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SUPPLEMENTARY INFORMATION

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The drivers of sustained use of liquified petroleum gas in India

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Drivers increasing the use of LPG in rural India

Supplementary information

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Supplementary Tables

Supplementary Table 1 | Number of observations across two waves of survey, grouped by state.
The panel subset only includes households that were surveyed in both waves.

State	Wave 1 (2014-2015)			Wave 2 (2018)			Panel Subset		
	Districts	Villages	Households	Districts	Villages	Households	Districts	Villages	Households
Bihar	9	126	1511	9	126	1512	9	126	1,246
Jharkhand	5	70	840	5	70	840	5	70	716
Madhya Pradesh	10	140	1680	10	140	1680	10	140	1,324
Odisha	3	42	504	6	84	1008	3	42	415
Uttar Pradesh	18	252	3023	18	252	3024	18	252	2,749
West Bengal	6	84	1005	6	84	1008	6	84	867
			8,563			**9,072**			**7,317**

Supplementary Table 2 | Distribution of households in the panel subset, grouped by wave and LPG-use category

		Category in Wave 2			
		Minority user	Primary user	Exclusive user	**TOTAL**
Category in Wave 1	Minority user	240	198	132	570
	Primary user	101	196	249	546
	Exclusive user	30	63	202	295
	TOTAL	371	457	583	**1,411**

Supplementary Table 3 | Determinants of upward movement in LPG-use category between Wave 1 and Wave 2 for households that were minority users of LPG in Wave 1 (model 1) and for households that were primary users of LPG in Wave 1 (model 2). The table shows results from two additional panel ordered logistic regression models. Model 1 explains determinants of upward movement only for households that used LPG as a minority fuel in Wave 1 (570 households), and Model 2 considers those that used LPG as a primary fuel in Wave 1 (546 households). The response variable in both models is the LPG-use category in both waves of survey. These models differ from Table 3 in that they consider different starting points of LPG use in Wave 1, whereas Table 3 captures all possible movements in the LPG-use category, and is thus considered more robust. Although we find (in Table 2) that households that relied on labour and agriculture as the primary source of income had lesser odds of primary and exclusive use, in these models, we do not find support for that hypothesis. Standard errors are in the parentheses below the odds ratios. *** p<0.01, ** p<0.05, * p<0.10

	Model 1				Model 2			
	Odds Ratio (SE)	**P>z**	**95% Conf. Interval**		**Odds Ratio (SE)**	**P>z**	**95% Conf. Interval**	
Percentage of households in a village using LPG as their primary cooking fuel	1.061 (0.011)	<0.001***	1.039	1.083	1.033 (0.004)	<0.001***	1.026	1.041
Women are involved in the household decision-making	0.948 (0.196)	0.798	0.633	1.422	1.058 (0.174)	0.734	0.766	1.459
Number of years that the household has had LPG (ln)	2.345 (0.561)	<0.001***	1.467	3.748	1.107 (0.089)	0.208	0.945	1.296
One-way distance to procure LPG cylinders (km)	0.960 (0.017)	0.022**	0.928	0.994	0.985 (0.012)	0.219	0.963	1.009
Household owns cattle	0.381 (0.093)	<0.001***	0.236	0.615	0.459 (0.072)	<0.001***	0.337	0.624
Household owns land	1.081 (0.290)	0.771	0.639	1.829	1.306 (0.257)	0.174	0.889	1.920
Economic status index	1.064 (0.051)	0.200	0.968	1.170	1.192 (0.046)	<0.001***	1.106	1.285
Household size (ln+1)	0.690 (0.159)	0.107	0.439	1.083	0.596 (0.110)	0.005***	0.415	0.856
Primary source of income of the household:								
Agriculture on own land or leased land	0.781 (0.208)	0.352	0.463	1.315	0.812 (0.171)	0.322	0.537	1.226
Casual agricultural or daily-wage labour	0.960 (0.284)	0.889	0.537	1.714	0.905 (0.203)	0.655	0.583	1.404
Salaried occupation	1.350 (0.427)	0.343	0.726	2.508	1.163 (0.262)	0.504	0.747	1.809
Number of observations	1,139				1092			
Number of households	570				546			
State fixed effects	Yes				Yes			
Log likelihood	-671.531				-783.688			
Wald Chi^2	41.46				191.42			
Prob > chi^2	0.0005				<0.0001			

Supplementary Table 4 | Determinants of LPG-use category in Wave 2 (cross-section model). The table shows results from a cross-section generalised ordered logistic regression model, with one additional covariate as compared to Table 2—whether the household considers LPG to be better for their health than traditional cookstoves in Wave 1. The response variable is the LPG-use category in Wave 2. The observation count—2,444—is lower than the model in Table 2 as only those households where the same respondent in the household was interviewed in both waves of survey were considered. The model explains determinants of households being primary users of LPG (as compared to minority users), and of being exclusive users of LPG (as compared to primary users) in Wave 2. Standard errors are in the parentheses below the odds ratios. *** p<0.01, ** p<0.05, * p<0.10

	Odds of primary use as opposed to minority use				Odds of exclusive use as opposed to primary use			
Dependent variable: LPG-use category	**Odds Ratio (SE)**	**P>z**	**95% Conf. Interval**		**Odds Ratio (SE)**	**P>z**	**95% Conf. Interval**	
Whether the household is a PMUY beneficiary	0.706 (0.097)	0.011**	0.539	0.924	0.552 (0.085)	<0.001***	0.408	0.746
Percentage of households in a village using LPG as their primary cooking fuel	1.043 (0.003)	<0.001***	1.038	1.049	1.025 (0.003)	<0.001***	1.020	1.030
Weekly expenditure on biomass (Wave 1) (ln+1)	1.012 (0.022)	0.593	0.970	1.055	0.978 (0.021)	0.299	0.937	1.020
Whether firewood is collected multiple times a week (Wave 1)	0.843 (0.105)	0.170	0.661	1.076	0.760 (0.099)	0.034**	0.590	0.980
Whether women are involved in the household decision-making	1.210 (0.144)	0.109	0.959	1.528	0.938 (0.115)	0.602	0.737	1.194
Number of years that the household has had LPG (ln+1)	1.416 (0.133)	<0.001***	1.178	1.703	1.310 (0.124)	0.004***	1.088	1.577
One-way distance to procure LPG cylinders (km)	1.002 (0.009)	0.810	0.985	1.019	0.997 (0.010)	0.776	0.978	1.017
Whether the household owns cattle	0.506 (0.059)	<0.001***	0.403	0.635	0.492 (0.054)	<0.001***	0.398	0.609
Whether the household owns land	0.847 (0.115)	0.221	0.649	1.105	0.827 (0.110)	0.154	0.637	1.074
Economic status index	1.156 (0.042)	<0.001***	1.077	1.240	1.181 (0.041)	<0.001***	1.104	1.263
Household size (ln+1)	0.658 (0.096)	0.004***	0.493	0.877	0.491 (0.069)	<0.001***	0.373	0.646
Considered LPG to be better for health than traditional cookstove in Wave 1	0.927 (0.103)	0.496	0.745	1.153	0.939 (0.105)	0.572	0.754	1.169
Education of the household head (ref: ≥12th standard)								
No Education	0.834 (0.132)	0.251	0.612	1.137	0.808 (0.129)	0.182	0.591	1.105
Up to 5th standard	1.035 (0.157)	0.818	0.769	1.394	0.768 (0.114)	0.075	0.574	1.027
Between 5th and 10th standard	1.015 (0.167)	0.927	0.736	1.400	1.052 (0.163)	0.742	0.776	1.426
Caste of the household head (ref: OBCs and general caste)								
Scheduled Caste	1.001 (0.133)	0.995	0.771	1.298	0.905 (0.127)	0.478	0.688	1.192
Scheduled Tribe	1.351 (0.320)	0.204	0.849	2.150	0.869 (0.209)	0.558	0.542	1.392
Primary source of income (ref: salaried occupation)								
Agriculture on own land or leased land	0.549 (0.122)	0.007***	0.354	0.850	0.521 (0.097)	<0.001***	0.362	0.750
Casual agricultural or daily-wage labour	0.461 (0.108)	0.001***	0.291	0.731	0.577 (0.118)	0.007***	0.385	0.862
Own business	0.786 (0.203)	0.350	0.474	1.303	0.811 (0.171)	0.321	0.537	1.226
Others	0.853 (0.316)	0.669	0.413	1.765	0.929 (0.300)	0.819	0.493	1.751
Number of households (n)	2444							
State fixed effects	Yes							
Log likelihood	-2115.336							
Prob>Chi^2	<0.0010							
Pseudo R^2	0.2112							

Supplementary Table 5 | Determinants of LPG-use category in Wave 2 (cross-section model). The table shows results from a cross-section generalised ordered logistic regression model, with one additional covariate as compared to Table 2—whether the household considers LPG to be better for their health than traditional cookstoves in Wave 2. The response variable is the LPG-use category in Wave 2. The model explains determinants of households being primary users of LPG (as compared to minority users), and of being exclusive users of LPG (as compared to primary users) in Wave 2. Standard errors are in the parentheses below the odds ratios. *** p<0.01, ** p<0.05, * p<0.10

Dependent variable: LPG category	Odds of primary use vs minority use				Odds of exclusive use vs primary use			
	OR (SE)	P>z	95% Conf. Interval		OR (SE)	P>z	95% Conf. Interval	
Whether the household is a PMUY beneficiary	0.647 (0.067)	<0.001***	0.528	0.792	0.569 (0.068)	<0.001***	0.450	0.720
Percentage of households in a village using LPG as their primary cooking fuel	1.043 (0.002)	<0.001***	1.039	1.048	1.027 (0.002)	<0.001***	1.022	1.031
Weekly expenditure on biomass (Wave 1) (ln+1)	1.014 (0.016)	0.397	0.982	1.046	0.982 (0.017)	0.290	0.950	1.015
Whether firewood is collected multiple times a week (Wave 1)	0.900 (0.086)	0.269	0.746	1.085	0.789 (0.082)	0.022**	0.644	0.967
Whether women are involved in the household decision-making	1.125 (0.099)	0.179	0.947	1.337	0.870 (0.081)	0.135	0.724	1.045
Number of years that the household has had LPG (ln+1)	1.268 (0.089)	0.001***	1.105	1.454	1.232 (0.089)	0.004***	1.070	1.420
One-way distance to procure LPG cylinders (km)	1.009 (0.007)	0.161	0.996	1.023	1.000 (0.008)	0.993	0.985	1.015
Whether the household owns cattle	0.442 (0.039)	<0.001***	0.373	0.525	0.425 (0.036)	<0.001***	0.359	0.502
Whether the household owns land	0.838 (0.085)	0.079	0.687	1.021	0.833 (0.086)	0.075*	0.680	1.019
Economic status index	1.146 (0.030)	<0.001***	1.089	1.207	1.169 (0.030)	<0.001***	1.111	1.231
Household size (ln+1)	0.608 (0.067)	<0.001***	0.490	0.756	0.485 (0.053)	<0.001***	0.391	0.602
Household considers LPG to be better for their health than traditional cookstove in Wave 2	1.593 (0.171)	<0.001***	1.291	1.965	1.287 (0.155)	0.037**	1.016	1.630
Education of the household head (ref: 12th standard and above)								
No Education	0.731 (0.085)	0.007***	0.582	0.917	0.738 (0.090)	0.012**	0.582	0.936
Up to 5th standard	0.916 (0.103)	0.435	0.735	1.142	0.751 (0.086)	0.012**	0.600	0.940
Between 5th and 10th standard	1.004 (0.126)	0.977	0.785	1.283	0.981 (0.118)	0.876	0.775	1.243
Caste of the household head (ref: OBCs and general caste together)								
Scheduled Caste	0.978 (0.099)	0.828	0.802	1.193	0.938 (0.103)	0.563	0.756	1.165
Scheduled Tribe	0.926 (0.164)	0.665	0.654	1.311	0.946 (0.181)	0.770	0.650	1.375
Primary source of income of the household (ref: salaried occupation)								
Agriculture on own land or leased land	0.600 (0.095)	0.001***	0.440	0.817	0.614 (0.085)	<0.001***	0.468	0.805
Casual agricultural or daily-wage labour	0.494 (0.082)	<0.001***	0.357	0.684	0.599 (0.090)	0.001***	0.446	0.805
Own business	0.860 (0.161)	0.422	0.595	1.243	0.902 (0.143)	0.514	0.660	1.231
Others	1.021 (0.307)	0.945	0.567	1.840	0.917 (0.245)	0.745	0.543	1.548
Number of households (n)	4102							
State fixed effects	Yes							
Log likelihood	-3594.534							
Prob>Chi^2	<0.0010							
Pseudo R^2	0.2002							

