Indonesia Residential End Use Survey

Final Report

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CLASP
Ipsos

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Contents

List of Tables

List of Figures

List of Abbreviations

°C	Degree Celsius
°F	Degree Fahrenheit
AC	Air Conditioner
ADB	Asian Development Bank
BAU	Business-as-Usual Scenario
BOE	Barrel of Oil Equivalent Barel Setara Minyak
BPS	Badan Pusat Statistik Central Bureau of Statistics
BTU	British Thermal Unit
CAGR	Compound Annual Growth Rate
CFL	Compact Fluorescent Lamp
EBTKE	Direktorat Jenderal Energi Baru, Terbarukan, dan Konservasi Energi Directorate General of New Renewable Energy and Energy Conservation
Est.	Estimated Estimasi
GDP	Gross Domestic Product
GHG	Greenhouse Gas
GWh	Gigawatt-hour
h, hr	Hour
HDI	Human Development Index
HH	Household
HP	Horsepower
KESDM	Kementrian Energi dan Sumber Daya Mineral (also MEMR)
Kg	Kilogram
kWh	Kilowatt-hour
LED	Light Emitting Diode
Lux	Unit of illuminance, as a measurement of luminous flux per unit area
LPG	Liquid Petroleum Gas
MEMR	Ministry of Energy and Mineral Resources (also KESDM)
MEPS	Minimum Energy Performance Standard (also SKEM)
MMBTU	Million British Thermal Unit used for natural gas
MoE	Margin of Error
MTOE	Million tonnes of oil equivalent
MWh	Megawatt-hour
NDC	Nationally Determined Contribution
NTT	Nusa Tenggara Timur
Nusra	Nusa Tenggara Lesser Sunda Islands
OE	Open Ended
PGN	Perusahaan Gas Negara Indonesia State-owned Gas Company

PK	Paard Kracht (equivalent to 1 metric Horsepower)
PLN	Perusahaan Listrik Negara Indonesia State-owned Electric Company
PODES	Pendataan Potensi Desa Registry of Village Potential
PSU	Primary Sampling Unit
RT	Rukun Tetangga Division of territories under Rukun Warga
RUEN	Rencana Umum Energi Negara National Energy Plan
RW	Rukun Warga Division of regions under the village or *Kelurahan*
SEC	Socio-Economic Class
SKEM	Standar Kerja Energi Minimum (also MEPS)
SNI	Standar Nasional Indonesia Indonesian National Standard
SUPAS	Survei Penduduk Antar Sensus Intercensal Population Survey
TV	Television
TWh	Terawatt-hour
UEC	Unit Energy Consumption, defined for annual energy consumption per unit in kWh/year
VA	Volt-Ampere
W	Watt
W/m^2	Watt per square meter

Executive Summary

Indonesia is the 4th largest country in the world, with over 265 million people in 2018.[1] Gross domestic product (GDP) has been growing by around 5% annually over the past decade,[2] while per-capita income has been concurrently growing by almost 4% annually.[3] The country's steady economic growth has contributed to a doubling in electricity consumption, from 129 TWh in 2008 to 256 TWh in 2018.

The residential sector is the primary electricity user, responsible for nearly 40% of consumption, followed by industrial (37%), commercial (23%), and transportation (0.11%).[4] Coal is the main fuel in electricity generation, responsible for 58% of primary energy consumed, followed by natural gas (27%), renewables (hydro, geothermal, solar, and wind; 8%) and oil (6%).[5]

Under the Paris Agreement, Indonesia committed to reducing greenhouse gas (GHG) emissions by 29% below a business-as-usual (BAU) baseline by 2030, or by 38% below BAU by 2030 with international support. Reaching these unconditional and conditional targets, will require reductions in energy consumption of 19% and 24% below BAU.[6]

The Ministry of Energy and Mineral Resources (MEMR or KESDM), through its Directorate General of New Renewable Energy and Energy Conservation (EBTKE), aims to reduce national energy consumption across all sectors by 17% in 2025 relative to BAU through various policies,[7] including energy efficiency standards and labeling for household electric appliances. Energy efficiency regulations for air conditioners and compact fluorescent lamps are already in place, and MEMR plans to issue additional Ministerial Regulations this year to further reduce household energy consumption.

As the leading international voice and resource for appliance efficiency policies and market acceleration initiatives, CLASP, together with its Indonesian partner Ipsos, conducted the first-of-its-kind national survey of household appliances in Indonesia. This extensive survey provides insights into appliance ownership and usage at the household level to support energy efficiency policies that maximize energy and CO_2 reductions and cost savings for household consumers, manufacturers, and the nation.

