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Rationalising Subsidies, Reaching the Underserved

Improving Effectiveness of Domestic LPG Subsidy and Distribution in India

ABHISHEK JAIN, SHALU AGRAWAL, AND KARTHIK GANESAN

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Thapar House
124, Janpath
New Delhi 110001
India

Tel: +91 11 40733300

info@ceew.in

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Authors
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A policy brief on 'Rationalising Subsidies, Reaching the Underserved - Improving Effectiveness of Domestic LPG Subsidy and Distribution in India.'

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The Council on Energy, Environment and Water (http://ceew.in/) is an independent, not-for-profit policy research institution. CEEW addresses pressing global challenges through an integrated and internationally focused approach. It does so through high quality research, partnerships with public and private institutions, and engagement with and outreach to the wider public. The International Centre for Climate Governance has ranked CEEW as India's top climate change think-tank two years in a row. In 2014, the Global Go To Think Tank Index ranked CEEW 1st in India in three categories.

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ABOUT CEEW

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ABOUT THE AUTHORS

Abhishek Jain

Abhishek Jain is a Junior Research Associate at Council on Energy, Environment and Water - CEEW. His current research focus is on Renewable Energy, Decentralized Energy, Energy Access, Integrated Energy Planning and Circular Economy. He is a recipient of Chevening scholarship from Foreign & Commonwealth Office of the United Kingdom. Abhishek is also an honorary scholar of Cambridge Commonwealth Trust. In the past, Abhishek has worked in the manufacturing industry in engineering design, energy management and project management roles with a leading MNC.

In last 4 years he has worked on diverse issues of energy, engineering and environment. He has researched and published on various areas including forecasting of electrification access scenarios in India, rural electrification through decentralised approaches, challenges to sustainable transportation in New Delhi, field research and assessment of hydroelectric power plants in the state of Himachal Pradesh, to name a few. In addition, Abhishek has completed multiple research and short term project stints with various organizations in India, Germany and the UK. He strongly believes in sustainable development led through inclusive growth and the importance of sound policy advisory in achieving the same.

Abhishek holds an MPhil degree in 'Engineering for Sustainable Development' from University of Cambridge and a B.Tech degree in mechanical engineering from Indian Institute of Technology (IIT) Roorkee. Abhishek is also a 'Certified Associate in Project Management' (CAPM®), accredited by PMI.

Shalu Agrawal

Shalu Agrawal is a Research Analyst at the Council on Energy Environment and Water. Her research interests include Renewable Energy Policy, Energy Access and Renewable Energy Finance.

Shalu is researching on finding potential ways to promote solar technologies in India, and has been involved in outlining a roadmap for scaling up solar energy generation to 5% of overall electricity demand in the country by 2021-22. She has worked on CEEW's research and policy projects involving mapping of the financial ecosystem for solar sector in India, exploring the potential of innovative financing mechanisms to scale up renewable energy and engaging with financiers to understand the barriers and opportunities in investing in clean sector.

She is currently working with the modelling team at CEEW to explore cost effective solutions for meeting India’s energy demand by 2050. She has also researched on ways to enhance access to energy through effective deployment of LPG. She participated in Centre for Science and Environment's "Challenge of the balance" programme (2012) which focused on environmental management in the developing world and managing the impact of climate

change on South Asia. During this program, she also served as the editor of the participants' environment magazine.

Shalu holds a B.Tech in Electrical Engineering from Indian Institute of Technology (IIT) Roorkee. She has also worked as intern at Schlumberger Asia Services Ltd. (Wireline segment) and Control & Switchgears Ltd (low voltage protection elements, assembly line).

Karthik Ganesan

Karthik Ganesan is a Senior Research Associate at CEEW, India. He leads the research efforts in the area of energy access and the future energy consumption pathways of rural India, and the opportunities for industrial energy efficiency gains. Most recently, he carried out an extensive analysis of the Indian government's policy support for RE industry and the cost implications of the exchequer. His focus has been to bring quantitative techniques from other domains, such as consumer choice models and system dynamics modelling to provide a holistic understanding of the various factors that influence energy policy and their impact in turn, on development and sustainability.

Prior to his association with CEEW he has worked on an array of projects in collaboration with various international institutions, with a focus on technology and environmental valuation. His published (and under review) works include the *Power Sector Expansion Plans in the Greater Mekong Sub-region: Regional governance challenges* (ADB), *Carbon Capture and Storage Potential for SE Asia* (ADB), *Valuation of Health Impact of Air pollution from Thermal Power Plants* (ADB), and *India's Energy Conundrum – What the future holds* (World Scientific).

Karthik graduated with a Masters in Public Policy from the Lee Kuan Yew School of Public Policy at the National University of Singapore. He has an M.Tech in Infrastructure Engineering and a B.Tech in Civil Engineering from the Indian Institute of Technology, Madras in Chennai.

EXECUTIVE SUMMARY

India has witnessed a considerable increase in domestic consumption of Liquefied Petroleum Gas (LPG) over the years and the phenomenal rise in the number of LPG connections in the country is testimony to it. However, only 28.5% of households reported LPG as their primary fuel for cooking, during Census 2010-11. This study, based on analysis of National Sample Survey (NSS) data, indicates that the excessive dependence on traditional fuel continues and much needs to be done to provide clean cooking energy to the people of the country at an adequate level of affordability. LPG consumption and the subsidies linked to it are heavily skewed in the favour of higher income groups and the urban areas of country. The prevailing LPG subsidy mechanism has only partially achieved its objectives, while inflating the fiscal burden to significant proportions.

The primary objective of this study is to analyse the efficacy of LPG subsidy in making clean cooking fuel affordable for households across the economic strata; and to suggest appropriate reforms to rationalise the subsidy mechanism to meet the energy needs of underserved population. It is based on a systemic investigation of contemporary issues, review of recent literature, and utilises the data on consumption patterns and the associated expenditures of the Indian population (based on the data of 68th Round of the NSS).

The key findings that emerge from our analysis are:

1. **On account of rising consumption of subsidised domestic LPG, the fiscal impact and import dependence has risen to significant proportions.** The subsidy bill for FY 2013-14 stood at INR 48,362 crore, constituting (~) 4 per cent of the non-plan expenditure of the recent budget, while import dependency for LPG has risen to a staggering 89%.

2. **Number of domestic connections does not necessarily imply an equivalent number of households using LPG as their primary cooking fuel.** Despite more than 110 million connections in 2011, only 70 million households indicated LPG as their primary cooking fuel.

3. **The consumption of LPG, and concomitantly the share of subsidy received by various income groups, is highly skewed**. More than 50% of the LPG subsidy is received by the richest 30% of Indian population, whereas the poorest 30% receive a meagre 15% of the total subsidy disbursed. Urban areas have more than 70% of distributors, as well as LPG connections, against 32% of the Indian population living in these areas. As a result of poor penetration of distributors in rural areas, even the richest rural households derive only (~) 50 per cent of their total cooking energy from LPG.

4. **Traditional cooking fuels, such as biomass and kerosene, are still used in**

abundance. Less than half of urban households and only 6% of rural households use LPG, exclusively, for cooking. The remaining 80% Indian households continue to use some form of solid or liquid fuels for cooking due to affordability, access and awareness limitations.

5. **The universal (and uniform) subsidy on LPG has resulted in low income households spending a disproportionately high share of their income on cooking energy.** The lowest income group spends as high as 8 per cent of their monthly expenditure on cooking energy as against a mere 2 per cent and 3.3 per cent by the highest income group in urban and rural areas respectively. Even in absolute terms, urban households consuming traditional cooking fuels, end up spending more than those using LPG.

6. **Based on past studies and literature, the analysis suggest that the affordability limit for cooking energy expenditure, below which it can be termed as affordable, is ~ 6 per cent of overall household expenditure**. Against this empirically observed limit, the lowest income groups (both rural and urban) spend almost 33% more (8% vs. 6%). Clearly, the LPG subsidy under the present regime has not been effective in delivering affordable cooking energy to the poorest and the low-income households.

7. **Availability of LPG in rural areas is a major hindrance to its adoption.** The *Rajiv Gandhi Gramin LPG Vitaran Yojana* (RGGLVY) has increased the LPG penetration in rural areas through low cost distribution model. In the first three years of the scheme (2009-2012), a little over 1.5 million new connections were awarded. However, sparsely populated or remote settlements are still underserved due to high cost of delivery and financial unviability of conventional distributor models.

8. **Awareness of the benefits of using LPG vis-vis traditional fuels** also influences the fuel choices for cooking energy. Past interventions by oil marketing companies (OMCs) on awareness, user training and first hand exposure to the benefits of LPG have resulted in a successful shift away from traditional fuels.