Supplementary Table 6 | Fuel displacement analysis of panel households (N=1411). The table shows per-capita cooking fuel displacement by all the specific movements among 1411 panel households. Even within the same categories, the sample sizes are different for changes in firewood and dung cake consumption, but not for LPG consumption. This is because all the households in panel subset are LPG-users, but not all of them use both dung cakes and firewood. We see a clear correlation between different categorical shifts and their mean biomass and LPG consumption. Households that had an upward transition in LPG category from Wave 1 to Wave 2 saw a steep decline in both firewood and dung cake consumption, and vice-versa.

Upward movement in LPG category from Wave 1 to Wave 2 (N=579)			
	Firewood (kg/person/week)	**Dung cakes (pieces/person/week)**	**LPG (kg/person/year)**
Minority to Exclusive LPG use (N=132)			
N	121	99	132
Mean (SD)	-6.90 (5.99)	-13.72 (17.60)	2.33 (6.28)
Minority to Primary LPG use (N=198)			
N	147	141	198
Mean (SD)	-2.20 (5.89)	-3.04 (10.73)	1.89 (5.84)
Primary to Exclusive LPG use (N=249)			
N	220	122	249
Mean (SD)	-4.50 (4.47)	-10.02 (11.60)	1.62 (7.61)
Downward movement in LPG category from Wave 1 to Wave 2 (N=194)			
	Firewood (kg/person/week)	**Dung cakes (pieces/person/week)**	**LPG (kg/person/year)**
Primary to Minority LPG use (N=101)			
N	79	71	101
Mean (SD)	2.43 (6.40)	1.95 (9.82)	-1.97 (12.96)
Exclusive to Primary LPG use (N=63)			
N	47	33	63
Mean (SD)	5.45	10.85 (9.33)	-0.16 (6.65)
Exclusive to Minority LPG use (N=30)			
N	25	17	30
Mean (SD)	8.28 (5.33)	14.33 (19.42)	-1.52 (3.77)
No change in LPG category from Wave 1 to Wave 2 (N=638)			
	Firewood (kg/person/week)	**Dung cakes (pieces/person/week)**	**LPG (kg/person/year)**
(N=638)			
N	353	313	638
Mean (SD)	0.36 (5.78)	-2.39 (13.79)	0.40 (8.78)

Supplementary Table 7 | Comparative analysis of LPG categories based on self-reporting and annual useful cooking energy derived in Wave 1 (Only panel households). In each cell, first row has frequencies and second row has row percentages.

	LPG category based on useful cooking energy calculations of panel households in Wave 1 (N=1411)			
Self-reported LPG category in Wave 1	LPG as minority cooking fuel	LPG as primary cooking fuel	LPG as exclusive cooking fuel	Total
LPG as minority cooking fuel	513 90.00%	56 9.82%	1 0.18%	570 100.00%
LPG as primary cooking fuel	241 44.14%	300 54.95%	5 0.92%	546 100.00%
LPG as exclusive cooking fuel	-	-	295 100.00%	295 100.00%
Total	754 53.44%	356 25.23%	301 21.33%	1411 100.00%

Supplementary Table 8 | Comparative analysis of LPG categories based on self-reporting and annual useful cooking energy derived in Wave 2 (Only panel households). In each cell, first row has frequencies and second row has row percentages.

	LPG category based on useful cooking energy calculations of panel households in Wave 2 (N=1411)			
Self-reported LPG category in Wave 2	LPG as minority cooking fuel	LPG as primary cooking fuel	LPG as exclusive cooking fuel	Total
LPG as minority cooking fuel	342 92.18%	29 7.82%	-	371 100.00%
LPG as primary cooking fuel	224 49.02%	225 49.23%	8 1.75%	457 100.00%
LPG as exclusive cooking fuel	-	-	583 100.00%	583 100.00%
Total	566 40.11%	254 18.00%	591 41.89%	1411 100.00%

Supplementary Table 9 | Comparative analysis of LPG categories based on self-reporting and annual useful cooking energy derived in Wave 2 (Only cross section households). In each cell, first row has frequencies and second row has row percentages.

	LPG category based on useful cooking energy calculations of cross-section households (N=4102)			
Self-reported LPG category in Wave 2	LPG as minority cooking fuel	LPG as primary cooking fuel	LPG as exclusive cooking fuel	Total
LPG as minority cooking fuel	1394 91.77%	119 7.83%	6 0.39%	1519 100.00%
LPG as primary cooking fuel	717 54.90%	570 43.64%	19 1.45%	1306 100.00%
LPG as exclusive cooking fuel	-	-	1277 100.00%	1277 100.00%
Total	2111 51.46%	689 16.80%	1302 31.74%	4102 100.00%

Supplementary Table 10 | Summary statistics of all covariates used in the primary cross-section model (n=4102 households). The table shows the summary statistics of all the covariates used in the cross-section analysis.

Name	Expected association with LPG use	Mean	Std dev.	Min	Max
Whether the household is a PMUY beneficiary	−	0.299	0.458	0	1
The Percentage of households in a village using LPG as their primary cooking fuel	+	43.046	23.847	0	100
Weekly expenditure on biomass (Wave 1)	+	84.326	155.029	0	2570
Weekly expenditure on biomass (Wave 1) (ln+1)	+	2.141	2.484	0	7.852
Whether firewood is collected multiple times a week (Wave 1)	−	0.240	0.427	0	1
Whether women are involved in the household decision-making	+	0.323	0.468	0	1
Number of years that the household has had LPG	+	4.167	4.666	0	37.5
Number of years that the household has had LPG (ln+1)	+	1.351	0.733	0	3.651
One-way distance covered by households to procure LPG cylinders	−	4.071	5.767	0	40
Whether the household owns cattle	−	0.574	0.495	0	1
Whether the household owns land	−	0.683	0.465	0	1
Index of household economic status	+	0.631	1.912	-2.727	18.049
Household size	−	6.422	3.299	1	38
Household size (ln+1)	−	1.930	0.398	0.693	3.664
Whether the household considers LPG to be better for their health than traditional cookstove in Wave 1	+	0.692	0.462	0	1
Whether the household considers LPG to be better for their health than traditional cookstove in Wave 2	+	0.866	0.340	0	1
Education of the household head (categorical; base category is 12th standard and above)					
No education	−	0.297	0.457	0	1
Up to 5th standard	−	0.305	0.461	0	1
Between 5^{th} and 10^{th} standard	−	0.185	0.388	0	1
Caste of the household head (categorical; base category is OBCs and general caste together)					
Scheduled Caste (SC)	−	0.183	0.387	0	1
Scheduled Tribe (ST)	−	0.063	0.242	0	1
Primary source of income of the household (categorical; base category is salaried occupation)					
Agriculture on own or leased land	−	0.407	0.491	0	1
Casual agricultural or daily-wage labour	−	0.353	0.478	0	1
Own business	+	0.128	0.334	0	1
Others	+/−	0.022	0.147	0	1

Supplementary Table 11 | Summary statistics of all covariates used in the panel model from Wave 1 and Wave 2 (N=1411 households). The table shows how the covariates have evolved over the two waves for the households considered for panel analysis. A sharp decline in the average one-way distance travelled to procure LPG is worth noting, indicating the expansion of rural distribution network in these six states. Slightly unintuitive, but we observed a decline in the average value of the economic status index over the two waves of surveys. As also summarised in Supplementary Table 13, this is mainly driven by a decline in the average number of rooms, beds, and tables. Further, the shifts in sources of primary income in a mere span of 3.5 years is also noteworthy. Many more households are not relying on labour as their primary source of income.

		Wave 1				Wave 2			
Name	**Expected association with LPG use**	**Mean**	**Std dev.**	**Min**	**Max**	**Mean**	**Std dev.**	**Min**	**Max**
Percentage of households in a village using LPG as their primary cooking fuel	+	25.296	19.678	0	91.667	48.146	24.007	0	100
Women are involved in the household decision-making	+	0.220	0.415	0	1	0.279	0.449	0	1
Number of years that the household has had LPG	+	5.274	5.346	1	34	8.774	5.346	4.5	37.5
Number of years that the household has had LPG (ln)	+	1.204	0.963	0	3.526	2.030	0.503	1.504	3.624
One-way distance to procure LPG cylinders (km)	−	6.816	6.722	0	50	3.613	5.269	0	40
Household owns cattle	−	0.590	0.492	0	1	0.585	0.493	0	1
Household owns land	−	0.750	0.433	0	1	0.733	0.443	0	1
Economic status index	+	1.733	2.239	-2.11	17.205	1.538	2.034	-2.595	18.049
Household size	−	7.341	4.188	1	46	6.682	3.624	1	38
Household size (ln+1)	−	2.025	0.424	0.693	3.850	1.948	0.417	0.693	3.664
Primary source of income of the household:									
Agriculture on own land or leased land	−	0.505	0.500	0	1	0.460	0.499	0	1
Casual agricultural or daily-wage labour	−	0.147	0.354	0	1	0.214	0.410	0	1
Salaried occupation	+	0.151	0.358	0	1	0.144	0.351	0	1

Supplementary Table 12 | Duration of the second wave of ACCESS survey in all six states in the two waves. In the table, we report state-specific timing of data collection in both Wave 1 and Wave 2 along with the date when PMUY started enrolling beneficiaries in each of the six states. However, PMUY also had different launch dates in different districts within each state. On an average each of the six states had completed two years of PMUY when the second wave of survey was being conducted. We draw on specific references identified from the PMUY main website (https://www.pmujjwalayojana.com/events.html) (ref. [7]). These are noted in the table.

State	**Months when survey was conducted in Wave 1 (2014-15)**	**Date when PMUY begins enrolling households**	**Months when survey was conducted in Wave 2 (2018)**
Bihar	November 2014, December 2014, January 2015	27 June 2016[1]	April, May, June, September
Jharkhand	December 2014, January 2015	19 October 2016[2]	March, April, May, June, July, September
Madhya Pradesh	November 2014, December 2014	4th July 2016[3]	March, April, May, June, September
Odisha	May 2015	20th June 2016[4]	April, May, August, September
Uttar Pradesh	November 2014, December 2014, January 2015	1st May 2016[5]	March, April, May, June, September
West Bengal	November 2014, December 2014	14th August 2016[6]	June, September, October

Supplementary Table 13 | Summarizing the variables included in economic status index by Wave. The table shows the summary of all the variables which have been used in the creation of economic status index. A decline in the average number of rooms, beds, and tables from Wave 1 to Wave 2 could be potentially indicative of same assets getting split into younger generations. In fact, we indeed observe a slight decline in the household size over the two waves in Supplementary Table 11, in line to the broader trend of declining household sizes in India as people are moving towards nuclear family set-ups.

