
- Viability gap funding (VGF) to an extent of 40% is needed to achieve the targets
- Biodiesel blending (B5) and retailing pilot started on 10th Aug 2015 in 5 cities and 12 outlets in the country
- Bio gas as replacement to LPG, CNG and methanol blending with Gasoline and DME with Diesel and LPG are some other initiatives to be taken up



### Ethanol Blending Pan India

1.7%

December 2014



5%

December 2016

**250**

Million tonnes of  
surplus bio mass  
burns yearly in  
India

Challenge is to create a viable and robust bio  
mass supply chain for ethanol conversion



## Hybrid Electric & Hydrogen Fuel Cell Vehicles – Future of Mobility

“Future mobility and fuel requirement will be based on the size of vehicle and distance to travel. A single technology will not act as a solution to all needs. For short distances electric vehicles will be suitable, for general purposes hybrid and PHVs (plug in hybrid vehicles) will be required and for medium – long distances FCVs (hydrogen fuel cell vehicles) will play a crucial role.”

Summary of his presentation is as follows:

- Toyota is committed towards Zero Emission Environment by 2050 and is working on a wide range of environment technologies
- The energy management system in hybrid vehicles is the backbone for providing better efficiency
- Toyota's Prius with fuel economy of 27.16 km/l is world's largest selling hybrid car while Camry (made in India) with fuel economy at 19.16 km/l
- Toyota is focused on fuel diversification and is working rigorously to on different technologies i.e. electricity, hydrogen, biofuel and natural gas
- Focus on hydrogen fuel, with development of MIRAI with zero CO<sub>2</sub> emissions with similar capabilities as of cars plying globally
- Toyota has even developed cultivation methods for raw materials of bio-ethanol and gene modified yeast for conversion technology.



**Mr. Jitendra Goyal, General Manager, Toyota**



	Electricity	Hydrogen	Biofuel	Natural Gas
	EV	FCV	Internal Combustion Systems	Internal Combustion Systems
Well to Wheel CO <sub>2</sub> *	★~★★★★	★~★★★★	★~★★★★	★★
Supply Volume	★★★	★★★	★	★★
Cruising Distance	★	★★★	★★★	★★
Refueling Time (Charging/Filling)	★	★★★	★★★	★★★
Infrastructure	★★	★	★★★	★★

Comparison of different kind of vehicle fuels against running parameters



## Sustainable Energy for Locomotives of Indian Railways



**Dr. Anirudh Gautam, General Manager, RITES,  
Ministry of Railways**

“Sustainable transport fuel characteristics are closed loop, least polluting, GHG neutral, economical, compact with high energy and power density and is also scalable”

Summary of his presentation is as follows:

- Cost economics comparison with potential savings with use of LNG over diesel in railways to the tune of 44.6% (diesel fuel expenditure bill in 2011-12 was Rs 11000 Cr)
- Railway Board has sanctioned development of prototype LNG gas turbine loco by Research Design & Standard Organization (RDSO)
- Already one prototype gas turbine locomotive running in Russian Railways since 2008, order for 40 numbers placed by Russian Railways
- The presentation also discussed development of methanol locomotive. Methanol blends with diesel fuel and related technicalities were discussed
- Potential savings by using methanol conversion was also discussed in his presentation





**28%**

Cost differential  
between Methanol  
and Diesel

**44.6%**

Cost differential  
between LNG and  
Diesel

	Diesel locomotives	Electric Locomotives	LNG Locomotives
Fuel consumption (diesel / diesel equivalent per year)	3 billion litres	3.8 billion litres	3 billion litres
NOx (ktons)	600	680	300
PM (ktons)	25	385	2



## 28<sup>th</sup> April, 2017 Session – IV



**Session Chairman** – Mr. Sanjiv Singh, Director (Refineries), IndianOil  
(L-R) Prof. L. M. Das, IIT Delhi; Dr. Tapan Sahoo, Sr. Vice President (R&D), Maruti Suzuki India Ltd.; Mr. Sanjiv Singh, Director (Refineries), Indian Oil; Ms. Rashmi Urdhwareshe, Director, ARAI

“The challenge is to have a clean environment in spite of consuming more fuel while the pressure would be on existing technologies while switching over to new possible fuels of the future. The biggest challenge to industry both oil and automotive is that if nothing changes drastically we need to meet the demand of the future, if things change drastically then to adapt ourselves for those change requirement”

This session was also focused on transport fuel like use of hydrogen and domestic technology development in automotive sector.



