From traditional fuels to LPG & LED use:

Policy instruments for a sustainable transition of household cooking & lighting habits in India

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- Intermediate Reporting -

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Introduction

- Major challenges in the (Indian) energy sector:
  - Provide basic energy services to a growing population
  - Participate in a global transition to low-carbon energy systems
  - Reduce detrimental health effects caused by traditional fuel use

→ Our research project: How to promote efficient and clean/healthy energy solutions?

- Focus on **household energy use** for
  - **Cooking:** Cleaner cooking fuels, notably Liquefied Petroleum Gas (LPG)
  - **Lighting:** Efficient lighting solutions, notably LED bulbs

- Context: Ongoing government policies to promote LED and LPG

The road towards clean fuel use in India

Household air pollution from burning solid biomass has hazardous consequences for human health and the environment (Smith 2006, WHO 2014).

– > 2 million premature deaths due to HH air pollution

– Inefficient stove combustion leads to emission of pollutants like black carbon and methane

Rural India: Traditional fuels remain dominant despite government programmes

– > 800 million people relying on solid fuels (firewood / cow dung) for cooking

– Policies to improve affordability (subsidies) and accessibility (better supply)

– Latest initiative: 50 million free LPG connections through **Ujjwala Yojna (PMUY), 2016-2019**

– Rapid increase of LPG customers → But additional LPG consumption limited

Which instruments to complement clean cooking fuel policies?

The transition to a sustained all purpose use of clean cooking fuels remains a challenge

- Uptake ≠ sustained LPG use (Aklin et al. 2016)

→ How can more regular use of LPG be achieved after adoption?

Awareness as neglected factor of households' fuel choices

– Poor awareness about the (health) benefits of LPG amongst rural households (Aklin et al 2016)

– Need better understanding to what extent health-information matters:

→ Does higher awareness about the severe health impacts of indoor air pollution effectively increase LPG consumption ?

The problem of inefficient lighting in India

- Energy usage is mostly in the areas of domestic cooking and lighting, agriculture, transport and industrial sectors.