	2015 (N=1411)	2018 (N=1411)	Total (N=2822)
Monthly Expenditures (INR +1)			
Mean (SD)	7256 (5501)	8724 (6126)	7988(5867)
Range	501- 60001	1 - 56001	1- 60001
Number of Rooms			
Mean (SD)	3.759 (2.263)	3.573 (1.951)	3.666 (2.115)
Range	1.000 - 13.000	0.000 - 20.000	0.000 - 20.000
Number of Beds			
Mean (SD)	2.782 (2.334)	2.272 (1.816)	2.527 (2.107)
Range	0.000 - 12.000	0.000 - 17.000	0.000 - 17.000
Number of Tables			
Mean (SD)	0.925 (0.948)	0.844 (0.864)	0.884 (0.908)
Range	0.000 - 6.000	0.000 - 10.000	0.000 - 10.000
Number of Chairs			
Mean (SD)	2.860 (2.034)	3.202 (2.102)	3.031 (2.075)
Range	0.000 - 9.000	0.000 - 20.000	0.000 - 20.000
Number of Bicycles			
Mean (SD)	0.982 (0.825)	0.897 (0.751)	0.940 (0.790)
Range	0.000 - 5.000	0.000 - 11.000	0.000 - 11.000
Number of Motorcycles			
Mean (SD)	0.688 (0.762)	0.692 (0.649)	0.690 (0.708)
Range	0.000 - 7.000	0.000 - 4.000	0.000 - 7.000
Kuccha (=1)			
Not Kuccha	137 (9.7%)	177 (12.5%)	314 (11.1%)
Kuccha	1274 (90.3%)	1234 (87.5%)	2508 (88.9%)

Supplementary Table 14 | Results from testing the parallel lines assumption in the cross-section regression model (N=4102) using the .05 level of significance. The table shows results from the Wald test after using *autofit* command in Stata to test for the parallel lines assumption. We found that the parallel line assumption was violated for the state dummies and three other variables. Since, there is no theoretical justification to impose parallel lines restriction for certain variables, we did not fit partially constrained generalized ordinal logistic regression, and allowed coefficients of all the independent variables to vary freely between the outcome categories. That helped us in better understanding the impact of each independent variable in determining the upward transition of the households from a specific LPG category. However, we still present the results from partially constrained generalized ordered logistic regression after using the *autofit* command in Supplementary Table 15.

Step 1: Constraints for parallel lines imposed for whether the household owns land (P-Value = 0.9885)
Step 2: Constraints for parallel lines imposed for education of the household head (No Education) (P-Value = 0.9896)
Step 3: Constraints for parallel lines imposed for caste of the household head (Scheduled Tribe) (P-Value = 0.9188)
Step 4: Constraints for parallel lines imposed for primary source of income of the household (Agriculture on own land or leased land) (P-Value = 0.8838)
Step 5: Constraints for parallel lines imposed for primary source of income of the household (own business) (P-Value = 0.8419)
Step 6: Constraints for parallel lines imposed for education of the household head (Between 5th and 10th standard) (P-Value = 0.8260)
Step 7: Constraints for parallel lines imposed for number of years that the household has had LPG (ln) (P-Value = 0.7283)
Step 8: Constraints for parallel lines imposed for caste of the household head (Scheduled Caste) (P-Value = 0.6830)
Step 9: Constraints for parallel lines imposed for primary source of income of the household (Other occupation) (P-Value = 0.6786)
Step 10: Constraints for parallel lines imposed for whether the household owns cattle (P-Value = 0.5403)
Step 11: Constraints for parallel lines imposed for economic status index (P-Value = 0.5582)
Step 12: Constraints for parallel lines imposed for whether household is a PMUY beneficiary (P-Value = 0.2452)
Step 13: Constraints for parallel lines imposed for one-way distance to procure LPG cylinders (km) (P-Value = 0.2047)
Step 14: Constraints for parallel lines imposed for whether firewood is collected multiple times a week (Wave 1) (P Value = 0.1554)
Step 15: Constraints for parallel lines imposed for primary source of income of the household (casual agricultural or daily-wage labour) (P-Value = 0.1941)
Step 16: Constraints for parallel lines imposed for weekly expenditure on biomass (Wave 1) (ln+1) (P-Value = 0.1624)
Step 17: Constraints for parallel lines imposed for household size (ln+1) (P-Value = 0.0917)
Step 18: Constraints for parallel lines are not imposed for the following variables:
Percentage of households in a village using LPG as their primary cooking fuel (P Value = <0.0001)
Whether women are involved in the household decision-making (P Value = 0.01743)
Education of the household head (Up to 5th standard) (P Value = 0.02779)
All the state dummies (P Value = <0.0001)

Results of Wald test of parallel lines assumption for the final model:
$Chi^2(17) = 12.80$
$Prob > Chi^2 = 0.7495$
A nonsignificant test statistic from the Wald test indicates that the final model does not violate the proportional odds/ parallel lines assumption.

Supplementary Table 15 | Determinants of LPG-use category in Wave 2 (cross-section model).

Results from the partially constrained cross-section generalised ordered logistic regression model after using *autofit*. The response variable is the LPG-use category in Wave 2. We show determinants of households being primary users of LPG (as compared to minority users) and being exclusive users of LPG (as compared to primary users). Except for three variables - percentage of households in a village using LPG as their primary cooking fuel, women's involvement in household decision-making, and education of the head of the household (between 5th and 10th standard) - coefficients for all other variables are constant across both the categories. There are 4,102 observations, all who were surveyed in both waves, and who were using LPG in Wave 2. Standard errors are in the parentheses below the odds ratios. *** p<0.01, ** p<0.05, * p<0.10

	Odds of primary use as opposed to minority use				Odds of exclusive use as opposed to primary use			
Dependent variable: LPG-use category	**Odds Ratio (SE)**	**P>z**	**95% Conf. Interval**		**Odds Ratio (SE)**	**P>z**	**95% Conf. Interval**	
Whether household is a PMUY beneficiary	0.612 (0.056)	<0.001***	0.512	0.731	0.612 (0.056)	<0.001***	0.512	0.731
Percentage of households in a village using LPG as their primary cooking fuel	1.043 (0.002)	<0.001***	1.039	1.047	1.027 (0.002)	<0.001***	1.023	1.031
Weekly expenditure on biomass (Wave 1) (ln+1)	0.998 (0.013)	0.860	0.972	1.024	0.998 (0.013)	0.860	0.972	1.024
Whether firewood is collected multiple times a week (Wave 1)	0.847 (0.069)	0.041**	0.721	0.993	0.847 (0.069)	0.041**	0.721	0.993
Whether women are involved in the household decision-making	1.118 (0.098)	0.201	0.942	1.327	0.881 (0.082)	0.172	0.735	1.057
Number of years that the household has had LPG (ln)	1.252 (0.074)	<0.001***	1.115	1.406	1.252 (0.074)	<0.001***	1.115	1.406
One-way distance to procure LPG cylinders (km)	1.006 (0.006)	0.322	0.994	1.018	1.006 (0.006)	0.322	0.994	1.018
Whether the household owns cattle	0.430 (0.031)	<0.001***	0.374	0.495	0.430 (0.031)	<0.001***	0.374	0.495
Whether the household owns land	0.831 (0.070)	0.028**	0.704	0.981	0.831 (0.070)	0.028**	0.704	0.981
Economic status index	1.160 (0.025)	<0.001***	1.112	1.211	1.160 (0.025)	<0.001***	1.112	1.211
Household size (ln+1)	0.541 (0.049)	<0.001***	0.452	0.647	0.541 (0.049)	<0.001***	0.452	0.647
Education of the household head (Ref: 12th standard and above)								
No Education	0.748 (0.073)	0.003***	0.617	0.906	0.748 (0.073)	0.003***	0.617	0.906
Up to 5th standard	0.933 (0.097)	0.504	0.761	1.143	0.756 (0.080)	0.008***	0.614	0.931
Between 5th and 10th standard	1.011 (0.103)	0.912	0.828	1.236	1.011 (0.103)	0.912	0.828	1.236
Caste of the household head (Ref: OBCs and general caste together)								
Scheduled Caste	0.967 (0.084)	0.704	0.815	1.148	0.967 (0.084)	0.704	0.815	1.148
Scheduled Tribe	0.953 (0.144)	0.750	0.708	1.283	0.953 (0.144)	0.750	0.708	1.283
Primary source of income of the household (Ref: salaried occupation)								
Agriculture on own land or leased land	0.622 (0.075)	<0.001***	0.491	0.787	0.622 (0.075)	<0.001***	0.491	0.787
Casual agricultural or daily-wage labour	0.552 (0.071)	<0.001***	0.429	0.712	0.552 (0.071)	<0.001***	0.429	0.712
Own business	0.887 (0.126)	0.398	0.673	1.171	0.887 (0.126)	0.398	0.673	1.171
Others	0.965 (0.223)	0.877	0.613	1.518	0.965 (0.223)	0.877	0.613	1.518
Number of households (n)	4102							
State fixed effects	Yes							
Log likelihood	-3611.8592							
Prob>Chi^2	<0.0001							
Pseudo R^2	0.1963							

Supplementary Table 16 | Testing for multicollinearity among independent variables in the cross-section regression model (N=4102). The table shows results from the VIF analysis of all the covariates used in the cross-section regression model. The highest value of VIF is 3.79, much lesser than the acceptable level of 10. So, we do not suspect the presence of multicollinearity in our cross-section model.

Variable	VIF	1/VIF
Primary source of income of the household (Casual agricultural or daily-wage labour)	3.79	0.263799
Primary source of income of the household (Agriculture on own land or leased land)	3.55	0.28147
primary source of income of the household (Own business)	2.22	0.451029
Education of the household head (No Education)	2.02	0.494133
Number of years that the household has had LPG (ln)	1.9	0.526791
Education of the household head (Up to 5th standard)	1.88	0.530753
Whether household is a PMUY beneficiary	1.73	0.577574
Economic status index	1.71	0.583263
Education of the household head (Between 5th and 10th standard)	1.58	0.633154
Whether the household owns land	1.52	0.658496
Percentage of households in a village using LPG as their primary cooking fuel	1.5	0.668108
Household size (ln+1)	1.3	0.768346
Whether the household owns cattle	1.26	0.790566
Primary source of income of the household (Other occupation)	1.24	0.809339
Whether women are involved in the household decision-making	1.22	0.81974
Whether firewood is collected multiple times a week (Wave 1)	1.18	0.843941
One-way distance to procure LPG cylinders (km)	1.18	0.849942
Caste of the household head (Scheduled Tribe)	1.14	0.87417
Weekly expenditure on biomass (Wave 1)	1.13	0.886478
Caste of the household head (Scheduled Caste)	1.1	0.906378
Mean VIF	**1.83**	

Supplementary Table 17 | Testing for multicollinearity among independent variables in the panel-regression model (N=1411). The table shows results from the VIF analysis of all the covariates used in the panel regression model. The highest VIF is 2.46, much lesser than the acceptable level of 10. So, we do not suspect the presence of multicollinearity in our panel model as well.