**Mr. Sanjiv Singh, Director (Refineries), Indian Oil**

# Potential of Hydrogen as a Clean Transport Fuel



**Prof. L. M. Das, IIT Delhi**

“ IC engines can be configured with neat hydrogen ( $H_2$ ), hydrogen supplementation (petrol+ $H_2$ ),  $H_2$ +CNG and diesel+ $H_2$ . Hydrogen as a fuel can be used in bicycle, yacht, boats, trains and may also in aviation sector too ”

Summary of his presentation is as follows:

- Use of Hydrogen as a fuel which is an abundant, clean and efficient fuel
- He discussed about major research activity in the field of Hydrogen IC engines around the world
- Development, demonstration and performance of  $H_2$ -fuelled three wheelers which were jointly developed by IIT Delhi, Mahindra and Air Products in New Delhi (2012) was also discussed
- Providing vehicle mileage of 75 km / kg of  $H_2$ , 15 vehicles were launched in Delhi to cover 30,000 km to test reliability under long operations



**15**

Vehicles to cover  
**30000** kms  
to test reliability

Demonstration &  
field trials of  
Hydrogen fuelled  
3-wheelers

**75**

Km/kg H<sub>2</sub>  
Vehicle Mileage



# Clean & Alternative Fuels for Transport



**Dr. Tapan Sahoo, Sr. Vice President (R&D),  
Maruti Suzuki India Ltd.**

“From mild hybrid to strong hybrid to full EVs is the path where India can move for future development. If we are able to aggregate the demands in terms of various technologies this will enable the local manufacturing of key components and therefore bringing in affordability”

Summary of his presentation is as follows:

- Indian Auto industry is on a growth track and is poised to become 3rd largest auto maker by 2026
- Maruti Suzuki has produced 5.44 lakh alternate fuel vehicle till date and development of CNG vehicles by introducing new models is in pipeline.
- Discussion on FAME India scheme which was launched to shift focus from development of electric vehicle to electrification of supporting infrastructure
- For emission reduction the issues related to consistency and quality of fuel was touched upon
- He highlighted a problem to oil industry that in order to reach BS VI, ideally fuel availability should be from beginning of 2018-19 but actual fuel availability would be only by 2020-21
- Session chair clarified that BS VI fuel comes at an additional cost and with very low % of vehicle on BS VI, fuel availability plan has to be framed accordingly



## Transportation and ARAI Perspective

“Vision coming out of integrated transport vision statement slightly differs from the auto vision. While auto vision looks at growth numbers, the transport vision statement is for providing sustainable, safe, affordable, smart and integrated mobility system for people of India and therefore it envisages to integrate rails, roads, airways and waterways”

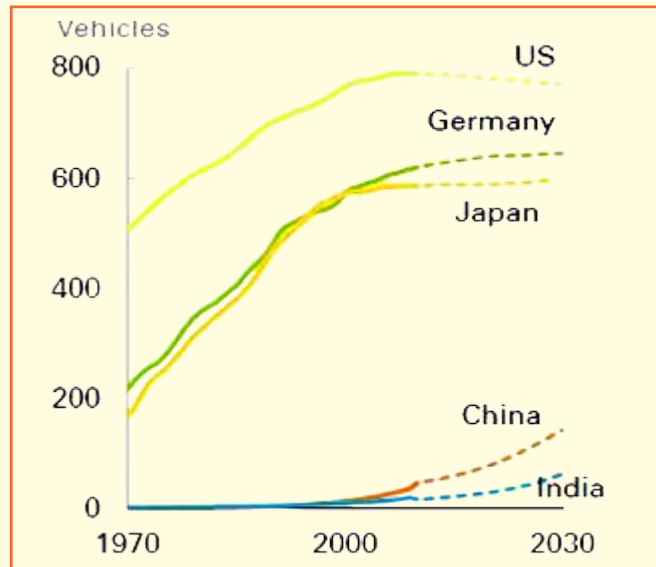
Summary of her presentation is as follows:

- Automotive Research Association of India (ARAI) R&D drivers are working towards low carbon footprints, pedestrian safety, light vehicles, environmental concerns and performance of vehicles
- Currently 182 million vehicles registered in India
- Indian fleet is ageing with more than 30% of vehicles more than 15 years old.
- The average growth of vehicles is 10.16% per annum in last 5 years
- Intelligent transportation system is important for development of better transportation system and focus needs to be shifted from development of intelligent system in car to the overall scheme of transportation
- Notifications on new fuels like LNG, hydrogen CNG and many others are under discussion
- She discussed different engine optimizations which are being carried out. This will lead towards development of new face of transportation