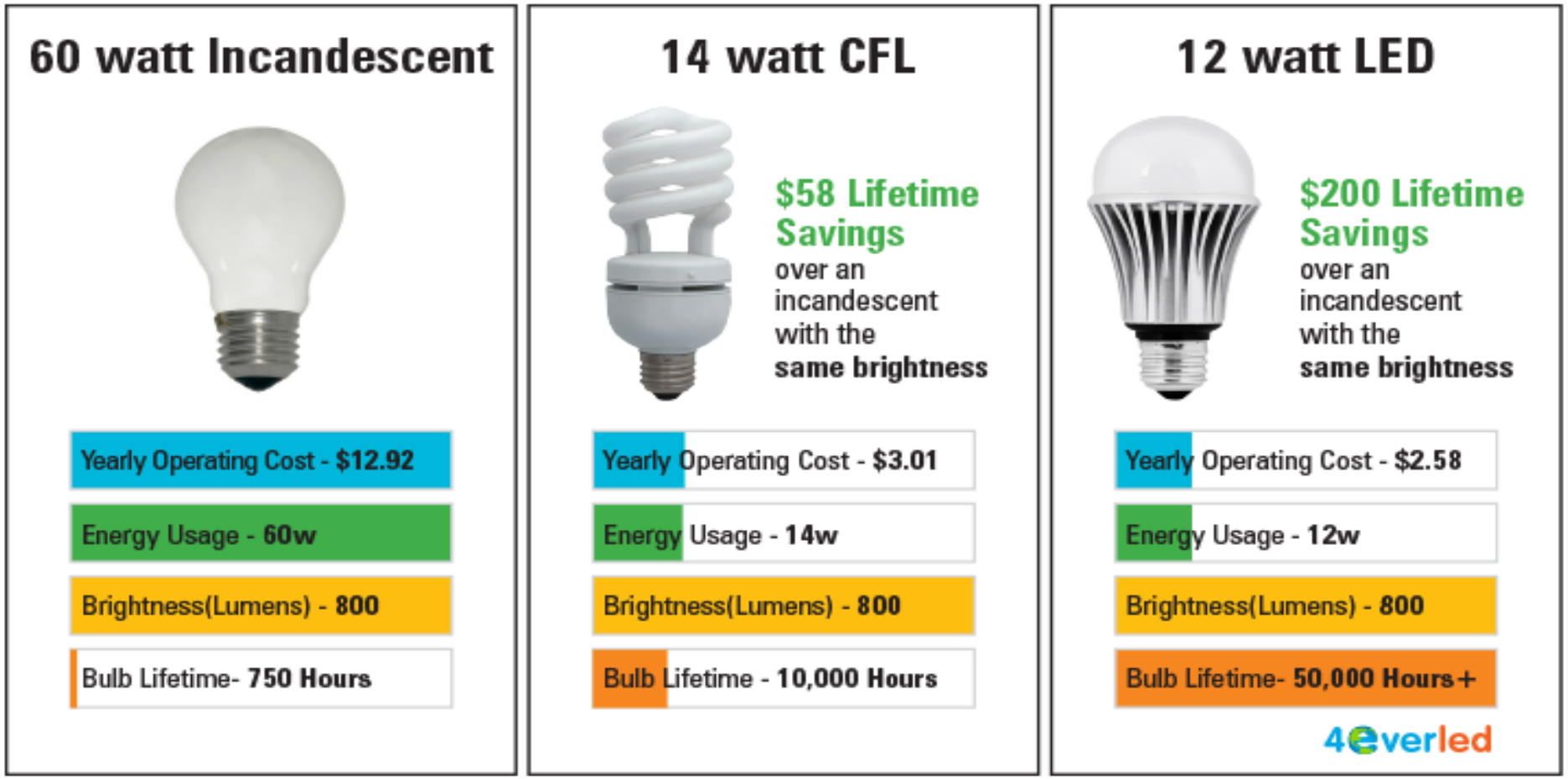
- A wide disparity exists in terms of capita energy consumption pattern between rural and urban areas.

- Inefficient lighting from traditional kerosene lamps, incandescent bulbs as well as CFLs are major sources of increased energy and environmental costs (contains mercury and toxic CO2 emissions). (Menaria, 2014).

- **Issues for a sustained transition to efficient lighting solutions**
- Availability
- Access
- Affordability

Benefits of Energy Efficient Lighting

Households	energy savings, reduced bills, mitigation of impacts of higher tariffs
Environment	reduction in local pollution and in green house gas emissions (GHGs)



How effective are energy efficiency policies in India?

- **Various policies for efficient lighting: Standards and Labelling Programme, Bachat Lamp Yojana, UJALA.**

- BUT: adoption limited due to various factors such as:
- lack of information/awareness,
- distortion in prices
- agency problems etc.

- **Research Question**:

How does awareness of energy efficiency, ease of access and ensured affordability influence household behavior towards a sustained adoption of efficient lighting solutions (with specific reference to LED lamps)?

Data & Methods

- Assessment of secondary data (NSS, IHDS, ACCESS, Census)
- Focus group discussion
- Key informant interviews & discussions with key stakeholders (public sector)
- Pilot studies
- **Full-fledged field study:**

  Household survey with willingness-to-pay (WTP) experiments for LPG and LED

  Sample: 440 Households in Bikaner (Rajasthan)

  Irregular LPG users

Field study Bikaner District, Rajasthan

WTP for a LPG refill conditional on health-information

Survey experiment with strong health frame to test effect of health-information systematically

- Random assignment of households to health or placebo frame
  - Treatment group: information on health-risks related to cooking with traditional fuels
  - Control group (“Placebo”): technical information on LPG
- Assessment of willingness to pay (in both cases) to examine the impact of the health frame