The survey team conducted the survey in both urban and rural districts in all of Indonesia's 34 provinces. The team visited a total of 5,443 households, interviewing the key person in the household aware of appliance usage and the average monthly electricity and other fuel bills. Key information gathered in the survey included ownership of the appliances, specifications of the appliances, and time and duration of usage.

This survey represents the electrified household population in Indonesia. Java has the largest proportion of the national population (60%), followed by Sumatera (21%), and Kalimantan, Bali and Nusa Tenggara, Sulawesi and Papua (19%). A map showing the distribution of the coverage achieved in this survey through random sampling across the nation is provided in Figure 1.

[1] MEMR, Handbook of Energy & Economic Statistics of Indonesia, 2018, p. 3.
[2] GDP Growth (annual %) - Indonesia. (n.d.). World Bank Open Data | Data. https://data.worldbank.org/indicator/NY.GDP.MKTP.KD.ZG?end=2018&locations=ID&start=1961&view=chart
[3] Indonesia Economic Snapshot. http://www.oecd.org/economy/indonesia-economic-snapshot/
[4] MEMR, Handbook of Energy & Economic Statistics of Indonesia, 2018, pp. 41-53.
[5] Statistics Report 2018. PLN. https://www.pln.co.id/stakeholder/laporan-statistik
[6] Government of Indonesia, First Nationally Determined Contribution Republic of Indonesia, November 2016, p.10.
[7] President of Indonesia, Presidential Regulation Number 22 of 2017 about National Energy General Plan (RUEN), p. 30.

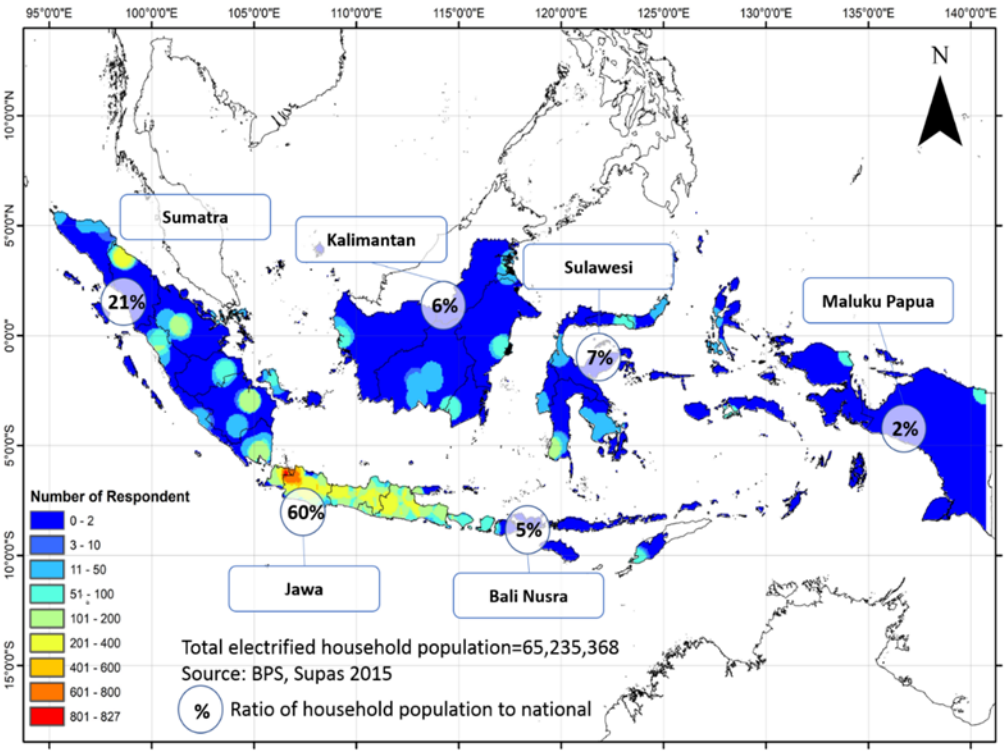


Figure 1: Distribution map of survey coverage and Indonesia's household population with access to electricity

The survey found that all electrified households have lighting, with an average of 5.4 lighting points (lamps and tubes). For other common appliances, the survey found that televisions (TVs) were owned by 93% of households, cell phones by 78%, electric irons by 70%, refrigerators by 69%, rice cookers by 69%, and electric fans by 64%. Other appliances were less common, with penetration rates below 40% include water pumps at 35%, washing machines at 29%, and blenders at 27%. Most of these appliances were reportedly used daily, except for irons, washing machines, and blenders, which were used every 2 to 3 days. Table 1 lists the penetration and number of appliances owned, and daily usage for the most common appliances.