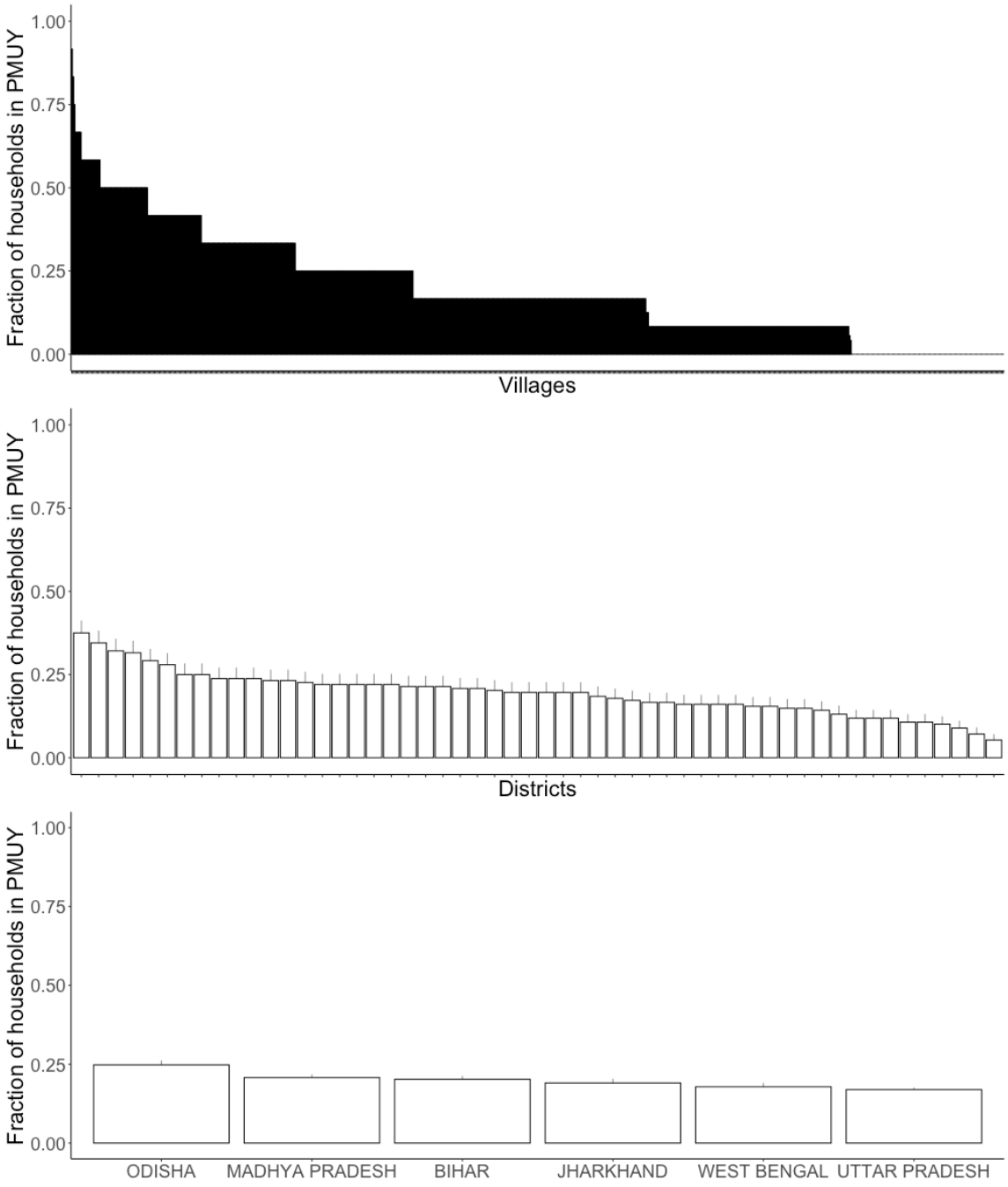
Variable	**VIF**	**1/VIF**
Primary source of income of the household (Agriculture on own land or leased land)	2.46	0.40715
Household owns land	1.77	0.566283
Primary source of income of the household (casual agricultural or daily-wage labour)	1.74	0.575186
Primary source of income of the household (Salaried)	1.58	0.63319
Economic status index	1.5	0.664745
Percentage of households in a village using LPG as their primary cooking fuel	1.44	0.696355
Household owns cattle	1.38	0.722748
Household size (ln+1)	1.36	0.733807
One-way distance to procure LPG cylinders (km)	1.2	0.83203
Number of years that the household has had LPG (ln)	1.15	0.872441
Women are involved in the household decision-making	1.14	0.876513
Mean VIF	**1.67**	

Supplementary Table 18 | Determinants of LPG-use category in Wave 2 after clustering the errors at the village level (cross-section model). The table shows results from the cross-section generalised ordered logistic regression model after clustering the errors at village level. There are a total of 689 clusters (villages). The response variable is the LPG-use category in Wave 2. The model explains determinants of households being primary users of LPG (as compared to minority users), and of being exclusive users of LPG (as compared to primary users) in Wave 2. There are 4,102 observations, all who were surveyed in both waves, and who were using LPG in Wave 2. Robust standard errors are in the parentheses below the odds ratios. *** p<0.01, ** p<0.05, * p<0.10

	Odds of primary use as opposed to minority use				Odds of exclusive use as opposed to primary use			
Dependent variable: LPG-use category	**OR (SE)**	**P>z**	**95% Conf. Interval**		**OR (SE)**	**P>z**	**95% Conf. Interval**	
Whether household is a PMUY beneficiary	0.641 (0.069)	<0.001***	0.520	0.791	0.565 (0.074)	<0.001***	0.437	0.731
Percentage of households in a village using LPG as their primary cooking fuel	1.043 (0.002)	<0.001***	1.039	1.047	1.027 (0.002)	<0.001***	1.023	1.031
Weekly expenditure on biomass (Wave 1) (ln+1)	1.012 (0.016)	0.445	0.982	1.043	0.982 (0.016)	0.266	0.951	1.014
Whether firewood is collected multiple times a week (Wave 1)	0.897 (0.084)	0.245	0.748	1.077	0.789 (0.091)	0.041**	0.629	0.9990
Whether women are involved in the household decision-making	1.132 (0.106)	0.186	0.942	1.360	0.872 (0.084)	0.155	0.722	1.053
Number of years that the household has had LPG (ln)	1.261 (0.092)	0.001***	1.094	1.454	1.228 (0.090)	0.005***	1.063	1.418
One-way distance to procure LPG cylinders (km)	1.010 (0.007)	0.187	0.995	1.024	1.000 (0.008)	0.979	0.985	1.016
Whether the household owns cattle	0.445 (0.041)	<0.001***	0.372	0.533	0.422 (0.038)	<0.001***	0.353	0.504
Whether the household owns land	0.835 (0.082)	0.066*	0.688	1.012	0.833 (0.088)	0.086*	0.677	1.026
Economic status index	1.148 (0.031)	<0.001***	1.088	1.211	1.172 (0.031)	<0.001***	1.112	1.235
Household size (ln+1)	0.606 (0.064)	<0.001***	0.493	0.746	0.485 (0.056)	<0.001***	0.387	0.607
Education of the household head (categorical; base category is 12th standard and above)								
No Education	0.747 (0.084)	0.009***	0.599	0.931	0.745 (0.092)	0.017**	0.585	0.949
Up to 5th standard	0.925 (0.096)	0.456	0.755	1.134	0.756 (0.085)	0.013**	0.606	0.943
Between 5th and 10th standard	1.026 (0.128)	0.836	0.804	1.309	0.999 (0.121)	0.993	0.788	1.267
Caste of the household head (categorical; base category is OBCs and general caste together)								
Scheduled Caste	0.986 (0.095)	0.882	0.816	1.191	0.940 (0.102)	0.571	0.760	1.163
Scheduled Tribe	0.937 (0.183)	0.741	0.639	1.375	0.957 (0.176)	0.812	0.668	1.373
Primary source of income of the household (categorical; base category is salaried occupation)								
Agriculture on own land or leased land	0.607 (0.101)	0.003***	0.438	0.841	0.622 (0.085)	0.001***	0.476	0.813
Casual agricultural or daily-wage labour	0.506 (0.089)	<0.001***	0.359	0.713	0.610 (0.090)	0.001***	0.457	0.814
Own business	0.867 (0.172)	0.471	0.588	1.278	0.909 (0.146)	0.551	0.663	1.246
Others	1.011 (0.305)	0.972	0.560	1.824	0.923 (0.244)	0.762	0.550	1.551
Number of households (n)	4102							
State fixed effects	Yes							
Log likelihood	-3605.420							
Prob>Chi^2	<0.0001							
Pseudo R^2	0.1977							

Supplementary Figures

Supplementary Figure 1 | Distribution of PMUY households by villages, districts, and states covered in the second wave of ACCESS survey. This figure shows the distribution of the proportion of households enrolled in PMUY at three geographic units: village, district, and state. This figure shows that there is high variation in the number of households across villages (from 0% to around 90%; sample size is approximately 12 per village), moderate variation at the district level (5% to 38%), and little variation at the state level (17% to 25%). Overall, these results indicate that PMUY and non-PMUY customers largely belong to similar geographic areas.



Supplementary Notes

Supplementary Note 1 | Survey Design

The survey contains two waves of household data collected in 2014-15 and 2018 across six major states in India: Bihar, Jharkhand, Madhya Pradesh, Odisha, Uttar Pradesh, and West Bengal. Due to budgetary constraints, we sampled one district from each administrative division of each state, except for in Odisha and West Bengal—both of which have only three large divisions—where we sampled two districts in each division. Each district was chosen with a probability proportional to its population relative to the division population. In total, we have 51 districts in Wave 1—where we sampled only one district from each division of Odisha—and 54 districts in Wave 2. The total sample is therefore 8,563 households in Wave 1 and 9,072 households in Wave 2.

Once the district is selected, we split the total population of each district into two groups of villages such that one comprises primarily large villages and other comprises primarily small, but the population in each group is more or less equal. Although the number of households in each group is the same, the group with large villages has fewer villages. Seven villages were then sampled from each group with probability proportional to population. This stratified sampling ensured that the sampling is self-weighted within a district, yet guaranteed both small and large villages in the sample. In every village, we survey 12 households at random.

We were able to retain 85% of the same households from Wave 1 in Wave 2, allowing for the panel data analysis used in this article. The head of the household was requested for interview, failing which any other willing adult was interviewed. If no adult was available, or if the household was no longer willing to participate, enumerators replaced the household by interviewing the fifth house to the right of the originally sampled household. Depending on the literacy of the respondent, written or oral consent was acquired at the start of the interview.

We use a 45-minute survey questionnaire on household energy access in rural India which included seven modules: (1) socio-economic information, (2) electricity access, (3) satisfaction with electricity, (4) cooking energy access, (5) satisfaction with cooking energy, (6) energy policy preferences, and (7) willingness to pay for electricity and LPG.

The data was collected by enumerators who were recruited and trained using role-playing exercises by researchers at the Council on Energy, Environment and Water (CEEW)—three of who are authors. The trainings were followed by field pilots where enumerators were assessed for quality and the survey instrument was tested further for effectiveness. During the data collection phase, quality was monitored regularly to ensure minimal errors in data coding. Resurveys were conducted where data quality appeared questionable. Responses were collected using a paper-based instrument in Wave 1 and using an app-based software programme by SurveyCTO in Wave 2.