Incentivizing more regular use

- For each household a specific price (< subsidized market price) results, we offer partial cost-reductions (voucher)
- Households use voucher to partly cover the bill of their next LPG refill from the distributor
- Conditional WTP’: Voucher expiry date reduces household’s average time until next refill by 50%

VISUALIZATION

Treatment: Health frame (poster)

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VISUALIZATION

Control: Technical frame (poster)

Survey and WTP assessment for LED

The survey shall assess the demand and supply side challenges for adopting LED bulbs:

–**Supply Side :** availability, pricing and access

–**Demand Side**: awareness of efficiency aspects of LEDs such as (lower costs / longer lifespans)

Measuring WTP for an LED bulb

– LED bulbs procured from the parallel legitimate private market and offered to households at the price at which they are available with the outlets of EESL.

– Auction technique applied for LED and LPG experiment to reveal (maximal) willingness-to-pay for a LED bulb

– For each household a specific price (<= market price) results, we offer the partial cost-reductions.

– The respondent makes an upfront payment of the price drawn by her, and thereby procures the LED bulb.

Expected policy insights from the study

- An in-depth understanding of the factors that determine regularity of LPG use and sustainable transition to LEDs.

- Insight on:
  - to what extent awareness about the health-benefits of using clean cooking fuels affect this willingness-to-pay
  - How pricing and ease of access affect people's willingness-to-take up energy efficient appliances.

- An indicative estimate of how much a household can spend on regular LPG use and on adopting LED lighting.

Where we stand now

Findings so far

- Focus group discussions: Strong response to health information (LPG)
- LPG: Willingness-to-pay differential not significant in pilot -> methodological issues
- LED: Average willingness-to-pay very close to the legal price

Schedule for upcoming activities

- September ‘17: Continued interactions with stakeholders to enable field study (Oil Corporations)
  Finalization of field logistics, samples and tools
- October 2017: Field study on UJALA and UJJAWALA (October – December 2017)
- February 2018: Dissemination of results (scientific community / stakeholders in public sector)

Questions / Comments…? Thank you!