Based on these findings, **it is recommended that the elements of affordability, availability and awareness (*the three As*) should be focused on simultaneously, to effectively achieve the objectives of LPG subsidy in the country.** The key recommendations to this effect are three fold:

1. **Rationalise LPG subsidies:**

   a. **Reduce the limit on subsidised LPG to 9 cylinders per annum per connection, to enable efficient usage while allowing fiscal space to increase LPG user base.** A cap of 9 cylinders per annum would be sufficient to cater at

least 70 per cent cooking energy needs of up to 90 per cent households which reported positive consumption of LPG.

b. **Introduce differentiated subsidy for domestic LPG, to align the prices with affordability.** Households with LPG connection can be classified into three categories, viz. Below poverty line (BPL), Middle income, and Well-to-do. Each category would receive a differentiated level of subsidy support, through a mechanism such as direct benefit transfer, against their actual consumption, up to the capped limit of 9 cylinders per annum. An indicative level of the proposed prices[1] for each category is as follows:

- ***For Below poverty line:*** INR 308 /cylinder of 14.2 kg
- ***For Middle income:*** INR 509 /cylinder of 14.2 kg
- ***For Well-to-do:*** INR 947 /cylinder of 14.2 kg

c. **Exclude the Well-to-do category (top 15 per cent population by income) from LPG subsidy net.** Even at unsubsidised LPG prices, their cooking expenditure would be well within the affordability limit i.e. 6 per cent of their monthly household expenditure. There are a range of options discussed in the report, which could serve as identification criteria for both inclusion and exclusion of households from the subsidy range. The criteria are based on the income tax and asset ownership data (discussed in detail in later sections),

2. **Improve LPG availability in rural areas**

a. **Leverage existing institutions such as Self Help Groups (SHGs) and rural supply chains to deliver LPG in far flung areas.** This would help address the accessibility issues with minimum investment and fiscal outlay, in a short timeframe. For instance, SHGs could operate remote extension counters or mini-distribution agencies. With a loan of INR 1.25 Lakh (for capital and operational expenditure) at 7% interest rate[2], an SHG can supply LPG to about 200 households in a financially viable manner.

b. Establish uniform delivery charges per cylinder by pooling the transportation costs at national level to reduce the price incidence on rural customers and OMCs.

3. **Raise the awareness of the benefits of LPG consumption.** A combination of different strategies and actors could be used to highlight health and associated benefits of LPG consumption over inefficient burning of traditional solid fuels. This

[1] For reference: Domestic subsidised LPG was priced at INR 414 per 14.2 kg (in Delhi market in August 2014). These prices are also in accordance with prevailing oil prices as of August 2014.

[2] Banks (PSUs and RRBs) have been directed to give loans to women SHGs at 7 per cent interest rate under Swarnajayanti Gram Swarojgar Yojana (SGSY)(Press Trust of India, 2013).

will create the demand for LPG from sections which currently rely on alternatives, and would facilitate its higher adoption and usage in the long-run.

1. INTRODUCTION

How could India increase the access to modern cooking energy to millions of underserved citizens while maintaining fiscal discipline? Liquefied Petroleum Gas (LPG) is increasingly becoming the fuel of choice for domestic cooking and heating in India. The LPG consumer base has increased by nearly 45 million (connections) between 2010 and 2013, and now stands at 160 million. However, in the Census (2011), only 28.5% of households stated LPG as their primary cooking fuel, against the 46.5% of households that had LPG connections[3]. Also, our analysis on data from the National Sample Survey (NSS) suggests that (~) 80% of the population still uses some form of traditional fuels to satisfy their cooking and heating needs. Both these observations indicate that despite the rising preference for LPG, the use of solid fuels for cooking is still very high, resulting in indoor air pollution, the second biggest reason of premature deaths in the country (Institute for Health Metrics and Evaluation, 2010).

Even the current level of LPG use has come at a high cost. In 2013-14, the overall level of 'subsidy' provided by the government to domestic LPG consumers was a staggering INR 48,362 crore (~ USD 8 Billion)[4]. To put this subsidy outlay into context, it amounts to nearly 4 per cent of the estimated non-plan expenditure of the government for the year 2014-15. Finally, more than 89 per cent of the LPG consumed in the country is imported, either in the form of crude or the refined product directly (CSO, 2013) .

The LPG subsidy regime in its current form has been unable to improve the state of energy access effectively, while the country as a whole continues to bear the rising costs of its provision. **There is need for a significant overhaul of the LPG subsidy regime to make clean cooking energy affordable as well as accessible for the underserved population, while keeping in mind the imperatives of fiscal discipline and national energy security.**

Existing studies have highlighted the rising subsidy burden, skewed distribution of LPG subsidy across different income groups and geographies, and issues of diversion (Clarke, Sharma, & Vis-Dunbar, 2014; Lang & Wooders, 2012; MoPNG, 2010a, 2013a). The prevalent studies have approached the issue of LPG subsidy rationalisation with a predominant focus on reducing the fiscal burden and the 'under-recoveries' of Oil Marketing Companies (OMCs). In order to reduce the subsidy outlay, past recommendations have talked about reducing the subsidy amount, imposing a cap on subsidised cylinders, targeting the beneficiaries, and direct transfer of cash.

However, in order to enhance the efficacy of LPG subsidy and to meet its objective, important questions still remain unanswered are:

(i) How to identify households who deserve monetary support to enable LPG use

[3] Assuming no household had multiple connections, as mandated; India had 11.5 million LPG connection in 2010-11 (The Indian Express, 2010)

[4] Inclusive of direct subsidy and under-recovery component (MoPNG, 2014b)

and to what extent the support is required?

(ii) How to increase the distribution and availability of LPG to underserved locations in cost effective manner?

(iii) How to increase the awareness of the benefits of LPG consumption to generate demand and enable sustained use of the clean cooking fuel?

Keeping in view the huge unmet demand for clean cooking energy in the country, this study answers the above questions while structuring the recommendations around three key pillars of LPG penetration. These are **Affordability** (of adoption and sustained use), **Availability** and the **Awareness** (detailed in subsequent sections).

The report has been structured as follows:

Section 2 provides a brief view of the drivers for a subsidy and the current levels of subsidy for domestic consumers.

Section 3 explores the possibility of arriving at normative affordability limits based on existing literature and compares current expenditure patterns across income classes against this 'affordability limit'.

Sections 4 and 5 discuss the existing LPG consumption profile and the prevailing alternative options to LPG. A brief commentary on the efficiency of energy service delivery across these options is also provided in these sections.

Sections 6, 7 and 8 form the core of the study and propose an alternative subsidy mechanism that targets the needy and is able to identify those who are 'well-to-do' for exclusion from the subsidy. In addition the sections also provide meaningful recommendations to improve the availability in rural areas and documents interventions that have been successful in raising the awareness about clean cooking solutions among rural households.

Section 9 forms the concluding portion of the study and raises the question of whether there exist other clean and cost-effective solutions that need to be considered in the basket of options that are available to policy makers.

2. RATIONALE FOR SUBSIDY

LPG was introduced to the country in 1955 and subsidies became part and parcel of the commodity in the late-70s, when the government took complete control over the provision of essential commodities such as fossil fuels derived from petroleum (MoPNG, 2013c). Until 1978, there were virtually no imports but subsequently, with the rise in popularity of LPG, domestic capacity expansion (to manufacture) as well as imports began to rise. Household consumption of LPG in recent years, has consistently accounted for 85 per cent to 90 per cent of the total LPG consumption in the country(CSO, 2013).

Much of the growth in the consumption of LPG has been witnessed because of the massive subsidies associated with its domestic consumption. Currently, every household with an LPG connection in India, irrespective of its economic or social status, is entitled to 12 subsidised cylinders (of 14.2 kg each) per annum. Beyond 12 cylinders, LPG cylinders for domestic consumption are available at the unsubsidised price[5]. As per August 2014 prices in Delhi, the retail selling price (RSP) of a subsidised cylinder of 14.2 kg was INR 414, against the desired selling price (a reflection of cost of production/ procurement) of non-subsidised cylinder of INR 885. In other words, the commodity is subsidised to the extent of 53 per cent. However the extent of subsidy associated with each cylinder varies with the fluctuations in international oil prices.

Although the overall government support towards controlling the RSP of subsidised LPG is termed as 'subsidy', there are multiple components to this subsidy. They include (inter alia) direct subsidy by government, the 'under-recoveries' of Oil Marketing Companies (OMCs) including what is passed on to upstream oil companies, freight subsidy etc. Given that LPG subsidy is long standing and increasing, it is necessary to understand the drivers behind the provision of this subsidy

The International Monetary Fund suggests that "*fuel subsidies generally arise out of a desire to shield consumers, especially poor households, from high and often volatile fuel costs for lighting, cooking, and transportation*" (Anand, Coady, Mohommad, Thakoor, & Walsh, 2013). The Indian government, in implementing the extensive subsidy programme for fossil fuels, is of the view "*that in order to insulate the common man from the impact of rise in international oil prices and the domestic inflationary conditions, the Government has to modulate the Retail Selling Price (RSP) of sensitive petroleum products*" (MoPNG, 2014a). In line with the global view, the above statement suggests that subsidies in India have been instituted with a view to limit the expenditure on necessary fuels to affordable levels, especially of the poor and low income households.

[5] Unsubsidised price does not reflect the true cost of production/ provision but a desired level based on an Import Parity Price. For more details on the differences refer to (Sethi, 2010)

3. AFFORDABILITY OF COOKING FUEL

Is cooking energy priced at affordable levels in India and what is a desirable level of expenditure on cooking? Affordability in relation to energy and utility services is widely discussed in literature as the capacity to pay for a minimum level of service (Bartl, 2010; Fankhauser & Tepic, 2007). The most frequently used measure to evaluate the same is the 'affordability ratio' i.e. the ratio of monthly expenditure on energy services to the overall monthly expenditure of the household (Fankhauser & Tepic, 2007).

Using this concept, but limiting it only to cooking energy[6] expenditures, the affordability ratio for Indian households was evaluated using the consumption expenditure data from the 68th round of the National Sample Survey (NSS)[7], conducted in 2011-12. The data suggests that cooking energy expenditure forms a significant proportion of overall energy expenditure for Indian households. On an average, Indian households spend between 40 per cent and 80 per cent of their energy expenditure towards cooking energy; with a median (and average) spend of 60 per cent.

The affordability ratios were evaluated across income deciles[8], which are defined on the basis of monthly per capita expenditures (MPCE) of the households. MPCE is widely used and accepted as a close proxy for income (Morris, Carletto, Hoddinott, & Christiaensen, 2000). The analysis results, in Figure 1, show that the average value of the affordability ratio across the income groups varies from as high as 8.1% and 8.0% in the lowest income group to as low as 3.3% and 2.0% in the highest income groups in rural and urban areas respectively.