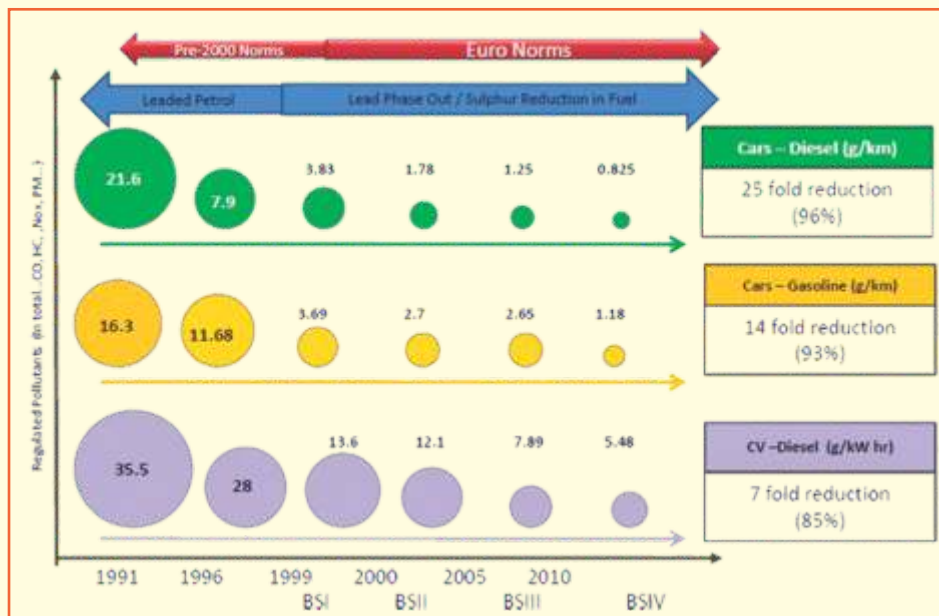


Ms. Rashmi Urdhwareshe, Director, ARAI





Vehicle density per 1000 population in India expected to grow to 65 by 2030





World Petroleum Council



## 28<sup>th</sup> April, 2017 Valedictory Session



**Valedictory session:** (L-R) Dr. R. K. Malhotra, Director General, FIPI; Dr. Pierce Riemer, Director General, World Petroleum Council; Mr. A. P. Sawhney, Additional Secretary, MoP&NG; Mr. N. K. Bansal, Director (Oil Refining & Marketing), FIPI.

“In years to come India will have the largest population than any country and will need large energy requirement and use all energy resources. Stranded assets is something that I think particularly the large populations like China and India with large coal reserves is something that not going to happen. The challenge is to use all these assets in a sustainable manner”

Dr. Pierce Riemer, Director General, World Petroleum Council in the concluding session discussed that it is important to have technology up gradation in order to reduce emissions. He talked about the development of different engines / systems which will help in attaining reduced emission targets.



**Dr. Pierce Riemer, Director General, World Petroleum Council**

“Working aggressively to provide clean cooking fuel, especially LPG to each and every house, with plans to add 100 million users in a short time is a humongous task, the rate of addition is going at a good pace”

Shri A P Sawhney, Additional Secretary, MoP&NG in the concluding session mentioned the aggressive targets India had kept for providing LPG connection to BPL families which has been very well achieved even before the considered time frame. He stated the fact that development of CNG / PNG India is still falling short and the target to provide PNG connections to 10 million households is yet to be achieved. He mentioned that companies in India are working aggressively to achieve this target. He also mentioned about the importance of development of LNG infrastructure so that LNG can be used as a direct fuel in transportation.

He also highlighted that by 2019 most of the refineries in India will be able to produce BS VI compliant fuel and hence the move to reduce emissions by having BS VI compliant engines and fuels is on track. He also mentioned that India has been able to aggressively expand its renewable energy base with the cost of production of solar power falling drastically. He compared that in some countries even for cooking electricity is being used, however India will still take probably 10-15 years to attain the same. Therefore use of LPG and PNG in India will be considered as the primary fuel for cooking for years to come.



**Shri A. P. Sawhney, Additional Secretary, MoP&NG**



**Mr. N. K. Bansal, Director, (Oil Refining and Marketing), FIPI**

The two day workshop was concluded with vote of thanks by Mr. N. K. Bansal, Director (Oil Refining and Marketing), FIPI.