Diyatra,
Bikaner (Rajasthan),
January 2017

APPENDIX

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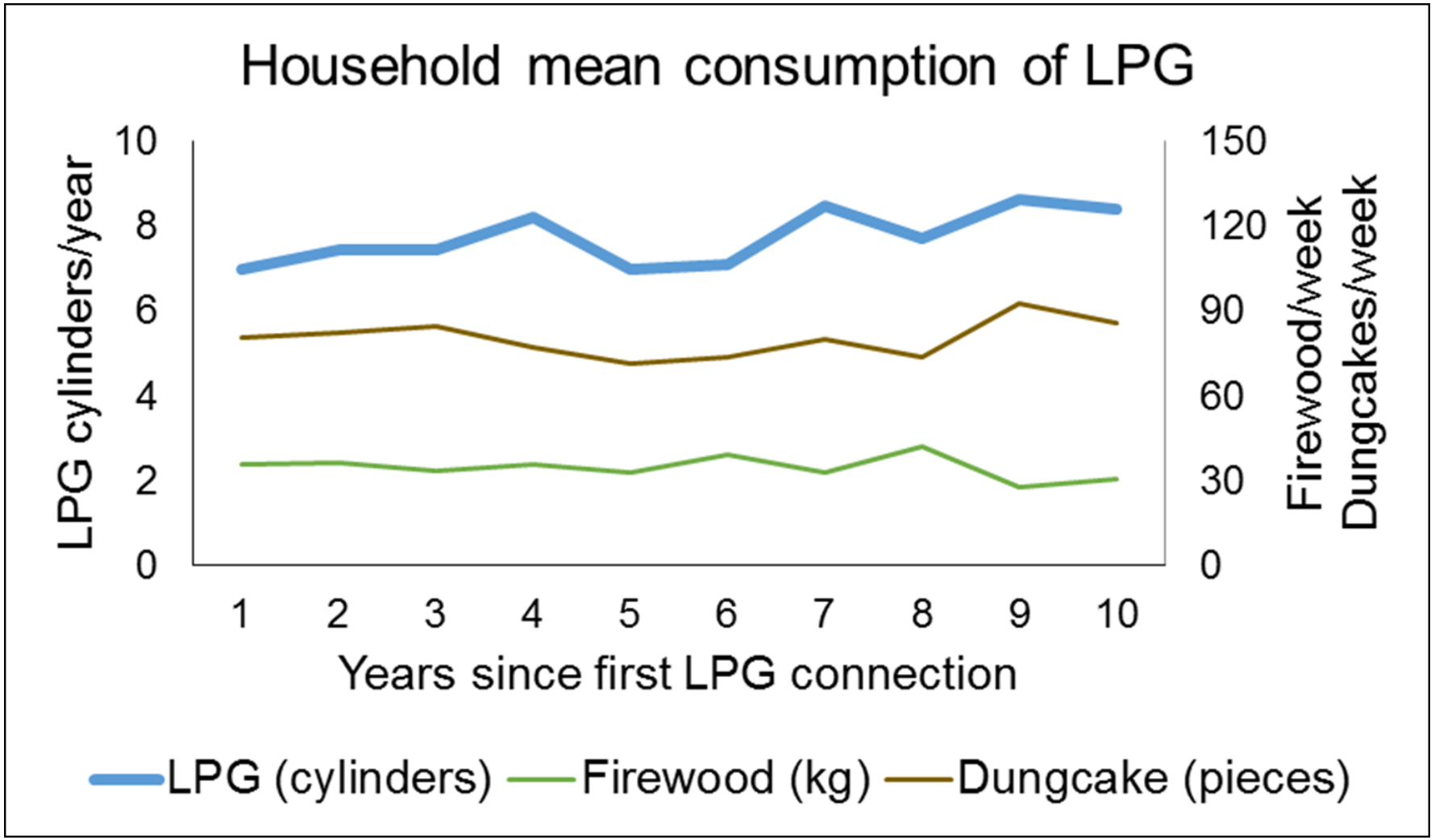
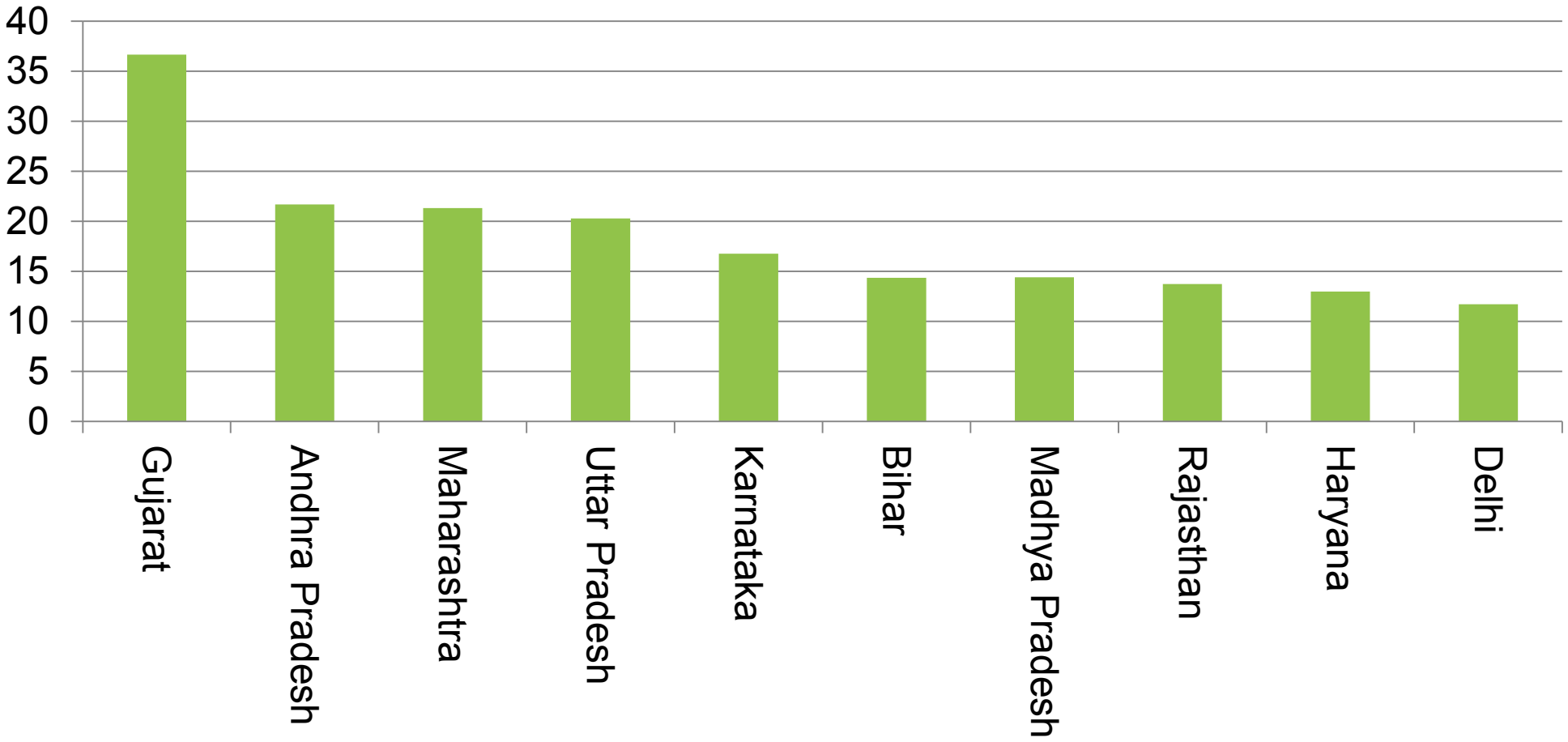
Waiting for behavioural change?