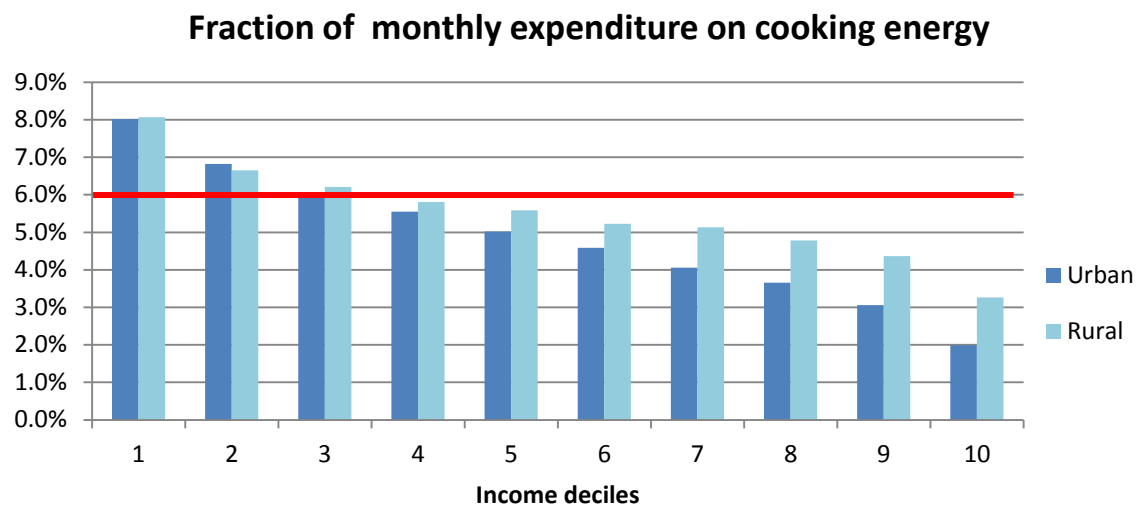
In a discussion on affordability, it is difficult to define a normative threshold for the affordability ratio, below which the energy could be termed as affordable. However, there exists a precedent in literature where governments or international agencies have tried to establish such normative limits on different energy expenditures to design policies to safeguard vulnerable or low income groups (Bartl, 2010; Chester, 2014; Fankhauser & Tepic, 2007; Winkler et al., 2011). A meta-analysis of these cases indicates that such a limit is (~) 10 per cent for the overall energy expenditure. Using the average (as well as median) value for proportion of energy expenditure on cooking i.e. 60 per cent (as discussed above), the affordable limit for cooking energy expenditure then comes close to 6 per cent for an Indian household.

[6] For the purpose of this report, 'cooking energy' is referred to as both cooking and heating energy, as it is difficult to segregate such usage in the household from aggregated fuel consumption data; Moreover, cooking energy is the useful end use energy, after taking into account the device efficiencies.

[7] Henceforth will be referred to as NSS data

[8] Income deciles are defined as grouping the population into ten equal sets on the basis of their income from lower to higher.

Figure 1: Cooking expenditures of poor households are well above the affordability limit



Source: CEEW Analysis[9]

As illustrated in Figure 1 above, the lowest income groups (both rural and urban) spend almost 33 per cent more than the normative affordability limit (~ 6%) for the monthly expenditure on cooking energy. Clearly, the LPG subsidy under the present regime has not been effective in delivering affordable cooking energy to the poorest and the low-income households. The higher expenditure incurred on energy will have implications for their ability to allocate the necessary portion of their income on other essential commodities and services such as health, education and durables.

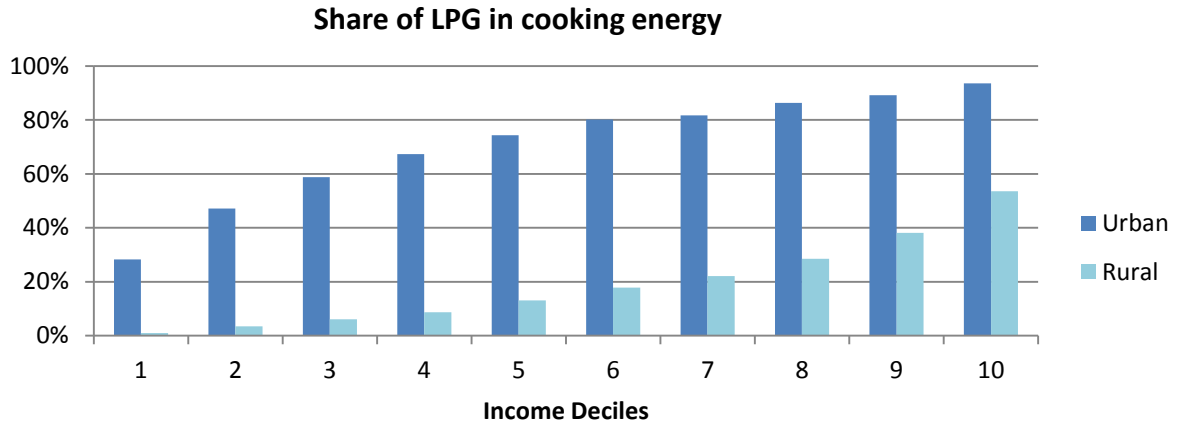
[9] Unless specified otherwise, throughout this report refers to the analysis of expenditure data from the 68th Round NSS

4. LPG CONSUMPTION ACROSS INCOME DISTRIBUTION – A SKEWED REALITY

While it is has been established that the poor spend a larger portion of their expenditure in procuring cooking energy, has it actually resulted in a more equitable consumption of desirable commodities such as LPG? Based on our analysis, it is evident that only the top three income deciles in the country derive more than 50 per cent of their cooking energy from LPG. Concurrently, they are also the only groups to spend a lion's share of their cooking energy expenditure on LPG. Figure 2 below depicts the variation in dependence on LPG in both rural and urban areas, across income deciles. It is worthy to note that in urban India all income groups but the lowest rely (and spend) on LPG for a large portion of their cooking energy needs. In sharp contrast, even the richest income group of rural households derive only around 50 per cent of their total cooking energy from LPG. This is because of the poor penetration of LPG in rural India, as well as the simultaneous consumption of other cooking fuels (detailed in subsequent sections).

Distribution agencies play a significant role in the LPG availability and uptake. Of the 12,610 LPG distributors in the country (MoPNG, 2013b), nearly 70 per cent are located in urban and peri-urban areas (PIB, 2013) while the population living in urban areas is closer to 32 per cent (Census, 2011). Concomitantly, the distribution of LPG connections is also skewed with 68% of connections in urban India (Lok Sabha, 2013). Urban India has reaped the benefits of a higher density of population (required for economically attractive propositions for a distributor) resulting in higher presence and penetration of LPG distributors. The disparity in provision of LPG distribution infrastructure is evident and the poor penetration and usage in rural locations can be partly attributed to this.

Figure 2: Poor LPG penetration in rural India, even for the richest households



Source: CEEW Analysis

The skewed consumption of LPG implies that the benefits of the subsidy provided by the government are also not reaching the population they are most intended to serve. Those groups that rely on LPG to satisfy a larger share of their energy consumption (i.e. the rich, today) corner a larger share of the subsidy. Figure 3, which is derived from the analysis of LPG consumption reported by the households in NSS data[10], illustrates that more than 50 per cent of the subsidy is actually received by the richest 30 per cent households in the country, while the poorest 30 per cent households receive a mere 15 per cent of total share.

Figure 3: Poorest 30% of households receive less than 15% of total subsidy

Source: CEEW Analysis

The analysis on cooking energy expenditure, LPG consumption patterns and resulting subsidy disbursal collectively indicates that the current regime of LPG subsidy along with existing distribution penetration has not accrued the intended benefits of LPG subsidy in the country.

[10] Calculated on the basis of reported LPG consumption of each household, and at current quota of subsidised LPG

5. TRADITIONAL ALTERNATIVES TO LPG

a. How prevalent are traditional fuels?

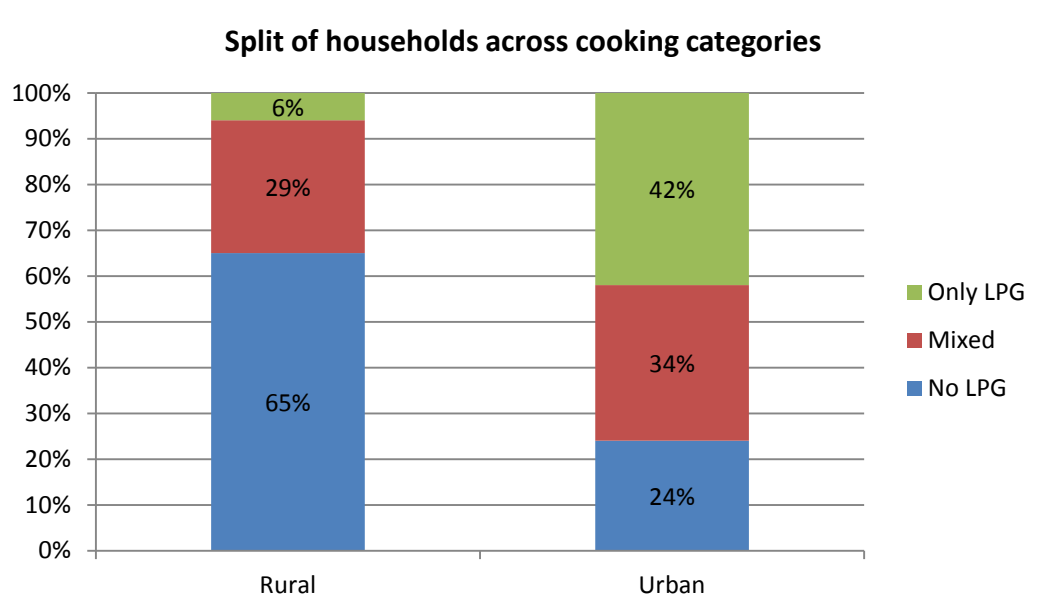
In rural areas LPG use for cooking is low, as indicated in Figure 2, and clearly suggests that these households rely on other fuels to a large degree. These other fuels primarily include solid fuels (biomass, coal, coke, charcoal, etc.) and in some cases liquid fuels such as kerosene. Though not substantiated in official documents, one of the key drivers for the cooking fuel subsidy is to enable poorer households to reduce their dependence on inefficient use of solid fuels, which also have a significant impact on health of women and children of the household.