Supplementary Note 2 | Survey Questionnaire (Wave 2)

Questionnaire code guidelines:

1. All the questions have been coded as follows:

   Module number (prefixed with m)_question number (prefixed with q)_variable description

   For example, question number 103 is in Module 4 (Do you use domestic gas (LPG) for cooking?), and it will be coded as 'm4_q103_lpg' in the data set.

2. 'finalhhid' is the common identifier variable at household level in both Wave 1 and Wave 2 data sets. It can be used to merge both waves of data. It is created by concatenating village id (m1_q11_village_code) and household id (m1_q3_hhid).

3. In the merged data set (horizontal integration of both waves of data), all 2018 observations/variables can be identified with a prefix 't'. For example, question number 103 (Do you use domestic gas (LPG) for cooking?) will be coded as 'm4_q103_lpg' for 2015, but 'tm4_q103_lpg' for the year 2018. In the appended data set (vertical integration of both waves of data), variable names will be same for both the waves, and variable – 'year' (which takes two values – '2015' and '2018') can be used to identify observations of both the waves.

Introduction to the Household Head

[Interviewer shows ID card to the respondent]

My name is _____. I work with MORSEL, an organization based in Lucknow that conducts surveys in India. Your household has been selected to participate in a short survey. Survey has questions on household energy (electricity and LPG). This is a joint study between National University of Singapore, Johns Hopkins University, and the Council on Energy, Environment, and Water.

We interviewed _____ about three years ago from your household on these issues. We are doing a follow-up of the survey, which will take about 40 minutes. Can we speak with _____ now?

Module 1

F.1. Did the original respondent agree to be interviewed?

1 Yes (**skip to F.3**) 0 No (**skip to F.2)**

F.2. Did any other adult member of the household agreed to be interview?

1 Yes (**skip to F.3**)0 No (**skip to F.4**)

IF YES to F.1 or F.2.

[**Declare the following to the respondent**]

"As you have agreed to participate in this survey, you are now requested to provide your signature to confirm this, for our records. This however is not binding upon you. If you do not wish to sign, please tick the box below."

[**Now please encourage the respondent to sign. If they choose not to, please ask them to tick the box.**]

F.3. I give my consent to be interviewed ☐

IF NO to F.2

F.4 If no, record the reason: _____

My name is XXXXXXXX. I work with MORSEL, an organization based in Lucknow that conducts surveys in India. Your household has been selected to participate in a short survey. Survey has questions on household energy (electricity and LPG). This survey is a joint study between National University of Singapore, Johns Hopkins University, and the Council on Energy, Environment, and Water. It will take around 45 minutes. Would you like to participate?

1. Did the household head or any other adult member of the household agree to be interviewed?
   1 Yes 0 No

2. If no, record the reason: _____

A. MetaData

3. Household ID _____

4. ID and Name of Interviewer ID ___ NAME _____

5. ID and Name of Supervisor ID ___ NAME _____

6. Date of Interview _____

7. Interview start time _____ Interview end time _____

Geographic Information

8. State _____

9. District _____

10. Block _____

11. Village _____

12. Habitation _____
[ASK VILLAGE HEAD IF NEEDED]

13. Full Address _____

14. Mobile Contact Number _____

15. GPS Latitude _____

16. GPS Longitude _____

B. Household Head and Roster

Obtain the following information from the household head. If the household head is NOT available, interview another adult member of the household.

17. Relationship to household head 1 Self 2 Spouse
3 Mother/father 4 Son/Daughter
5 Other, specify _____

18. Name _____

19. Age _____ [YEARS]

20. Gender 1 Male 0 Female

21. Native language _____

22. Read and write native language? 1 Yes 0 No

23. Level of education of the household head

1 No formal schooling 2 Up to 5th standard 3 Up to 10th standard
4 12th standard or diploma 5 Graduate and above

24. Religion 1 Hindu 2 Muslim 3 Other

25. Government Caste Category 1 Scheduled Caste 2 Scheduled Tribe
3 Other Backward Class 4 General
5 Others 6 No Caste

26. Which ration card does your household have?

0 None 1 APL (Patra Grahasti) 2 BPL 3 Antyodaya

27. Number of adults living in this household permanently (as of now) _____ [NUMBER]

28. How many members in the family have a voter ID card?_____ [NUMBER]

29. Number of children (0-18 years) permanently living in the household (as of now) _____ [NUMBER]

30. How many children are currently studying? _____ [NUMBER]

BN1. Can any adult above 25 years of age living in this household permanently read and write in any language? 1 Yes
0 No

BN.2. Number of female members living in this household, aged 18-59 years _____ [NUMBER]

BN.3. Number of male members living in this household, aged 18-59 years _____ [NUMBER]

BN.4. Number of male members living in this household, aged 16-17 years _____ [NUMBER]

C. Economic Activity

31. What is the primary source of income in your family?

1 Agriculture on own land 2 Cultivation on leased land 3 Casual agricultural labor
4 Salaried job 5 Cattle rearing 6 Own business
7 Daily laborer 8 Other _____ [SPECIFY]

CN1. Is any member of the household earning more than 10,000 rupees per month? 1 Yes 0 No

32. How much is your expenditure on household needs in a typical month? _____ [RUPEES]

33. How many rupees did your household save last year? _____ [RUPEES] (If positive value, **skip to 34**)

IF savings is equal to 0

33.1. If your household did not save money, how much do you need to borrow in a typical year? _____ [RUPEES]

34. Does anyone in your household have a bank account? 1 Yes 0 No

35. Is your household currently indebted? 1 Yes 0 No

35.1. IF YES: How much in total? _____ RUPEES

35.2. IF YES: What is the monthly interest rate of your largest loan? _____ PERCENT

36. How much land does your household own? _____ [0 if none] _____ [UNIT]

If more than 0:

CN2. Of this, how much land do you irrigate? _____ [0 if none]

If more than 0:

CN3. For how many crop seasons do you irrigate? _____

37. How many cattle and livestock do you own?

___ COWS ___ BUFFALOES ___ FOWLS/CHICKEN
___ COW CALVES ___ BUFFLOES CALVES
___ GOATS ___ OTHER ANIMALS

38. Who in your household makes decisions on purchase of durable goods?

1 Male head of household 2 Female head of household 3 Jointly 4 Other, specify: _____

39. Is the house you live in *pucca*? 1 Pucca 2 Mixed 3 Kaccha

40. Do you own your house? 1 Yes 0 No

41. Does your household have a toilet? 1 Yes 0 No

42. Does your household have piped water? 1 Yes 0 No

43. How many rooms does your house have? ____ [NUMBER]

IF 39 ==2

CN4. How many of these rooms are pucca rooms? ____ [NUMBER]

CN5. How many of these rooms are kaccha? ____ [NUMBER]

CN5.1. How many of these rooms are mixed? _____ [NUMBER]

44. How many beds does your household own? ____ [NUMBER]

45. How many tables does your household own? ____ [NUMBER]

46. How many chairs does your household own? ____ [NUMBER]

47. How many bicycles does your household own? ____ [NUMBER]

48. How many motorcycles does your household own? ____ [NUMBER]

49. How many pressure cookers does your household own? ____ [NUMBER]

CN6. Do you own mechanized 3-4-wheeler agricultural equipment? 1 Yes 0 No

IF 48==0

CN7. Do you own a motorized 2/3/4 wheeler or a fishing boat? 1 Yes 0 No

CN8. Do you own a Kisan credit card? 1 Yes 0 No 99 DK

If YES: CN8==1. What is the credit card limit? _____ [RUPEES]

CN9. Do you own a landline phone? 1 Yes 0 No

CN10. Is any household member a government employee? 1 Yes 0 No

CN11. Is any household member paying income tax or a professional tax? 1 Yes 0 No 99 DK

(Only for those HHs who are indulge in agriculture)**

50. Do you use pumps for irrigation? 1 Yes 0 No (skip to 50.2)

IF YES:

CN12. Do you own the pump? 1 Yes 0 No

50.1. What type of pump?
1 Diesel pump 2 Electric pumps 3 Both diesel and electric

IF NO:

50.2. Would you like to use an electric pump? 1 Yes 0 No

51. How satisfied are you with the current situation of electricity for your agriculture business?

1 Unsatisfied 2 Neutral 3 Satisfied

(for all Households)**

52. Do you or any other member of your family running a business activity (other than agriculture)?

1 Yes 0 No (**Skip to 53**)

IF YES

52.1. Do you use electricity for your business? 1 Yes 2. No **(skip to 52.1.2)**

IF YES

52.1.1. How satisfied are you with the current situation of electricity for your business?

1 Unsatisfied 2 Neutral 3 Satisfied

CN13. What equipment do you run with electricity? [DON'T PROMPT]

1.Sewing machine 2. Dal/Rice/Oil Mill
3. Motorised loom 4. Puncture repair/air compressor 5.Thrasher
6. Water pump 7.Water purifier 8.Fodder cutter
9.Fridge/Chiller 10. Crop dryer 11. Computer
12 Printer/Xerox 13 Lights and fans 14 Weighing scale 15 Other

52.1.2. Has electricity contributed to increasing your income from your primary occupation?
1 Yes 0 No

IF NO to 52.1

52.1.2. Can electricity contribute to increasing your income from your primary occupation?

1 Yes 0 No

(only to households who indulge in agriculture and no other business activity)**

53. Would you be interested in running a business activity (other than agriculture) in future?

1 Yes 0 No **(Skip to55)**

54. [REMOVED]

IF YES: CN14. What type of business would you like to run? [DON'T PROMPT]

_____

Module 2 - Lighting and Electricity Situation

55. Do you use grid electricity for lighting? 1 Yes 0 No **(Skip to 56)**

***IF YES*:**

55.1. How many years ago was your house connected to the grid?

____ [YEAR AGO] [*NA* if house already had electricity when the respondent moved in; DK if the respondent doesn't remember or doesn't know]

55.2. What was the connection fee?

_____ [RUPEES] [*NA* if house already had electricity when the respondent moved in; DK if the respondent doesn't remember or doesn't know]

55.3. What is your total electricity spending per month? ____ [RUPEES/MONTH]

55.4. Do you have a meter? 1 Yes 0 No

55.5. Do you pay a fixed or variable amount monthly?

0 Variable 1 Fixed 2 No Payment

1N1 In the last one year, how often did you receive your electricity bill? _____ [months] **[**Code NB if did not receive a bill in the last one year or ever; Code NP, if there is no pattern in receiving bills; Code GO, if respondent went to electricity department to pay the bill**]**

56. Have you heard about micro-grids? 1 Yes 0 No

[*** ENUMERATOR: READ THE TEXT BELOW REGARDLESS OF ANSWER, SHOW PICTURE***]

Micro-grids are systems that generate electricity and distribute it at the local level. Electricity can be produced from solar energy, micro-hydro, diesel or some other source. The electricity can then be used by local users. It provides limited but reliable electricity supply compared to the grid electricity in rural India.

57. If the monthly bill for both options were the same, would you prefer your household to be electrified through a micro-grid system or through the regular grid?

0 Regular grid 1 Micro-grid DK Don't know

58. Do you use micro-grid for lighting? 1 Yes 0 No **(Skip to 59)**

***IF YES*:**

58.1. Is it powered through:

1 Solar 2 Diesel
3 Biomass gasification 4 Micro-hydro

58.2. What is your total spending for micro-grid electricity per month?
_____ [RUPEES/MONTH]

58.3. Do you have a meter? 1 Yes 0 No

58.4. Do you pay a fixed or variable amount monthly?

1 Fixed 0 Variable 2 No Payment

58.5. How much did you have to pay upfront for the micro grid connection?

____ [RUPEES] [*NA* if house already had electricity when the respondent moved in; DK if the respondent doesn't remember or doesn't know]

59. Have you heard about solar home systems? 1 Yes 0 No

[*** ENUMERATOR: READ THE TEXT BELOW REGARDLESS OF ANSWER, SHOW PICTURE***]

Sunlight can be used to produce electricity through solar home systems and will provide electricity only for your household. The energy from sunlight is captured by solar panels, which are typically installed on a house's rooftop, and is then

transformed into electricity. This electricity can be stored in batteries and then be used whenever you want. The system life is 3-5 years and recurring costs are approximately zero. The company provides a maintenance guarantee.