Source: Aklin et al. (2016)

Distribution of LEDs in top 10 States 2017, in millions of LED bulbs



Existing evidence on the effectiveness of health-information

Krishnapriya 2017: Experimental field study in rural Uttar Pradesh and Kerala (2013)

- Effect of information w.r.t. health benefits & costs on the dirty/clean fuel mix used for cooking
- Stimulus disseminated in varying modes and recipient-combinations (leaflet hanging in HH, combined with posters in village & information through health workers)

→ No significant impact on the use of LPG was found. Possible explanations: Comparatively high upfront costs of adopting LPG and buying cylinder refills, problems of availability

→ More evidence required:

- To what extent is response related to change in valuation of LPG?
- How to achieve regular use of LPG ?

TEMPLATE OF VALUE VOUCHER [front]

[FRONT]

गैस वाउचर / VOUCHER LPG REFILL **No. 1**

लाभार्थी का नाम /
Full name of beneficiary: _____

रकम /Amount: _____

पता / Address: _____

समाप्ति की तारीख/Valid until: _____

ग्राहक पहचान /
LPG consumer ID: _____

वर्तमान सिलिंडर न°/
No. of currently used cylinder: _____

Stamp of University of Zurich here

Measuring Willingness-to-pay for LPG using Becker-Degroot-Marschak (BDM) auction mechanism

Dependent Variable Y: maximum willingness to pay (WTP) for a full cylinder of LPG

Condition: currently used cylinder is consumed more quickly (half of usually remaining time).

Measurement with BDM Auction :

1. Information of respondent: Offer price will be randomly drawn number between 240 and 480 INR
2. The respondent is states his/her bid*
3. Random draw of offer price (from a set of number cards by the respondent)
4. Comparison of bid vs. offer: bid > offer -> LPG can be bought at offer price.

   bid < offer -> No LPG purchase at reduced rate possible

** Enumerator presents potential bids to him/her by counting down numbers starting from 480*