For the purposes of categorising households we refer to three categories of consumers, throughout this report:

1) Households that rely only on solid/liquid fuels - 'No LPG' – ***No LPG***
2) Households that use a mix of solid/liquid fuels and LPG – ***Mixed fuel***
3) Households that purely rely on LPG - ***Only LPG***

Based on the consumer expenditure data of NSS (68th round), the proportion of households under each of these categories is calculated. As illustrated in **Figure 4**, in urban India the *'No LPG'* category constitutes nearly 24 per cent of households, compared to 65 per cent in rural India. The proportion of households that fall under *'mixed fuel'* category varies from 29 per cent to 34 per cent as we move from rural to urban areas.

Figure 4: More than 80% of Indian households continue to use traditional fuels for cooking



Source: CEEW Analysis

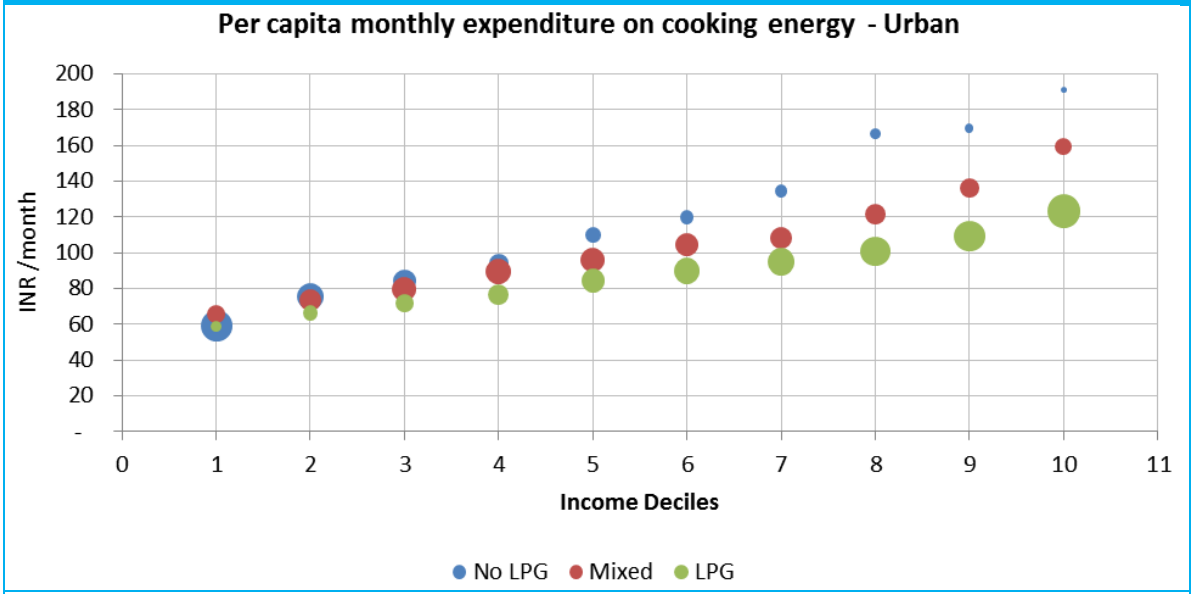
b. How much cheaper are traditional fuels?

Firewood, when collected at no cost, is an economically attractive option, while that which is procured from the market is a significant burden for those relying on it. The poor efficiency of the existing stock of the traditional stoves means that in terms of useful delivered energy, the use of expenditure on firewood is comparable, and in many cases more expensive, than LPG. Although firewood price exhibits a large variance, depending on the geography and local availability, the cost effectiveness of fuel (based on the median value) is still in favour of LPG. It is estimated that for ***every Rupee*** spent, ***firewood burnt in traditional cook stoves delivers only 150 kcal*** of useful energy whereas ***LPG delivers as much 220 kcal***[11]. Only 28 per cent of the rural households that use firewood collect all of their consumption, free of cost. For these households it is difficult to justify a shift to LPG usage. However, costs associated with time required for collection and the opportunity cost of selling this in the market are still present, but these are not accounted for in the data that was used for the analysis.

A useful way to understand the disparity among cooking fuels is to compare the per capita expenditure on cooking energy by various categories of consumers. Figure 5 below illustrates this variation for urban areas. It is clear that consumers who rely solely on traditional fuels are few in number (as indicated by the size of the bubbles), but they spend a significantly (up to 50 per cent) higher amount on cooking energy. In rural areas, as indicated in Figure 6, the differences are less clear and for those relying on LPG, the expenditure is slightly higher. The reason can be partially explained by the higher quantum of freely available firewood as well as the lower price of firewood as compared to urban markets. There is still some way to go, before rural consumers decide to make the switch to LPG on economic considerations alone. However, the time value of resources spent in collecting firewood, the opportunity cost of selling the firewood in the market and other externalities (health and safety) when factored in would certainly tilt this picture in favour of LPG.

[11] Assumptions were made on the average efficiencies of LPG cook stoves and traditional biomass cookstoves, based on a range of values from various studies and reports

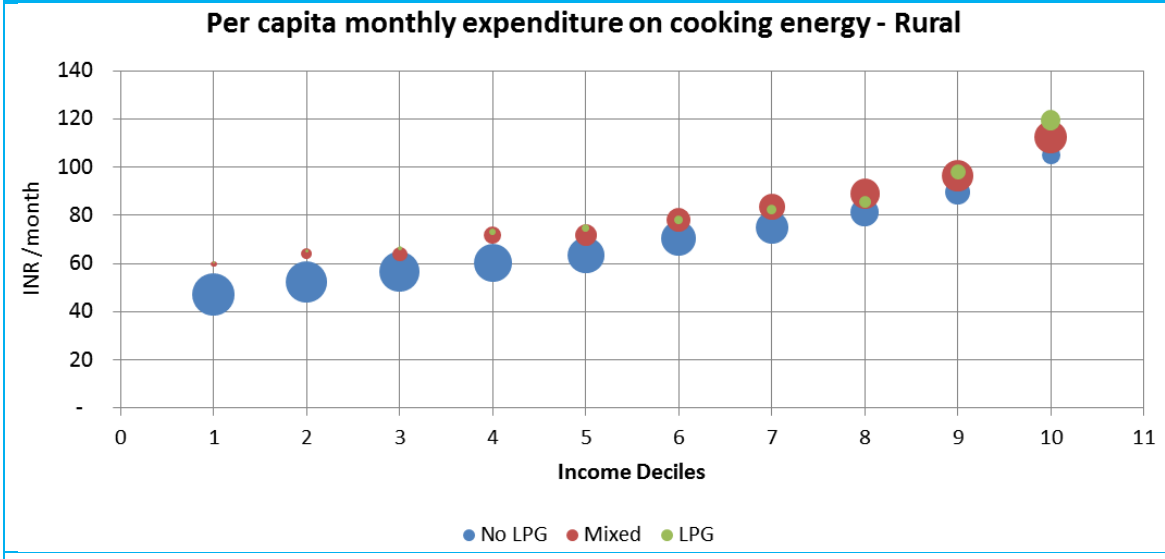
Figure 5: LPG – cheapest cooking solution in urban areas; benefits richest households disproportionately



Source: CEEW Analysis

However, the realisation of the benefits of LPG and the ability to factor in the costs of unclean fuels are contingent on the level of awareness. This is an important reason why awareness generation should form a critical pillar of government programs, alongside the efforts to provide monetary subsidy and improve distribution channels. In other words, the three ***As*** (***Affordability, Availability and Awareness)*** need to go hand in hand to achieve the larger policy objective of universal provision of clean cooking energy solutions in the country. In the following sections of the report, we try to develop recommendations to address the issues around each of these three pillars.

Figure 6: Even with subsidy, LPG is marginally costlier than alternatives in rural India



Source: CEEW Analysis

6. AFFORDABILITY – REFORMING THE SUBSIDY

6.1 Rationalising the quantity of subsidised LPG

A recent government statement suggests that 99% of total domestic LPG connections in India consume 12 or less than 12 cylinders per year (Economic Times, 2014). This essentially implies that at the current LPG subsidy cap of 12 cylinders per year, the government is subsidising the entire cooking energy needs of almost all the LPG consumers in the country – a consequence of universal subsidy with a generous cap.

Analysis of the LPG consumption trends from NSS data indicates that households which reported positive consumption of LPG, on an average consume 8.9 cylinders per year. This implies that fixing the cap at 12 cylinders for every domestic connection, in the absence of strong enforcement and monitoring of the distribution process, leaves room for agencies to divert subsidised LPG to unintended consumers. Even in the presence of a monitoring/ enforcement mechanism such as direct benefit transfer (DBT), a higher cap than the need of the consumer would always leave room for diversion towards unintended uses (auto/commercial) by the end-consumers themselves.