60 Do you use solar home system or solar lanterns for lighting?

1 Solar home system 2 Solar lantern 3 both 4 Neither **(Skip to 61)**

IF 1, 2, or 3:

60.1. How many hours of lighting per day do you get from it? _____ [HOURS/DAY]

60.2. Is it rented or owned? 0 Rented 1 Owned

IF RENTED:

60.3. How many rupees does it cost you per month? _____ [RUPEES/MONTH]

IF OWNED:

60.4. How many rupees did it cost you? _____ [RUPEES]

60.5. How much subsidy did you receive? _____ [RUPEES]

60.6. What is the loan did you take? _____ [RUPEES]

IF 60.6 value is greater than zero

60.7. What is the term of the loan? _____ [MONTHS]

60.8. What is the per month installment? _____ [Rupees/month]

61 Do you use kerosene lamps for lighting? 1 Yes
0 No **(Skip to 64)**

IF YES:

61.1. How many kerosene wick lamps do you use? _____ [LAMPS]

61.2. How many kerosene lanterns do you use? _____ [LANTERNS]

61.3. How many hours a day do you use kerosene lamps for lighting?

_____ [HOURS/DAY] (**cumulative sum**)

61.4. How many liters of kerosene do you buy from PDS per month? _____ [LITERS/MONTH]

61.5. What is the price you pay for PDS kerosene? _____ [RUPEES/LITER]
[DO NOT USE ZERO HERE – CODE "DK" IF DON'T KNOW]

61.6. How many liters of kerosene do you buy from the market per month? _____ [LITERS/MOMTH]

61.7. What is the price you pay for market kerosene? _____ [RUPEES/LITER]
[DO NOT USE ZERO HERE – CODE "DK" IF DON'T KNOW]

61.8. In your opinion, do kerosene fumes have an effect on your health? 1 Yes 0 No 2 DK

61.9. Do you use kerosene for anything other than lighting? 1 Yes 0 No
(IF NO, Skip to 64)

IF YES:

61.10. What for? SPECIFY [ONLY NON-LIGHTING USAGE]
_____

61.11. How many liters/month do you use for this? [LET RESPONDENT ANSWER; DON'T MAKE SUGGESTIONS]
_____ [LITERS/MONTH]

[ALL HOUSEHOLDS]

62. [REMOVED]

63. [REMOVED]

64. For how many hours artificial lighting is used for reading (reading books, newspapers, studying, etc.) on an average per day? [Insert values in hours not hours/minutes]

_____ Children [0-24 HOURS PER CHILD]

_____ Adults [0-24 HOURS PER ADULT]

65. How many hours per day do you listen to the radio? _____ [0-24 HOURS]

66. How many hours per day do you watch television? _____ [0-24 HOURS]

67. Do you own a mobile phone? 1 Yes 0 No **(Skip to 68)**

IF YES:

67.1 How many mobile phones does your household have? _____ [NUMBER]

67.2 How much per month do you pay for charging the phone battery? _____ [RUPEES/MONTH]

68. *[*** ENUMERATOR: FILL IN WITHOUT ASKING RESPONDENT ***]*

*[*** Does the household have any electricity (whether from the grid, from a solar household system, or from a micro grid) ***]*

1 Yes 0 No

(IF "YES", GO TO 69 (Electrified Households); IF "NO", GO TO 79 (Non-Grid Households)

***** Electrified Households**

[HOUSEHOLDS THAT HAVE GRID, SOLAR HOUSEHOLD SYSTEM, DIESEL GENERATOR, OR MICRO GRID]

69. How many hours a day is electricity usually available? _____ [HOURS/DAY]

70. For how many hours is electricity usually available between sunset and midnight (till 12 o' clock)? _____ [0 – 6 HOURS]

71. How many days in the last month has there been no power throughout the day? ____ [0-30 DAYS]

72. How many days in a month have you experienced that electric equipment suffered because of voltage fluctuation? _____ [0-30 DAYS]

73. How many days a month have you experienced that voltage was too low to run appliances? _____ [0-30 DAYS]

74. Whom do you currently pay for your primary source of electricity?

0 Representative of electricity department 1 Village energy committee / Village head

2 Neighbor or relative 3 No one / no need to pay

4 Don't know where to pay 5 Others (SPECIFY) _____

75. How many of the following items/ appliances do you USE? [** Read all options**]

75.1. Incandescent bulbs? ____ [NUMBER]

75.2. CFL bulbs ____ [NUMBER]

75.3. LED lights? ____ [NUMBER]

75.4. Tube light? ____ [NUMBER]

75.5. Fans? ____ [NUMBER]

75.6. Electric iron? ____ [NUMBER]

75.7. Refrigerator? ____ [NUMBER]

75.8. Television? ____ [NUMBER]

75.9. Electric Radio/Music System? ____ [NUMBER]

75.10. Cooler? ____ [NUMBER]

75.11. Washing machine? ____ [NUMBER]

75.12. Electric stove? ____ [NUMBER]

75.13. Inverter? ____ [NUMBER]

75.14. Electric Water Pump ____ [NUMBER]

75.15. Others? _____ ____ [NUMBER]

75.16. Others? _____ ____ [NUMBER]

76. Are there appliances that you would want to use, but are unable to use **only** because of the limited supply or poor quality of electricity?

1 Yes 0 No (**skip to 77**)

IF YES, then which of the following appliances would you want to use? [Read all options**]**

76.1. Fans? 1 Yes 0 No

76.2. Electric iron? 1 Yes 0 No

76.3. Refrigerator? 1 Yes 0 No

76.4. Television? 1 Yes 0 No

76.5. Electric Radio/Music System? 1 Yes 0 No

76.6. Cooler? 1 Yes 0 No

76.7. AC? 1 Yes 0 No

76.8. Electric stove? 1 Yes 0 No

76.9. Computer/Laptop 1 Yes 0 No

76.10. Washing machine? 1 Yes 0 No

76.11. Electric Water Pump 1 Yes 0 No

76.12. Other_____

76.13. Other_____

IF ANY OF ABOVE IS YES:

76.14. If you were able to use all the appliances you desire as stated above, how much would you be willing to pay monthly for this overall usage? _____ [RUPEES/MONTH]

77. Generally, how satisfied are you with the electricity situation in your household?

1 Unsatisfied 2 Neutral 3 Satisfied

IF "1 UNSATISFIED"

78. Why are you unsatisfied? [CHECK ALL THAT APPLY]

78.1 Too expensive to consume 1 Yes 0 No

78.2 Not available when you need it 1 Yes 0 No

78.3 Poor quality (voltage fluctuations) 1 Yes 0 No

78.4 Poor maintenance and repair services 1 Yes 0 No

78.5 Other, SPECIFY: _____

***[*NON-ELECTRIFIED HOUSEHOLDS*] ***

79. If you had grid electricity, what would you use it for [DON'T READ OUT THE OPTIONS, MARK THE FIRST THREE RESPONSES AS 1,2,3 – AFTER THAT READ LEFT OUT OPTIONS AND MARK YES/NO]

79.1. Lighting?	1 Yes		0 No	___
79.2. Fans?		1 Yes	0 No	___
79.3. Electric iron?	1 Yes		0 No	___
79.4. Refrigerator?	1 Yes		0 No	___
79.5. Television?	1 Yes		0 No	___
79.6. Radio?		1 Yes	0 No	___
79.7. Cooler?		1 Yes	0 No	___
79.8. AC?	1 Yes		0 No	___
79.9. Electric stove?	1 Yes		0 No	___
79.10. Computer/Laptop		1 Yes	0 No	___
79.11. Washing machine?	1 Yes		0 No	___
79.12. Water Pump	1 Yes		0 No	___
79.13. Other: _____ [SPECIFY]	1 Yes	0 No	___	

80. Up to how much would you be willing to spend per month for such usage?
_____ [RUPEES/MONTH]

***[ALL *NON-GRID HOUSEHOLDS*] *" *

81. Is grid electricity available in your habitation? 1 Yes 0 No

IF YES:

If it is available, then why don't you have grid electricity? [**Read all options**]

81.1. Is the connection too expensive?	1 Yes	0 No
81.2. Is the monthly bill too expensive?	1 Yes	0 No
81.3. Is it too unreliable?	1 Yes	0 No
81.4. Don't know how to get or whom to ask?	1 Yes	0 No

81.5. Other: _____ [SPECIFY]

82. Are you interested in having grid electricity? 1 Yes 0 No

82.1. What amount are you willing to pay to get electricity connection? ____ [RUPEES]

1N2. If electricity connection was provided freely, would you be willing to get connected to the grid?

1 Yes 0 No

1N3. What times of the day do you require the electricity for?

1 6 AM – 9 AM	2 9 AM – 12 PM
3 12 PM – 3 PM	4 3 PM – 6 PM
5 6 PM – 9 PM	6 9 PM – 12 AM
7 12 AM – 6 AM	8 NA

Module 3 - Lighting and Electricity Satisfaction

83. What is the primary source of lighting in your HH?

1 Grid electricity 2 Kerosene lamp/lantern 3 Micro-grid
4 Solar home system or solar lantern 5. Other _____

84. This primary lighting source that you are using: [**Read all options**]

84.1. Is it adequate to use? 1 Yes 0 No

84.2. Is it reliable? 1 Yes 0 No

84.3. Is it expensive to use? 1 Yes 0 No

84.4. Is it safe to use? 1 Yes 0 No

85. So, overall how satisfied are you with the primary source of lighting in your home?

1 Unsatisfied 2 Neutral 3 Satisfied

86. Compared to 5 years ago, has your satisfaction about lighting in your home:

1 Decreased 2 Remained the same 3 Increased

87. [REMOVED]

88. Generally, how satisfied are you with the electricity at community places like schools/chaupals?

1 Unsatisfied 2 Neutral 3 Satisfied 99 Don't know

89. How many rupees would you be willing to pay to provide 5 hours per day of community electricity?
_____ [RUPEES/MONTH]

90. [REMOVED]

91. How many rupees would you be willing to pay to provide street lighting in your habitation?

_____ [RUPEES/MONTH]

92. [REMOVED]

93. Generally, how satisfied are you with the village's street lighting?

1 Unsatisfied 2 Neutral 3 Satisfied

94. Rank the following in order of importance for you [1-4, WITH 1 HIGHEST AND 4 LOWEST]:

94.1. Electrification of households ___
94.2. Street lighting ___
94.3. Electricity for productive usage ___
94.4. Electrification of community spaces ___

95. Do you think people in your village steal electricity?
1 Yes 0 No 99 Don't know 999 Not applicable/not available

96. Do you think stealing electricity is illegal?

1 Yes 0 No 99 Don't know 999 Not applicable/not available

97. Do you think such stealing should be stopped?
1 Yes 0 No 99 Don't know 999 Not applicable/not available

98. How many rupees per month would you be willing to spend for electricity that is available as per your need and would allow you to get artificial light for 12 hours a day, use a fan for 8 hours a day, and charge your mobile phone?
_____ [RUPEES PER MONTH]

Module 4 - Cooking Situation

[*ENUMERATOR: FOR THIS SECTION, PLEASE INVITE THE HOUSEHOLD'S PRIMARY COOK TO JOIN THE INTERVIEW EVEN IF NOT HOUSEHOLD HEAD***]**

100. [***DON'T ASK, FILL YOURSELF***] Able to interact with the primary cook?