## PROGRAMME DATE: 27 April, 2017

Timings	Topic	Speaker
08:30-09:30	<b>Assembly</b>	
09:30-10:30	<ul style="list-style-type: none"> <li>Welcome by Dr. R. K. Malhotra, Director General, FIPI</li> <li>Address by Dr. Pierce Riemer, Director General, World Petroleum Council</li> <li>Address by Mr. Christof van Agt, Senior Energy Analyst, International Energy Forum</li> <li>Vote of Thanks by Mr. S. Rath, Director (E&amp;P), FIPI</li> </ul>	
10:30-11:00	Tea/Coffee	
11:00-12:30	<b>Session-I</b> <b>Session Chairman: Mr. M. A. Pathan, Former Chairman, IOCL</b>	
11:10-11:30	Policy Interventions for Promoting LPG in India	Dr. Ajay Mathur, DG, The Energy and Resource Institute (TERI)
11:30-11:50	Development of Natural Gas Distribution Infrastructure in Cities	Mr. Rajeev Mathur, Managing Director, Mahanagar Gas Ltd.
11:50-12:10	LPG Supply-chain Management	Mr. M. B. Dilip Rai, Dy. General Manager (LPG-OPS), IOCL
12:10-12:30	Q&A	
12:30-13:30	Lunch	
13:30-16:50	<b>Session-II</b> <b>Session Chairman: Mr. Ashutosh Jindal, Joint Secretary (Mktg.), MoPNG, Govt. of India &amp; Dr. Anjan Ray, Director, CSIR-IIP</b>	
13:40-14:00	Health Impact Assessment with Switchover to Clean Cooking Fuels	Prof. Kirk R. Smith, Professor of Global Environmental Health, Director of the Global Health and Environment Programme, University of California, Berkeley
14:00-14:20	LNG as a Transport Fuel	Mr. Prabhat Singh, MD & CEO, PLL
14:20-14:40	Making Transportation Cleaner - The Options for India	Mr. Karthik Ganesan, Research Fellow, Council on Energy, Environment and Water
14:40-15:10	Q&A	
15:10-15:40	Tea/Coffee	
15:40-16:00	'LPG for Indian Households - From Connections to Sustained Use'	Mr. Abhishek Jain, Senior Programme Lead, Council on Energy, Environment and Water
16:00-16:20	A Systems Level Assessment of Biofuels and Hybrid Electric Vehicles for Transportation Sector	Dr. Amit Kumar, Professor, Department of Mechanical Engineering, University of Alberta
16:20-16:50	Q&A	

**DATE: 28 April, 2017**

Timings	Topic	Speaker
09:30-11:00	<b>Session-III</b> <b>Session Chairman: Dr. Y. B. Ramakrishna, Chairman, Working Group on Bio Fuels, MoPNG, Govt. of India</b>	
09:40-10:00	Outlook of Biofuels for Use in Transport Sector	Dr. Y. B. Ramakrishna, Chairman, Working Group on Bio Fuels, Ministry of Petroleum & Natural Gas, Govt. of India
10:00-10:20	Hybrid Electric & Hydrogen Fuel Cell Vehicles – Future of Mobility	Mr. Jitendra Goyal, General Manager, Product Design & Development Division, Toyota Kirloskar Motor Pvt. Ltd.
10:20-10:40	Use of Alternative Fuels in Railways	Dr. Anirudh Gautam, General Manager, Rolling Stock Division, RITES (Research Designs & Standards Organization), Lucknow
10:40-11:00	Q&A	
11:00-11:30	Tea/Coffee	
11:30-13:00	<b>Session-IV</b> <b>Session Chairman: Mr. Sanjiv Singh, Director (Refineries), IOCL</b>	
11:40-12:00	Potential of Hydrogen as a Clean Transport Fuel	Prof. L. M. Das, IIT Delhi
12:00-12:20	Clean & Alternative Fuels for Transport	Dr. Tapan Sahoo, Sr. Vice President (R&D), Maruti Suzuki India Ltd.
12:20-12:40	Transportation and ARAI Perspective	Ms. Rashmi Urdhwareshe, Director, ARAI
12:40-13:00	Q&A	
13:00-13:45	<b>Valedictory Session</b>	
13:00-13:10	Workshop Summary	FIPI
13:10-13:20	Concluding Remarks	WPC
13:20-13:40	Valedictory Address	Mr. A.P. Sawhney, Additional Secretary, MoP&NG
13:40-13:45	Vote of Thanks	Mr. N. K. Bansal, Director (Oil Refining & Marketing), FIPI
13:45	Lunch	



World Petroleum Council



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