Given the average level of LPG consumption, it is pertinent to analyse what a cap of 9 cylinders per connection would cover in terms of the overall cooking needs of a household. Preliminary analysis suggests that an LPG subsidy cap of 9 cylinders per annum would be sufficient to cater at least **70 per cent of cooking energy needs** of up to **90 per cent of the households** which reported positive consumption of LPG. It is important to note that this analysis is based on the household LPG consumption levels of the year 2011-12, when no cap on subsidised domestic LPG was in place, implying little incentive for households to limit their consumption through efficient and conservative usage. Consequently, capping the annual limit of subsidised LPG at a level lower than the 100 percent requirement of the average consumer (in the uncapped regime) would also facilitate judicious and efficient consumption of a highly subsidised, largely imported and non-renewable commodity.

Thus, to limit the diversion, encourage efficient consumption and to create fiscal space to cover un-served population without further increasing the subsidy burden, ***it is recommended that as an immediate and simple measure to rationalise domestic LPG subsidies, the number of subsidised cylinders per household per year be capped at 9***. If policy makers are considering lowering the cap any further (lower than 9) they must be cognisant of the extent of the needs covered by such a new cap. For instance, a cap of 6 cylinders would cover more than ***70 per cent of needs*** of only ***40 per cent of the households***, leaving almost 60 per cent of the households to meet a large portion of their cooking energy needs through unsubsidised LPG, thereby imposing a substantial burden on a significant proportion of population.

It is worthwhile correcting a commonly held misconception that Below Poverty Line (BPL) households (or poorer households in general) consume lesser amount of LPG and hence the subsidy cap for them could be lower. In a few of the areas, which were investigated through

telephonic interviews, the quota for BPL households was as low as 6 subsidised cylinders per year. In reality, poorer households are larger in size (members) and even with a lower per capita consumption, require as much in total quantum as smaller, richer households. The average BPL household, which relies entirely on LPG for cooking, consumes as many as 8.9 cylinders a year. Clearly, their needs are as much as other upper income households. Across all income categories, more than 50 per cent of the households consume more than 8.5 cylinders a month. A relook at the expenditure data from subsequent NSS surveys (post September 2012), as and when they become available, would be a better indicator of average consumption patterns in a capped regime and could help refine our analysis.

6.2 Rationalising the price of subsidised LPG

Apart from the reduction in the cap on subsidised cylinders, further rationalisation of the LPG subsidy could be considered on the basis of income or economic status of the households. The practical aspects of implementing a well-targeted subsidy regime, which benefits the ones who genuinely need the support, are complex. In doing so, it is desirable to ensure that the level of subsidy offered to a household enables it to procure a minimum level of clean cooking energy at affordable price levels.

In an earlier section, the average affordability ratio limit for the expenditure on cooking energy in India was evaluated to be (~) 6 per cent. This affordability limit can serve as a threshold measure that could be used to safeguard vulnerable groups against disproportionately high expenditures on procuring cooking energy. Should policymakers decide to adopt such a normative threshold, which is grounded in evidence and draws from the international experience, they must consider supporting those consumer categories where the proportion of monthly expenditure on cooking is more than 6 per cent.

Analysis of the affordability ratios with and without subsidy towards LPG (based on June 2014 prices in Delhi) indicates that the ***top 15 per cent of the Indian population by income does not need subsidy support on domestic LPG***, as their cooking expenditure would be well within 6 per cent of their monthly household expenditure even at unsubsidised LPG prices. This top 15 per cent of the population can be referred to as 'Well-to-do' category in the context of the cooking fuel subsidy.

However, for the rest 85 per cent of the population, subsidy against a minimum service level is required in the medium term, until they realise a substantial increase in their incomes and concomitantly their purchasing power (in real terms). Referring to Figure 1 in Section 0, it is also important to note that even at the current subsidised prices, the bottom 3 deciles or bottom 30% of the population is still paying more than the proposed normative limit. This indicates that at current prices, the domestic LPG is not affordable to the very poor of the country, especially the rural poor owing to their lower per capita income compared to urban counterparts. Thus in order to facilitate further adoption and usage of LPG in the low income groups, the prices needs to be brought into an affordable range. Based on analysis of expenditure levels, ***it is suggested that for the bottom 30 per cent of the population, which***

can closely be equated to the Below Poverty Line (BPL) population of the country, the subsidised price of domestic LPG be lowered.

Based on the above findings for both richest income groups and the poorest income group, ***it is recommended to classify the households with LPG connection into three categories, viz. BPL, Middle income, and Well-to-do. Each category would receive a differentiated level of subsidy support, via measures such as direct benefit transfer, against their actual consumption, up to the capped limit of 9 cylinders per annum.*** In the current system of administered retail price, a differential pricing strategy as proposed will most likely lead to diversion of subsidised commodity to unintended uses and users. Hence alternative mechanisms such as DBT (refer Box 1) are almost a prerequisite for a differential subsidy structure to succeed and to prevent leakage.

An indicative measure of the proposed price levels[12] for each category, based on an analysis of the consumption expenditure data from the NSS is as follows:

- ***For Below poverty line:*** INR 308 /cylinder of 14.2 kg
- ***For Middle income:*** INR 509 /cylinder of 14.2 kg
- ***For Well-to-do:*** INR 947 /cylinder of 14.2 kg, which essentially means that at June 2014 price levels, unsubsidised cylinders are within the affordability limit of this group

These figures were arrived at on the basis of average household size and average monthly per capita expenditure (MPCE) of the lower group of each category, while limiting their cooking energy expenditure to within the affordability limit of 6 per cent. These prices are presented as an illustration of a possible pricing strategy based on the concept of affordability ratio. It is also important to note that these prices are based on 2011-12 data. More recent data would yield slightly higher price levels for each category. For price revisions in the future, similar metrics and analyses could be applied to more recent NSS data on household consumption patterns, as and when made available.

Box 1: Direct Benefit Transfer Scheme

Direct Benefit Transfer (DBT) is an initiative of the central government to make electronic payments for centrally funded social protection schemes, using the framework of a national level unique identification (UID) programme. In case of LPG subsidy, it works as a 'cash enabled in-kind transfer' wherein the subsidy is provided, contingent on the purchase of an LPG cylinder at the prevailing market price, directly to the bank account of the beneficiary. After being in the 'roll-out phase' for nearly 6 months, the DBT for LPG subsidy was stopped in early 2014 (The Economic Times, 2014). The scheme was withdrawn in the face of mounting public pressure from its inefficient implementation as well as the debate surrounding the constitutional validity of the UID registration process. However, the newly elected government has proposed to re-launch DBT for LPG subsidy disbursal (Business Standard, 2014) and has planned to extend the DBT to 300 districts in India (The Indian Express,

[12] For reference: Domestic subsidised LPG was priced at INR 414 per 14.2 kg (in Delhi market in August 2014).

2014).

It is imperative that the new government reinstates the DBT in a manner such that, it does not contravene any constitutional provisions, is efficient, functional and finds wide acceptance. Though administratively demanding, DBT enables a uniform market price of LPG, which would prevent diversion from distributors and hence ensure better targeting of subsidy. It is virtually a prerequisite for any efforts intended to rationalise the subsidy disbursal process.

As DBT requires both the enrolment of UID and possession of a bank account, it is equally important that government simultaneously works on increasing UID enrolment and increasing the access to formal banking services, especially in rural India. As regards the former, a target of one billion UID enrollments has been set (The Indian Express, 2014). The latter issue is likely to get addressed with the recently launched *Pradhan Mantri Jan Dhan Yojana,* which aims to provide universal access to banking facilities. It has initial target of opening up bank accounts for 75 million families within an year, along with provision of credit and insurance facilities (PMO, 2014).

However, as much it is easy to analyse the consumption patterns and suggest a categorisation on basis of household income and economic status, the major challenge lies in the actual (on ground) identification of such households. For BPL classification, we propose to utilise the government's prevailing BPL definition and identification process.[13] For the identification of well-to-do households, as there is no existing process, various methodologies are proposed (in the following sub-section), with their relative advantages and limitations. The middle income category *de facto* consists of those who are neither classified as BPL nor as 'well-to-do'.

6.3 Identification based on income tax profiles

Identification of well-to-do households, based on their income tax-paying status could help exclude a substantial number of households, which fall in the top income groups in the country. However, only a meagre 2.9 per cent of Indian population pays income tax (The Economic Times, 2013b). Income data is also subject to the problems of under-reporting, especially for income derived from the private and informal sectors, particularly in rural areas (Falkingham & Namazie, 2001). Given that the informal economy accounts for almost 50% of India's GDP (NCEUS, 2008) and the country has very few income tax payers, this mechanism will not be exhaustive in identifying well-to-do households. Such a mechanism would instead indirectly benefit the tax evaders and those outside the tax network. Moreover, the privacy issues associated with the income tax information and the need to link tax-payers' addresses with LPG connection address would pose significant challenges, thus reducing the practical feasibility of the option.