1 Yes 0 No

101. How many meals are cooked in your house every day? _____ [NUMBER]

102. How much time is spent in cooking per day? _____ [HOURS/DAY]

103. Do you use domestic gas (LPG) for cooking? 1 Yes 0 No **(Skip to 105)**

***IF YES*:**

103.1 How many years ago did your house begin to use LPG?

_____ [YEARS] _____ [MONTHS]

3N1. Did you receive the LPG connection under Pradhan Mantri Ujjwala Yojana (PMUY)? 1 Yes 0 No

103.2 How much did it cost to install the LPG connection? _____ [RUPEES]

103.3 What all do you cook using LPG? [**Read all options**]

1 Only chapattis/roti 2 Only vegetables and lentils 3 Rice

4 Only tea/snacks 5 milk boiling 6 water boiling 7. Other (SPECIFY)_____

3N2. Do you use LPG for all your cooking needs (barring special occasions)?

1 Yes 0 No

IF NO: 3N3. Why not? [**Read all options**]

1 Too expensive to use 1 Yes 0 No

2 Free biomass is easily available 1 Yes 0 No
3 Few items are preferred to cook on chulha 1 Yes 0 No

4 Don't like LPG cooked food 1 Yes 0 No
5 LPG availability is a constraint 1 Yes 0 No

6. Other 1 Yes 0 No

103.4 How many large LPG cylinders do you use in a year? _____ [NUMBER/YEAR]

103.5 How many large cylinders do you get from authorized distributors? _____ [NUMBER/YEAR]

103.6 How many large cylinders do you get from market? _____ [NUMBER/YEAR]

103.7 How many small LPG cylinders do you use in a year? _____ [NUMBER/YEAR]

103.8 How many small cylinders do you get from authorized distributors? ____[NUMBER/YEAR]

103.9 How many small cylinders you get from market? _____ [NUMBER/YEAR]

103.10 [Removed]

103.11 [Removed]

3N4. How many months ago did you last refill your large cylinder from the authorized dealer? [months] [**Code NA, if the HHs has not taken a refill yet**]

IF 3N4==NA, skip to 103.12

3N5. How much did you pay to the distributor/delivery person in cash for that last refill? _____ [INR]

3N6. How much subsidy did you receive against that refill in your bank account? _____ [INR] [**Code NA, if not aware of the fact that subsidy is credited to bank account; DK if doesn't know the value of subsidy amount credited, Code 0 if is certain that there is no subsidy received against the refill**]

103.12 How much does a large cylinder of LPG from market cost? [DK IF RESPONDENT DOESN'T KNOW OR IF TAKES TOO LONG TO FIND OUT_____ [RUPEES/CYLINDER]

103.13 How much does a small cylinder of LPG from market cost? [DK IF RESPONDENT DOESN'T KNOW OR IF TAKES TOO LONG TO FIND OUT] _____ [RUPEES/CYLINDER]

103.14 Is the domestic gas cylinder delivered at your door step? 1 Yes 0 No

IF NO:

103.15 What is the one-way distance in kilometers your household typically travels to get LPG? _____ [KM]

3N7. Who gets the LPG cylinder when it has to be procured away from home? [**Multiple responses possible**]
1 Head of the household 2 Spouse of the head of the household 3 Son/Grandson of the household head 4 Daughter/Grand-daughter/Daughter-in-law of the household head 5 Other 6 N/A

104. Generally, how satisfied are you with the LPG situation in your household?
1 Unsatisfied 2 Neutral 3 Satisfied

IF UNSATISFIED

104.1 Why are you unsatisfied? [**Read all options**]

1 Too expensive to consume 1 Yes 0 No

2 Poor availability 1 Yes 0 No

3 Too far to procure 1 Yes 0 No

4 Poor maintenance services 1 Yes 0 No

5 Other, SPECIFY: _____

IF SATISFIED

3N8 Why are you satisfied? [**Read all options**]

3N8.1 Free from smoke 1 Yes 0 No

3N8.2 Very convenient to use 1 Yes 0 No

3N8.3 Saves cooking time 1 Yes 0 No

3N8.4 Very safe to use 1 Yes 0 No

3N8.5 Very good quality of cooking 1 Yes 0 No

3N8.6 It feels nice to have LPG at home 1 Yes 0 No

3N8.7 Other 1 Yes 0 No

3N9 How many days it usually takes between placing an order for LPG refill and receipt of the cylinder? ___ [DAYS]

3N10. Who takes the decision of whether to order a refill?

1 Head of the household 2 Spouse of the head of the household
3 Both 4 Son of the household head
5 Daughter/Daughter-in-law of the household head 6 Other 7 N/A

3N11 Who orders the refills? [**Multiple responses possible**]
1 Head of the household 2 Spouse of the head of the household 3 Son/Grandson of the household head 4 Daughter/Grand-daughter/Daughter-in-law of the household head 5 Other 6 N/A

3N12 What is the most convenient frequency for you to pay for cooking gas for all your cooking needs provided the gas is available to you all the time?

1 Few times a week 2 Once a week 3 Once every two weeks 4 Once a month
5 Once in two months 6 Once in six months 7 As and when required (as it is now) 8 Others, (specify) _____

***IF NO [TO QUESTION 103]*:**

105. Why don't you have LPG? [**Read all options**]

105.1. Is it not available or too far from your village to obtain? 1 Yes 0 No

105.2. Is it too expensive to install an LPG connection? 1 Yes 0 No

105.3. Is the monthly expense of LPG too expensive? 1 Yes 0 No

105.4. Don't know how to get or whom to ask? 1 Yes 0 No

105.5 Other, SPECIFY: _____

106. Are you interested in getting LPG? 1 Yes 0 No **(skip to 109)**

107. How much would you be willing to pay for LPG connection? _____ [RUPEES]

108. How much would you be willing to pay on monthly basis for enough LPG for your entire cooking needs? _____ [RUPEES/MONTH]

3N12 What is the most convenient frequency for you to pay for cooking gas for all your cooking needs provided the gas is available to you all the time?

1 Few times a week 2 Once a week 3 Once every two weeks 4 Once a month
5 Once in two months 6 Once in six months 7 As and when required (as it is now) 8 Others, (specify) _____

109. Do you use firewood and chips for cooking? 1 Yes 0 No **(Skip to 113)**

***IF YES*:**

109.1. Typically, how much firewood do you use per week for cooking? _____ [KG/WEEK]

Of this:

109.2. How much is collected by household members? _____ [KG]

109.3. How much is brought from the market? _____ [KG]

IF 109.2 =/= 0, then,

3N13. Who collects firewood the most often?

1. Head of household 2. Spouse of household head 3.Son of household head
4. Daughter/Daughter-in-law of household head 5. Grandson of household head
6. Granddaughter of household head 7. Other

110. What is your collection frequency for firewood?

1 Daily 2 A few times a week 3 A few times a month
4A few times a year 5 Not Applicable/Don't collect firewood

IF 110 == 1 or 2:

111. How much time do you spend each time you go for collection?_____HOURS/collection

111.1 What is the one-way distance in kilometers your household typically travels to:

111.1.1. Collect firewood and chips? _____ [KM]

111.1.2. Buy firewood and chips? _____ [KM]

IF 109.3 =/= 0, then,

3N14. How often do you buy firewood?

1 Daily 2 A few times a week 3 A few times a month
4A few times a year 5 Not Applicable/Don't buy firewood

IF 3N14 == 1 or 2, and IF 109.2 == 0

3N15. What is the one-way distance in kilometres your household typically travels to buy firewood and chips?
_____ [KM]

112. How much does a KG of firewood and chips cost? _____ [RUPEES/KG] [If the respondent does not know the answer write "DK"]

113. Do you use dung cakes for cooking? 1 Yes 0 No **(Skip to 114)**

***IF YES*:**

113.1. Typically, how many dung cakes do you use per week? _____ [PIECES/ WEEK]

113.2. If you bought all of this in market, how much would it cost you? _____ [RUPEES/WEEK]

Of this weekly usage:

113.3. How many are prepared by household members? ____ [PIECES/ WEEK]

113.4. How many are bought from the market? ____ [PIECES/ WEEK]

114. Do you use agro residue for cooking? 1 Yes 0 No **(Skip to 115)**

***IF YES*:**

114.1. Typically, how much agro residue do you use per year? _____ [KG/YEAR]

114.2. How much does a KG of agro residue cost? _____ [RUPEES/KG]

115. Do you use any other fuel for cooking? 1 Yes, SPECIFY _____ 0 No

115.1 How much do you use of this fuel in a month? _____ [UNITS/WEEK]

115.2 How much do you spend on this fuel in a month? _____ [RUPEES/ WEEK]

FOR ALL HOUSEHOLDS

116. Does your household have the following items and how many?

116.1. 3-stone cookstove? Indoor: ____ Outdoor: ____

116.2. Mud cookstove? Indoor: ____ Outdoor: ____ Portable: ___

116.4. Kerosene stove? Portable: ____

116.5. LPG gas stove? Portable: ____

116.6. Electric stove? Portable: ____

117. Where do you usually cook? 0 indoor 1 outdoor 2 mixed

Module 5 - Cooking Satisfaction

118. What is your primary cooking fuel?

1 Firewood and chips 2 Dung cakes 3 LPG 4 Other _____ [Specify]

119. Generally, how satisfied are you with the availability of this primary cooking fuel to your household?

1 Unsatisfied 2 Neutral 3 Satisfied

IF Unsatisfied:

119.1. Are you cooking less than you want because of poor availability of cooking fuel?

1 Yes 0 No

120. Compared to 5 years ago, has the availability of this fuel:

1 Decreased 2 Remained the same 3 Increased

121. The primary arrangement of cooking that you use: [**Read all options**]

Produces excessive smoke?	1 Yes	0 No
Is too expensive to use?	1 Yes	0 No
Is too dangerous to use?	1 Yes	0 No
Is too time consuming?	1 Yes	0 No
Has good quality of cooking?	1 Yes	0 No
Is too difficult to use?	1 Yes	0 No

122. So, overall how satisfied are you with your current primary cooking arrangement?

1 Unsatisfied 2 Neutral 3 Satisfied

123. Do you think there is an impact on your health from the cookstove that you use? 1 Yes 0 No

124. Considering the convenience of cooking, compared to traditional cookstove, the LPG-based cooking is:

1 Better 2 Similar 3 Worse 99 Don't know

125. Considering the impact on health, compared to traditional cookstove, the LPG-based cooking is:

1 Better 2 Similar 3 Worse 99 Don't know

126. Have you heard about improved biomass cookstoves? 1 Yes 0 No **(Skip to 129)**

***IF YES*:**

126.1 Compared to traditional cookstove, the improved biomass cookstove is:

1 Better 2 Similar 3 Worse 99 Don't know

127. Have you ever used an improved biomass cookstove in this household?

1 Yes 0 No **(IF NO, Skip to 129)**

***IF YES*:**

127.1. Do you still use it? 1 Yes 0 No

127.2. When did you first use it? _____ [YEARS AGO]

127.3. What was the cost of your improved biomass cookstove? _____ [RUPEES]

127.4. What is the type of clean cookstove?

0 Basic stove with chimney 1 Rocket type 2 Gasification-based

127.5. Who is the provider of the improved biomass cookstove?

0 Government 1 NGO 2 Private vendor

127.6. How satisfied are you with the performance of your improved biomass cookstove?

1 Unsatisfied 2 Neutral 3 Satisfied

IF 1 ("UNSATISFIED"; OTHERWISE GO TO NEXT QUESTION): [**Read all options**]

127.7. Too difficult to use?	1 Yes	0 No
127.8. Too dangerous to use?	1 Yes	0 No
127.9. Too costly?	1 Yes	0 No
127.10. Breakdown frequently?	1 Yes	0 No

127.11. Poor maintenance service? 1 Yes 0 No

127.12. Other. SPECIFY: _____

128. How much fuel does it save weekly compared to traditional chulha

_____ [KG/WEEK]? [*PUT NEGATIVE VALUES IF MORE FUEL CONSUMED THAN TRADITIONAL CHULHA*]

IF NO*: *[ENUMERATOR: READ TO THE RESPONDENT ***]***

Improved biomass cookstoves use biomass fuel for cooking. They burn biomass more efficiently than traditional stoves, reducing fuel use and smoke.