6.4 Identification based on asset ownership information

Considering the challenges in identifying well-to-do households based on income tax payers'

[13] The authors recognise the inefficiencies of the prevailing BPL identification system. A more robust process is required to identify BPL households for targeted delivery of other social welfare programs (beyond LPG subsidy) and is beyond the scope of the study itself.

details, indirect measures of identification are required, which can be correlated to income or expenditure. The existing body of works suggests that asset ownership (of consumer durables like cars) can serve as a useful proxy for household consumption expenditure, particularly in the middle income settings (Falkingham & Namazie, 2001; Howe, Hargreaves, Gabrysch, & Huttly, 2009). Identification of well-to-do households based on asset ownership could be a much more robust mechanism compared to income tax based identification, as it can also identify the households which under report their income. Following are some of the possibilities to identify well-to-do households based on asset ownership:

6.4.1 Identification based on passenger vehicle ownership data

The analysis on the NSS data establishes that the passenger four-wheeler vehicle ownership is heavily concentrated in the top income deciles. As per Census 2011, 11.5 million Indian households owned passenger vehicles (car/jeep/van), which is equivalent to around 4.7 per cent of total households in the country. Another benefit of exclusion based on car ownership would be the elimination of misuse of subsidised fuel as motor fuel by the end consumers. Households with car ownership can be easily identified through the national register maintained by ministry of road transport and highways, which contains all the necessary information on registered vehicles (MoRTH, 2014) in a digital format and can be linked to LPG connection holders through address and identification details.

In order to evaluate the efficacy of such a criterion, the NSS data was analysed which suggests that the passenger vehicle information could help exclude 30 - 50 per cent[14] of the well-to-do households; however for a comprehensive identification of rest of the household, there is a need to look into other asset ownership and their information sources.

6.4.2 Identification based on SECC data

For a comprehensive set of asset based exclusion criteria to identify well-to-do households, the information from Socio Economic and Caste Census (SECC)[15], which is nearing completion, could be used. SECC database will include household information on occupation, government employment, income level, tax payment status, dwelling type, land ownership and asset ownership (vehicles, refrigerators, landline phone). For instance, criteria like simultaneous ownership of air conditioner and refrigerator could be used for identification of well-to-do households. The analysis on NSS data suggests that such a criterion could exclude 50 - 55 per cent[14] of well-to-do households.

The SECC survey data is being maintained in a centralised national repository (Banerjee, 2014). Since the SECC data is linked to the National Population Register (NPR) database (Banerjee, 2014), the households can be identified based on their addresses. However, the limitations in using the SECC data is that the information under SECC is obtained through

[14] The two bounds of range resulted from evaluation against direct NSS survey sample data, and sample data with the use of multiplier.

[15] Refer http://secc.gov.in for more details on SECC

self-declaration, not verified and thus the authenticity of the information is not established. Also, given the stakes involved, households would have the incentive to withhold accurate information (Thakur, 2012; The Indian Express, 2012).

6.4.3 Identification based on Know Your Customer (KYC) declarations and in person validation (by OMC/ Distributor)

While the concept of a KYC declaration started in the banking industry, in a bid to make reasonable efforts to determine true identity of a customer, a modified version of the KYC has been used by Oil Marketing Companies (OMCs) to determine identity and address of customers (over the past two years) and weed out duplicate connections. A KYC form is in principle a self-declaration by the customer attesting the verity of all information provided in the form. An extension of the KYC process is envisioned, wherein information on key asset ownership could be directly collected by the distribution agency, to then help determine well-to-do households. In order to keep a check on spurious declarations, KYC forms could be validated through in-person inspections by the distribution agency personnel during the course of regular safety audits which are made mandatory every two years and serve an important purpose in keeping LPG installations at homes safe. The onus on limiting corruption in such a validation process is assumed to be on the OMCs, as they have a direct impact on their profit margins (through under recoveries).

Table 1 summarises the discussion and relative advantages and disadvantages of different mechanisms to identify ‘well-to-do’ households.

Table 1: Overview of Different Mechanisms to Identify 'Well-to-Do' Households

S. No	Data Source	Exclusion criteria	Possible Coverage	Advantages	Limitations
6.3	Income tax database	Income status	-	- Direct determination of income/economic status	- Under-reporting; - Informal economy; - Privacy issues; - Difficult to link individual data with household address
6.4.1	National database of registered vehicles	Ownership of passenger vehicle (four wheelers)	~11.5 million or 4.7% house-holds	- Near overlap with higher income groups; - Easy identification; - Could exclude ~50% well-to-do households	
6.4.2	SECC database (centralised and digital)	Simultaneous ownership of Air-conditioner and refrigerator	~ 20 million house-holds	- Strong correlation with Easy identification (linked to NPR); - Could exclude ~55% well-to-do households	- Data authenticity
6.4.3	KYC & in person validation by OMC/ distributor	Simultaneous ownership of Air-conditioner and refrigerator	~ 20 million house-holds	- Exhaustive coverage; - Periodic update; - Co-benefits	- Possibility of collusion during the validation process

Source: CEEW Analysis

While addressing affordability issues, it is also important to be cognisant of the fact that adoption and usage of LPG is not only dependent on the recurring fuel cost for refills, but also the up-front payments needed as security deposit to obtain the cylinders (refer Box 2 for a further details).

Box 2: High Up-Front Costs - A Hindrance to the Uptake of LPG by Poor Households

Apart from the recurring monthly expenditure on procuring refills, the high up-front payment for getting a new LPG connection is a significant barrier to the adoption of LPG by poorer households (Nayak, Werthmann, & Aggarwal, 2014). The initial cost for a single and double bottle connection, including the cost of double burner stove, is INR 3250 and INR 4750 respectively.

In order to remove this barrier and facilitate LPG adoption in rural areas, a scheme for providing a

one-time grant to BPL families is being implemented by the Government of India. Under this scheme, the security deposit for the domestic LPG cylinder and pressure regulator (INR 1600) are funded through the contributions from the Corporate Social Responsibility (CSR) funds of the OMCs (MoPNG, 2014c). Separately, several state governments also provide targeted capital subsidy to poor households, such as the recent 'Kerosene free Dilli' scheme in Delhi, 'Deepam' in Andhra Pradesh and 'Grihalaxmi' in Chattisgarh (MoPNG, 2013d).

However, it was observed during evaluation of the Deepam scheme that some households in rural areas gave their connections to their friends and relatives working in town, to daughters as a dowry and even to civil servants (like village teachers) (Rajakutty et al., 2002). In order to prevent such diversion of free connections towards unintended users, the government may consider provision of low cost loans for initial fixed cost instead of capital subsidy. With the ongoing aggressive drive for financial inclusion and re-launch of Direct Benefit Transfer scheme for LPG subsidy, implementing the low interest loan mechanism to finance the upfront costs could be considered.

In 2002, OMCs introduced smaller sized cylinders (5 kg) with the belief that lower initial fixed cost and refill cost would facilitate adoption amongst low-income groups and increase the LPG penetration in hilly and interior areas (MoPNG, 2010b). However, these had poor uptake and less than 1% of rural connections are actually of 5 kg. Mainly two reasons led to poor uptake of 5 kg cylinder. Firstly, the landed price of LPG for smaller cylinders was higher than the 14.2 kg cylinder per unit of gas supplied (due to higher cost of transaction). Secondly, the average household requires two or more such cylinders on a monthly basis, to satisfy their cooking needs, thus increasing the inconvenience associated with the repeated trips to the distributor to obtain the refills, as rural distributors do not provide home delivery.

7. AVAILABILITY – SUPPLY AND DISTRIBUTION OF LPG

Besides rationalising the domestic LPG subsidy cap and pricing it within the 'affordability limits' of the households, enhancing its availability is crucial element. The objective to increase LPG adoption and usage while displacing inefficient and unclean traditional fuels, can be more effectively achieved by only improving the distribution penetration and, hence the availability of the LPG, especially in rural areas.

The availability of LPG for the households could be attributed to multiple factors such as distance from the nearest distributor, ease of obtaining a connection, delivery mechanism (home delivery or pay and take basis), and finally the ability of OMCs to supply to the distributor to cater to the demand. Barring exceptional circumstances, supply from the manufacturer has rarely been indicated as a bottleneck in the supply chain.[16]

However, the geographic spread of LPG distribution agencies in the country is not uniform. Locations for setting up of LPG dealerships are identified based on a refill sale potential, which can sustain an economically viable operation. The refill sale potential of a new distributor, in turn, is based on several factors, including population, population growth rate, economic prosperity of the location and the distance from already existing distributor/s (IOCL, 2014).

Urban areas with high household density and good connectivity are a viable investment and, thus, see a large number of LPG distributors. The provision of home delivery of cylinders and reasonably small distances from the distributor, further contribute to ease of availability of LPG to urban households. Yet, a sizeable population in urban areas cannot avail LPG connection due to lack of proper identification proof or on account of red-tape and corruption in the process of awarding new connections. These hurdles have been observed even in the ambitious Kerosene Free Delhi scheme, the primary objective of which was to shift households away from kerosene by providing non-discriminatory access to LPG. This scheme with focus on low income households observed delays and corruption in the processing of LPG connection applications and allocation of 'blue books' to consumers (Pollanki, 2013).

The availability of LPG in rural areas is a major challenge. Rural areas suffer from disadvantages like attenuated supply chains, long distances and high transport costs, poor road networks, dispersed and remotely located customer base, and higher cylinder maintenance costs (World LP Gas Association, 2005). As a result, the existing LPG distribution infrastructure is heavily skewed towards urban areas. They have 70 per cent of total distributorships and 67% of total connections (Lok Sabha, 2013). In order to increase the availability and hence the adoption of LPG by rural households, there is a clear cut need to increase the number of distributors and their reach in rural India, either through conventional

[16] Based on independent telephonic interviews of LPG distributors

means or novel channels. Box 3 provides details on LPG transportation costs which explain the low distributor penetration in peri-urban and rural locations.

In a bid to increase LPG penetration in rural and remote areas, the Government of India launched the *Rajiv Gandhi Gramin LPG Vitaran Yojana* (RGGLVY) in 2009. The scheme was launched to establish small size and low cost LPG distribution agencies in rural areas (PIB, 2010). It was formulated in order to achieve the LPG connections target of the Oil Sector Vision 2015, which aims LPG coverage for up to 75 per cent of the population, with focus on rural areas (MoPNG, 2009).

Box 3: LPG Distribution Costs - A Case for Uniform Rates

An often overlooked component of LPG price build-up is the delivery charges for transporting cylinders from bottling plants to distributors. These were brought to light when OMCs sought government approval to hike the delivery charges based on actual incurrence (The Hindu, 2013). These charges have virtually remained unchanged since 2002, whereas the transportation costs have increased significantly over the time. During an interview with a Petroleum Planning and Analysis Cell (PPAC) official (who requested to be anonymous), it was indicated that the unattributed losses to OMCs on account of this is around INR 600 crore for the FY 2013-14. Currently the charges are calculated on distance based slab rates and are around INR 10, INR 12 and INR 14 per cylinder for three distance categories, up to 80 kms, 80 to 110 kms and above 110 kms respectively (The Economic Times, 2013a).

Though distance based slab rates for LPG transportation are the logical way to transfer costs, they discourage consumption at far off locations in two ways. First, due to the existing distance based slab rates, the higher loss incurred by OMCs in transporting cylinders to a far off location gives little incentive to them to increase supply to these areas. This further reduces the LPG availability in these areas, which invariably happen to be rural, hilly or areas with poor connectivity. Secondly, if the recent demand to increase delivery charges is approved, it would increase the rates by INR 5 for plains and INR 16 for hill areas, thus further widening the existing disparity in cylinder costs and skewing the consumption pattern of LPG.

Instead of distance based blocks/slabs, it is suggested that delivery charges be pooled at the national level, based on which a uniform transportation cost (to the distributor's location) could be arrived at. Further, this uniform transportation cost should be periodically revised to cover the actual cost incurred by the OMCs to transport LPG cylinders to the distributors. This will reduce the burden of higher distribution costs on remote rural consumers (through averaging) and promote the availability in far off locations. Also, rural locations, which were earlier unattractive due to higher distribution costs, will be relatively more attractive to OMCs than in the past, for setting up new LPG distribution agencies; a must for improving the LPG penetration in underserved rural areas.

The RGGLVY supports a low cost business model for LPG distribution agencies. The economic viability of the agency is contingent upon the potential of average monthly sale of 600 cylinders of 14.2 kg and 1,800 customers. Minimum cash balance requirements for applicants under this scheme is reduced to INR 4 lakhs as opposed to the INR 15 lakhs (urban) and INR 10 lakhs (rural) for regular dealership aspirants (IOCL, 2014). Ever since its

launch, 3,180 distributorships have been commissioned under RGGLVY (Lok Sabha, 2014).

Unlike regular distributorships, under the RGGLVY there is no provision for home delivery of LPG cylinder and it operates on 'pay and take' basis, in order to keep the delivery costs to a minimum. Households typically use cycles or motorized two wheelers to carry cylinders back home.[17] However, households located far away from distributor and lacking access to transport facility are still unable to access LPG. Further, sparsely populated and remote settlements will be left outside the coverage of RGGLVY due to high cost of delivery and economic unviability for the distributors. In the first three years of the scheme (2009-2012), a little over 1.5 million new connections were awarded (Lok Sabha, 2012). Given the ambitious goal of 75 per cent coverage of the entire population (by 2015), the scheme has not delivered at the requisite pace. Hence, there is a need to look for alternatives that go beyond conventional distributorship (even low cost) models, for enhancing LPG availability in underserved areas.

7.1 Alternate Distribution Arrangements

Expanding the distribution network for the last mile delivery of LPG exclusively in remote areas is an expensive proposal due to high cost of transport and inventory management. Leveraging existing institutions for LPG supply may help address the accessibility issues with minimum investment and fiscal outlay, in a short timeframe. Two such options that could be explored are: (i) Self-Help Groups and (ii) rural supply chain.

7.1.1 Self Help Groups (SHGs)

An SHG is a homogeneous group, comprising 15 to 20 members (mostly women), which serves as a conduit between the formal banking system and the poor in rural areas who are left out of the financial system. These are currently being used as a channel for financial inclusion. As of 2013, the number of SHGs in India linked with banks stood at 73.18 Lakhs (Kumar, 2013). Given their presence across the country, SHGs could serve as the medium to enhance LPG penetration into remote rural areas. SHGs could either act as link between rural distributors and the far off customers (like extension counters) or function as independent mini distribution agencies.

SHG as a remote extension counter

Presently, regular LPG distributors in urban areas can have rural extension counters to serve consumers in far off areas, wherein the infrastructure and working capital support is provided by the distributor and delivery is done by hired employees. In a similar vein, an SHG could serve as an extension counter of a private LPG distributor or a public distribution agency. This idea has been tested in the *Shakti Gaon* project, piloted by Odisha government in collaboration with IOCL (Business Standard, 2009). SHGs could maintain a small stock of cylinders (weekly stock of 30-40 for serving ~200 households) and get refills from the parent

[17] Based on independent telephonic interviews of RGGLVY distributors

distributor on weekly or fortnightly basis (details in Box 4). The income from connection and refill commission may be shared between the distributor and the SHG. The government could consider incentivising the distributors to open extension counters in underserved but less profitable locations, in the form of soft loans or one time capital subsidy.

Box 4: Odisha Model - LPG Distribution through SHGs

In four districts of Odisha, 72 SHGs have been supplying LPG cylinders to around 45,000 rural households since 2004.[1] This pilot initiative by ORMAS[2], under the *Shakti Gaon project,* was primarily conceived in order to provide livelihood opportunities to rural women along with access to clean cooking fuel.

Under this model, District Supply and Marketing Societies (DSMS) in each of the pilot districts are given LPG dealership under an MoU signed with IOCL and BPCL (Business Standard, 2009). At the block level, women SHGs function as Shakti retailers (extension counters) on behalf of DSMS (The New Indian Express, 2011). OMCs supply the cylinders to the DSMS, which in turn distributes them to the extension counters within the districts, based on the fortnightly refill demands. The SHGs maintain manual records, which are periodically updated by the DSMS to the OMCs online servers.

This is a state government supported initiative under which a capital support of INR 20-25 Lakh per LPG dealership and INR 40,000 per extension counter is given as a starting provision to the DSMS.[3] For the purpose of working capital, a loan of INR 1 Lakh is given to the SHGs under the SGSY, a livelihood promotion scheme of the union government.[4] Training to the SHG members is given by the resource centres set up under STEP[5], yet another central sector scheme. To supplement their income from LPG distribution, the SHGs operating the extension counters sell gas stoves and kitchen utensils, and also provide repair and maintenance services to the rural households.

[1] Based on information from an ORMAS (Orissa Rural Development and Marketing Society) official
[2] Orissa Rural Development and Marketing Society, an autonomous body under Panchayati Raj Department of Government of Odisha
[3] Based on information from an ORMAS (Orissa Rural Development and Marketing Society) official
[4] Swarnajayanti Gram Swarojgar Yojana, now called National Rural Livelihood Mission (Ajeevika)
[5] Support to Training and Employment Programme

SHG as mini distribution agency

For remote and small hamlets of 100 to 200 households, the RGGLVY model is not viable for a distributor (requiring a minimum of 1,800 connections). For such settlements, a low cost distribution alternative with SHG as mini distributor can be considered. Our analysis estimates that with a loan of INR 1.25 Lakh (for capital and operational expenditure) at 7% interest rate[18], an SHG can supply LPG to ~200 households in a financially viable manner. Soft loan aggregating to INR 1,250 crore by government is sufficient to commission 100,000 such mini distributorships, which could help serve an additional 20 million households in remote rural areas.

The income from LPG distribution will certainly not be the primary source of income for the

[18] Banks (PSUs and RRBs) have been directed to give loans to women SHGs at 7 per cent interest rate under Swarnajayanti Gram Swarojgar Yojana (SGSY)(Press Trust of India, 2013).

SHG. But SHGs could provide other value added services that could include the sale of cooking appliances and stove repair services to the households in the village. In order to ensure a minimum revenue flow, the dealership to an SHG can be limited to locations where a certain fraction of households are willing to pay fixed monthly instalments (based on annual consumption estimates) for LPG supply. This can also offset lumpiness associated with the refill cost, as households would be contributing periodically. However, SHGs as mini distributors would call for greater effort from OMCs to regulate and watch over the numerous and small distribution entities. Also, OMCs will be required to deliver small batches of LPG cylinders (less than one truck load) to SHGs dispersed far and wide.

A significant co-benefit of involving SHGs in LPG supply could also be the awareness generation among households, especially among the female population. The effectiveness of this has been established by the *Deepam scheme* in Andhra Pradesh (Rajakutty et al., 2002).

7.1.2 Rural Supply Chains

Under the current system, LPG is delivered by the distributor either at consumer's doorstep or the cylinder is collected by the consumer from the distribution agency. There is no provision for outsourcing the delivery of cylinders to consumers. Also, in case of upstream supply, large distances from bottling plants, need for additional LPG supply-truck fleet, unsuitability of terrain to current fleet of trucks, etc. may raise the cost of LPG supply by OMCs to distributors in remote areas.

In order to meet the challenge of increased cost of supply to remote locations, it would be worthwhile to utilise the existing rural supply chains to perform the role of an intermediary in the LPG distribution system. The bottled beverage industry and the fast moving consumer goods (FMCG) supply chains have presence even in the remotest rural areas (World LP Gas Association, 2005). Several specialised rural supply chain companies/networks such as *Drishtee, MokshaYug Access* (in Karnataka), RUDI (in Gujarat), etc. could be roped in for outsourcing of LPG cylinder delivery in remote rural locations.