129. Would you consider switching to improved biomass cookstove? 1 Yes 0 No

IF YES:

129.1. At what price would you be willing to buy one? ___ [RUPEES]

Biogas Plants [FOR ALL HOUSEHOLDS]

130. Have you heard about biogas with piped supply for cooking?

1 Yes 0 No **(IF NO, Skip to 134)**

***IF YES*:**

130.1. Compared to traditional cookstove, the biogas-based cooking is:

1 Better 2 Similar 3 Worse 99 Don't know

131. Have you ever used biogas for cooking in your household?

1 Yes 0 No **(IF NO, Skip to 134)**

***IF YES*:**

131.1. Do you still use it? 1 Yes 0 No

131.2. When did you first use it? _____ [YEARS AGO]

131.3. What kind of plant is/was it? 0 Individual 1 Community level

131.4. How satisfied are you with your biogas plant?

1 Unsatisfied 2 Neutral 3 Satisfied

IF 1 ("UNSATISFIED"): [**Read all options**]

131.5. Too difficult to use? 1 Yes 0 No

131.6. Too dangerous to use? 1 Yes 0 No

131.7. Too costly? 1 Yes 0 No

131.8. Breakdown frequently? 1 Yes 0 No

131.9. Poor maintenance service? 1 Yes 0 No

131.10. Other. SPECIFY: _____

132. Who is the provider of the biogas plant? 0 Government 1 NGO 2 Private vendor

133. What was the upfront cost of the biogas plant? _____ [RUPEES]

***IF NO*:**

[ENUMERATOR READ TO THE RESPONDENT, SHOW IMAGE ***]***

Biogas plants use organic products including dung, waste food to produce biogas. The gas is similar to LPG and is piped directly to your house. These plants also produce organic fertilizer which is used to improve the health of the soil in fields. However, biogas plants need daily attention in terms of maintenance, fuel feed and manure uptake.

134. Would you consider switching to biogas cooking? 1 Yes 0 No

IF YES:

134.1 . At what price would you be willing to install one? _____ [RUPEES]

Module 6 - Policy Preference

135. [REMOVED]

136. If you got reliable grid electricity, would you be willing to pay same rates as urban population in your state?

1 Yes 0 No

137. Please order the importance of government support to households on items from the following list. RANK THE SELECTION 1-5, WITH 1 MOST IMPORTANT AND 5 LEAST IMPORTANT.

LPG ____ [1-5]

Electricity ____ [1-5]

Kerosene ____ [1-5]

Clean water ____ [1-5]

Education ____ [1-5]

LIGHTING

138. Solar lanterns are portable devices that can be charged in the sun and provide light at night. Do you support government subsidies for solar lanterns, if they are funded by reducing subsidy for kerosene by the same amount?

1 Yes 0 No

139. [REMOVED]

139.1. [REMOVED]

139.2. [REMOVED]

139.3. [REMOVED]

139.4. [REMOVED]

139.5. [REMOVED]

139.6. [REMOVED]

5N1. Have you heard of the Deen Dayal Upadhyaya Gram Jyoti Yojana (DDUGJY) program?

1 Yes 0 No

IF YES

5N2. Has your household been electrified under DDUGJY? 1 Yes 0 No

IF NO to 5N2,

5N3. Have you heard of the Saubhagya scheme?

1 Yes 0 No

If YES

5N4. Has your household been electrified under Saubhagya?

1 Yes 0 No

KEROSENE QUESTIONS (FOR ALL HOUSEHOLDS)

140. What is your monthly quota for PDS kerosene? _____ [LITERS/MONTH]

[IF RESPONDENT DOESN'T KNOW MARK "DK" and skip to 142**]**

141. In last one year, how frequently it happened that you wanted to buy and you were able to get your entire PDS quota of kerosene?

0. 0-3 times 1. 4-6 times 2.7-9 times 3. 10-12 times

142. Do people in your village resell subsidized kerosene? 1 Yes 0 No

143. Do you think this practice should be stopped? 1 Yes 0 No

144. [REMOVED]

145. [REMOVED]

146. [REMOVED]

147. [REMOVED]

148. [REMOVED]

149. [REMOVED]

150. If the government could only subsidize one type of lighting, which one should it be?

[**READ ALL OPTIONS **]

0 Kerosene

1 Solar lantern/ Solar home systems

2 Micro-grid

3 Lighting through the regular electric grid

4 Other, specify: _____

LPG QUESTIONS (FOR ALL HOUSEHOLDS)

151 . [REMOVED]

152. Do people in your village resell subsidized LPG? 1 Yes 0 No 99 Don't Know 999 NA

153. Do you think that this practice should be stopped? 1 Yes 0 No 99 Don't Know 999 NA

154. Do you think that this practice is legal? 1 Yes 0 No 99 Don't Know 999 NA

155. Please rank the following on the basis of what government should priorities

[1 IS HIGHEST PRIORITY, 4 LOWEST PRIORITY]:

155.1. Provision of improved biomass cook-stoves ____ [1-4]

155.2. Increased LPG subsidy ____ [1-4]

155.3. Provision of improved biogas plants ____ [1-4]

155.4. Improved availability of LPG cylinders ____ [1-4]

Module 7 – Willingness to Pay (WTP)

WTP FOR GRID ELECTRICITY

Scenario A: Households without any grid connection

NM1. Imagine if you were to receive a new grid electricity connection of good quality electricity supply which is safe and available continuously in the premises of the household. You will be accurately metered and billed on a monthly basis. Would you be willing to spend up to Rs. [100/150/200/250/300/350/400] per month on electricity for the household?

1 Yes 0 No

IF YES

NM2. Please could you explain why you answered YES? [Don't prompt] [Multiple answers possible]

1. Getting reliable electricity is worth the cost
2. Not having grid electricity is a real problem for my household
3. As bills would come regularly, I am happy to pay this much monthly
4. My existing expenditure on lighting is anyway this much or more
5. Other (specify) _____

IF NO

NM3. Please could you explain why you answered NO? [Don't prompt] [Multiple answers possible]

1. The value of reliable electricity supply is not worth the cost
2. This is too expensive for my household
3. I don't need 24x7 electricity
4. I don't believe that grid can provide 24x7 supply
5. I don't believe that grid will do adequate and regular billing
6. I don't believe that people should have to pay for electricity
7. Other (specify) _____

Scenario B: Households with grid connection

NM4. Imagine if you were to receive improved electricity supply which is safe and available 24x7 in the premises of the household. You will be accurately metered and billed on a monthly basis. Would you be willing to spend up to Rs. [100/150/200/250/300/350/400] per month on electricity for the household?

1 Yes 0 No

IF YES

NM5. Please could you explain why you answered YES? [Don't prompt] [Multiple answers possible]

1. The improvement is worth the cost
2. Intermittent supply is a real problem for my household
3. As bills would come regularly, I am happy to pay this much monthly
4. Inaccurate billing has been a real problem for my household in the past
5. Other (specify) _____

IF NO

NM6. Please could you explain why you answered NO? [Don't prompt] [Multiple answers possible]

1. The improvement is not worth the cost
2. This is too expensive for my household
3. I don't need 24x7 electricity
4. I don't believe that grid can provide 24x7 supply
5. I don't believe that grid will do adequate and regular billing
6. I don't think that people should have to pay for electricity

Other (specify) _____

WILLINGESS-TO-PAY (WTP) FOR LPG

Scenario A: Households without any LPG connection

NM7. Indoor air pollution from cooking with traditional fuels such as firewood, dung cakes, crop waste, has a significant negative impact on health. Imagine if you were to receive a new LPG connection free of cost which would enable you to cook using clean cooking fuel. You would receive LPG as and when you need at your door step. Would you be willing to pay Rs.[200/300/400/500/550/600/650/700] per month to meet all your cooking needs?

IF YES

NM8. Please could you explain why you answered YES? [Don't prompt] [Multiple answers possible]

1. Reduction in pollution/health impact
2. Convenience of using LPG is worth the cost
3. Time saving of using LPG is worth the cost
4. Indoor air pollution is a real problem for my household
5. Using LPG is cheaper than buying firewood or dung cakes
6. Paying one time for a cylinder is difficult, but I can pay on a monthly basis

Other (specify) _____

IF NO

NM9. Please could you explain why you answered NO? [Don't prompt] [Multiple answers possible]

1. I don't believe that Chulha has negative health impact
2. Reduction in pollution/health impact is not worth the cost
3. I/my family prefer food cooked on chulha
4. This is too expensive for my household
5. I don't need LPG
6. I don't believe that LPG creates less indoor pollution
7. I don't believe that people should have to pay for LPG
8. I am fine with it the way it is now
9. Other (specify) _____

Scenario B: Households with LPG connection

NM10. Indoor air pollution from cooking with traditional fuels such as firewood, dung cakes, crop waste, has a significant negative impact on health. Cooking on LPG can reduce one's exposure to such pollution. Imagine if you were to receive LPG as and when you need at your door step. Would you be willing to pay Rs.[200/300/400/500/550/600/650/700] per month to meet all your cooking needs?

IF YES

NM11. Please could you explain why you answered YES? [Don't prompt] [Multiple answers possible]

1. Reduction in pollution/health impact is worth the cost
2. Convenience of using LPG is worth the cost
3. Time saving of using LPG is worth the cost
4. Indoor air pollution is a real problem for my household
5. Using LPG is cheaper than buying firewood or dung cakes
6. Paying one time for a cylinder is difficult, but I can pay on a monthly basis

Other (specify) _____

IF NO

NM12. Please could you explain why you answered NO? [Don't prompt] [Multiple answers possible]

1. I don't believe that Chulha has negative health impact
2. Reduction in pollution/health impact is not worth the cost
3. I/my family prefer food cooked on chulha
4. This is too expensive for my household
5. I don't need clean cooking fuel
6. I don't believe that LPG creates less indoor pollution
7. I don't believe that people should have to pay for LPG
8. I am fine with it the way it is now
9. Other (specify) _____

Supplementary Note 3 | Economic Status Index

The economic status index is based on the approach prescribed by Filmer and Pritchett (2001), and includes the following covariates:

- Monthly household expenditure
- Number of rooms in the household
- Number of beds in the household
- Number of tables in the household
- Number of chairs in the household
- Number of bicycles with the household
- Number of motorbikes with the household
- Whether household has pukka or mixed (pukka-kuccha) room (binary variable)

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