The rural supply chains could act as intermediaries in the following three ways:

1) Supply cylinders from bottling plants to small rural distributors;
2) Supply small batches of LPG cylinders from rural distributors to their extension counters;
3) Supply cylinders from rural and RGGLVY distributors to the end-consumers

There might be regulatory concerns in involving rural supply chain for LPG delivery due to the subsidised nature of product. This concern could be addressed if subsidy is disbursed under the DBT regime. Under the proposed DBT regime the subsidy would directly reach the consumer (beneficiary) and commodity will be available to purchase at the market price, leaving no incentive for siphoning off of the cylinders by rural supply chain players.

8. AWARENESS GENERATION – BUILDING THE DEMAND FOR LPG

Analysis of the NSS data indicates that in 2012, close to 80% of Indian population relied on solid fuels and kerosene to satisfy some portion of their cooking energy needs. Even in urban areas, almost 30 per cent of households in top 3 income deciles consume solid or liquid fuels to meet their cooking energy needs. Among other reasons, this could be attributed in part to the lack of awareness about the health impacts of indoor air pollution from the use of traditional solid fuels for cooking purposes.

Education is often cited as a useful proxy measure for awareness, and several studies acknowledge the importance of the education levels of the head and adult women of the household, in determining the fuel choice (Farsi, Filippini, & Pachauri, 2007; Ganesan & Vishnu, 2014; Masami; Kojima, Robert, & Xin, 2011; Puzzolo, Stanistreet, Pope, Bruce, & Rehfuess, 2013). These indicate that with the rise in education levels the likelihood of households adopting and using LPG for cooking increases. Besides the lack of awareness about health benefits of using clean cooking fuel, misperceptions about LPG usage also hinder its adoption. A study undertaken in 8 states of India by MART[19] found that despite overcoming the affordability and availability barrier, villagers did not adopt LPG as they believed that cylinders were unsafe and gas leakage might cause health problems (MART, n.d.).

Significance of awareness generation can also be gauged from the fact that households having access to a *Rasoi Ghar* (community kitchens having LPG cooking service set up by HPCL), exhibited a positive behavioural change among rural women. The evaluation of this model by NCAER[20] found that a significant number of women opted out of the community kitchen and decided to invest in obtaining an individual LPG connections (MART, n.d.).

Thus, increasing awareness about health and cost benefits of moving to cleaner cooking fuels and technologies as well as providing the basic training about safety features could effectively build a demand base for LPG and establish the enabling conditions to drive a shift towards LPG as domestic cooking fuel.

8.1 Models and Approaches for Raising Awareness

Diverse strategies are being employed the world over to promote adoption of clean cooking technologies and fuel. Information dissemination through mass media such as newspapers, TV and radio as well as outdoor media such as wall paintings and posters is the simplest strategy which the government and OMCs could use to reach the wider public. For instance, the LPG Safety Association of Southern Africa published pictorial guides in several local languages, while the Ghana government sponsored newspaper advertisements to promote

[19] Marketing and Research Team

[20] National Council of Advanced Economic Research

safe LPG usage. As in the case of Total Sanitation Campaign (TSC) and polio vaccination drives, the government can involve pubic faces or celebrities for a nationwide campaign through mass media as well.

A recent study based on interviews in 11 rural villages suggests that carefully designed social marketing, awareness campaigns and free trials are required to promote adoption of clean cooking services in rural India (Bhojvaid et al., 2014). Although this study was focused on adoption of improved cook stoves (ICS), some of the findings are relevant for promotion of LPG as well. It was found that information dissemination through different media in non-technical language, with a focus on women, is particularly effective (Masami Kojima, 2011).

More interactive mode of generating public awareness could involve street-plays, road-shows, particularly traditional and folk media such as puppetry, drama, songs etc. The International Institute of Energy Conservation (IIEC) has designed a short drama performance involving local communities to raise awareness of the benefits of using LPG in South Africa (IIEC, 2004). Since 2009, under its 'Suraksha Sanchetna Abhiyan', HPCL has been using specially designed Exhibit Buses and road-shows to spread information about LPG safety and conservation. HPCL also conducted 'Art for Awareness' campaign in select schools to educate children about safe use of LPG, who could carry the safety message to their mothers and households. (HPCL, 2011)

One of the most effective awareness strategies used is practical demonstrations at the community level which can dispel fears and misconceptions among potential consumers of LPG, while clearly demonstrating the ease of cooking and other associated benefits. Community LPG kitchens (*Rasoi Ghar*) run by HPCL have been extremely successful in promoting LPG adoption by households. *Drishtee*, a rural supply chain organization, conducts demonstration camps in rural areas to sell and promote improved biomass cook stoves in rural areas. As reported, 75 per cent of its buyers were part of the demonstration camps, while the other 25% based their decision on neighbourhood feedback of the product (Drishtee, 2014). LPG distributors could also conduct demonstrations and spread awareness through public announcement in rural areas. Few such instances were observed during interviews with some RGGLVY distributors.

Shifting households to clean cooking fuels is also a health imperative. Therefore, efforts to create awareness about clean cooking practices could be integrated into the ongoing health awareness campaigns and strategies such as those under the National Rural Health Mission, RGSEAG[21] (Sabla), etc. Table 2 (below) details the various actors and strategies that have been adopted across the world, in improving the awareness of the benefits of cleaner cooking solutions. It also highlights the issues on which information has to be essentially conveyed to the target audience.

[21] Rajiv Gandhi Scheme For Empowerment Of Adolescent Girls

Table 2: Awareness Generation: Actors, Strategies and Content	
Actors	Government; Oil Marketing Companies; Distributors; consumer associations; Civil Society Organisations, Rural supply chain; Self Help Groups; Asha workers
Strategies	Advertisement (newspapers, pamphlets, radio and television); community level demonstrations; street-plays; road-shows; competitions in schools; pictorial guides and use of folk media
Content	Health benefits; time and labour savings; safety precautions; cost estimates and benefits
Source: CEEW Analysis	

A combination of various strategies through different actors could be effectively used to promote the adoption of clean cooking services and technologies. It is argued that unless LPG becomes the primary energy source, the health benefits of LPG connection remain low (Rajakutty et al., 2002). Households having access to cheap or free biomass are likely to use low levels of LPG in their daily cooking (Masami; Kojima et al., 2011). Paying for cooking service, therefore, is not an economically attractive proposition for such households. In order to transition these households to cleaner cooking solutions, there is a need for sustained and intense awareness generation drives, highlighting the health benefits of using the alternative options, either in the form of LPG or other cleaner technologies, which can use the freely available biomass (e.g. improved cook stoves, biogas, etc.). In light of this competition from cheap/free fuel, the efforts to expand access to LPG should first consider focusing on areas where free or cheap biomass is diminishing.

9. CONCLUSION

Rising incomes and aspirations certainly point to a future where India is likely to consume a significantly larger share of the global LPG supply. What is clear is that the current subsidy regime is not financially sustainable. The current provision of LPG subsidy is regressive and does not serve the intended beneficiaries. Subsidy in the form of under-recovery has significant implications for the ability of OMCs to invest in expanding services to those areas that need it, as it takes away the much needed financing. It also impacts the ability of upstream oil companies to invest in new exploration activities and improving production from aging wells, as they share a significant financial burden in the current subsidy sharing formula. In addition to the analysis presented in this study, there exists a significant body of work which documents the failings of the current subsidy regime while also suggesting suitable mechanisms to alter it. The start of any such effort will be to first transition to a common, market-based price for LPG and deliver targeted subsidies for those groups that need it, through a direct transfer of cash (DBT). Data and information gaps remain, in identifying those households that deserve the subsidy, and these need to be plugged, in due course of time. Some options to this effect are provided in this study and the feasibility of these needs to be tested by the OMCs or by the MoPNG.

Along with a more targeted subsidy regime, the need to increase the distribution and availability of LPG to rural areas cannot be understated. In order to achieve a more equitable consumption and benefit of LPG to the masses, innovative mechanisms which can increase LPG penetration to rural and remote locations are proposed in the study. Pilots or feasibility tests on the proposals would be required to establish the cost effectiveness and efficacy of these options. Concurrently, a targeted drive to increase the awareness of the benefits of using cleaner fuels will help create demand for the same and contribute to increasing its penetration.

On the one side, LPG is increasingly becoming the modern fuel of choice for aspiring Indian population; while on the other, given the low resource base of petroleum in the country, India's reliance on imported fossil fuel is also rising at an alarming rate. This has a two-fold negative implications: First, the rising current account deficit (CAD) and second, the increasing concerns about energy security associated with the provision of an essential and basic service such as cooking energy for a population of more than a billion.

While the underlying objective is to provide clean and affordable cooking energy to all, given the increasing import bills, energy security concerns and the long term sustainability, universal LPG coverage may prove to be a sub-optimal solution. The options for provision of clean cooking energy are diverse. It is necessary to chart the alternative options that exist and evaluate their suitability for different regions and contexts, while recognising the difference in level of service provided by each. Such an evaluation is especially important for areas where LPG provision is unlikely to reach or can be displaced in a cost effective manner.

These options include waste-to-energy in urban areas, improved biomass cook-stoves and processed biomass fuels, biomass gasification at community level, biogas generation and supply – both community and home-based and finally electricity based cooking and heating solutions, which are already on the rise. The next phase of this research will undertake the task of technological assessment of these options. The end objective is to be able to compare these alternatives and ascertain how a combination of these solutions could provide clean and affordable cooking energy to every Indian household.

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Council on Energy, Environment and Water,
Thapar House, 124, Janpath, New Delhi 110001, India

Tel: +91 407 333 00 | Fax: +91 407 333 99

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