Table 1. Household ownership and monthly usage of top 10 most common electrical appliances

Household Appliances	% Penetration	Average Number of Appliance per Owning Household	% Days Used per Month
Lighting	100%	5.4	100%
Television	93%	1.1	95%
Cell phone	78%	1.9	98%
Iron	70%	1	37%
Refrigerator	69%	1	97%
Rice cooker/warmer	69%	1	95%
Electric fan	64%	1.3	89%
Water pump	35%	1	93%
Washing machine	29%	1	55%
Blender	27%	1	42%

Households with higher socioeconomic status generally own more and higher wattage appliances, which leads to higher energy consumption. Air conditioners (ACs) in particular were found to be predominantly owned by wealthy households, with average expenditures above 6 million Indonesian Rupiah (IDR, Rp) per month (approximately USD 430). Only 5% of households nationwide own ACs. Similar trends were also observed for water dispensers, washing machines, and water pumps. As shown in Figure 2, the disparity is considerably less prominent for TV, rice cooker, refrigerator, iron, and fan.

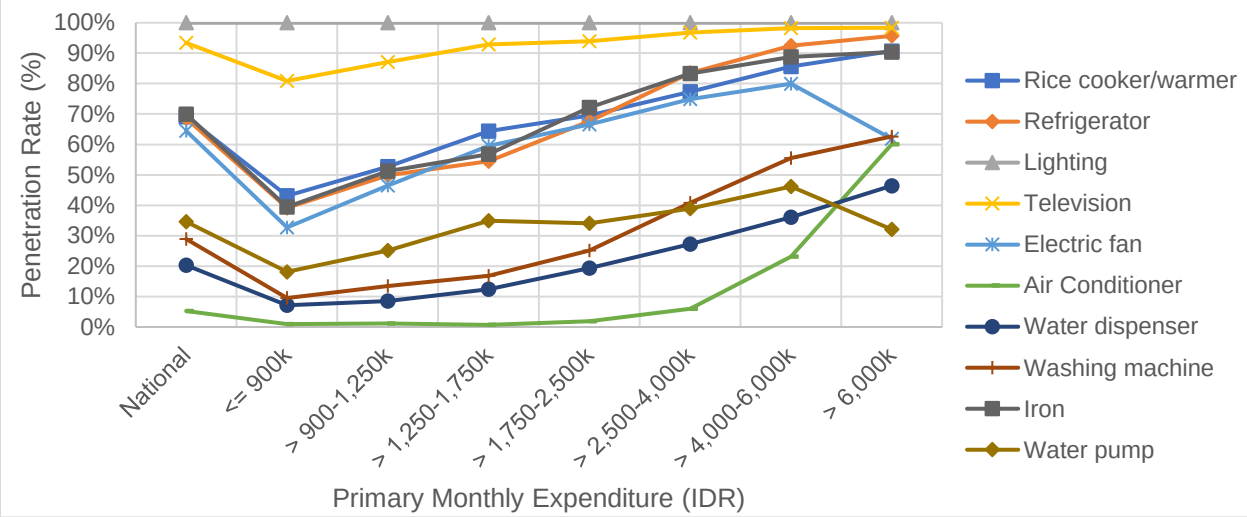


Figure 2: Penetration rate of the 10 highest electricity-using appliances across ranges of primary monthly expenditure

Based on their penetration, ownership, usage, wattage, and assumptions on full-load operation, CLASP identified the top 10 electricity-using appliances, responsible for 98% of Indonesia's residential electricity consumption. These appliances are slightly different from the list of the most common appliances, above, as some common appliances are not used frequently (blender) or have lower per-unit energy consumption (cell phone). The appliances and their energy consumption estimates are listed in Table 2 and Figure 3, while their hourly impact on energy demand are shown in Figure 4.

Table 2. Household ownership and electricity consumption of top 10 electricity-using appliances

Household Appliances	% Penetration	Annual Electricity Consumption (GWh/year)	Est. Annual Electricity Consumption per 1% Penetration (GWh/1%)[8]	Est. Equivalent Number of Units per 1% Penetration (unit)
Rice cooker	69%	15,057	218	659,941
Refrigerator	69%	14,354	209	664,235
Lighting	100%	13,112	131	3,518,335
TV	93%	6,378	68	699,976
Fan	64%	5,153	80	859,720
AC	5%	5,057	958	752,108
Water dispenser	20%	2,420	119	654,335
Washing machine	29%	1,066	37	656,106
Iron	70%	1,063	15	655,180
Water pump	35%	961	28	654,250

[8] The impact of the appliance as the national penetration increases by 1 percentage point.

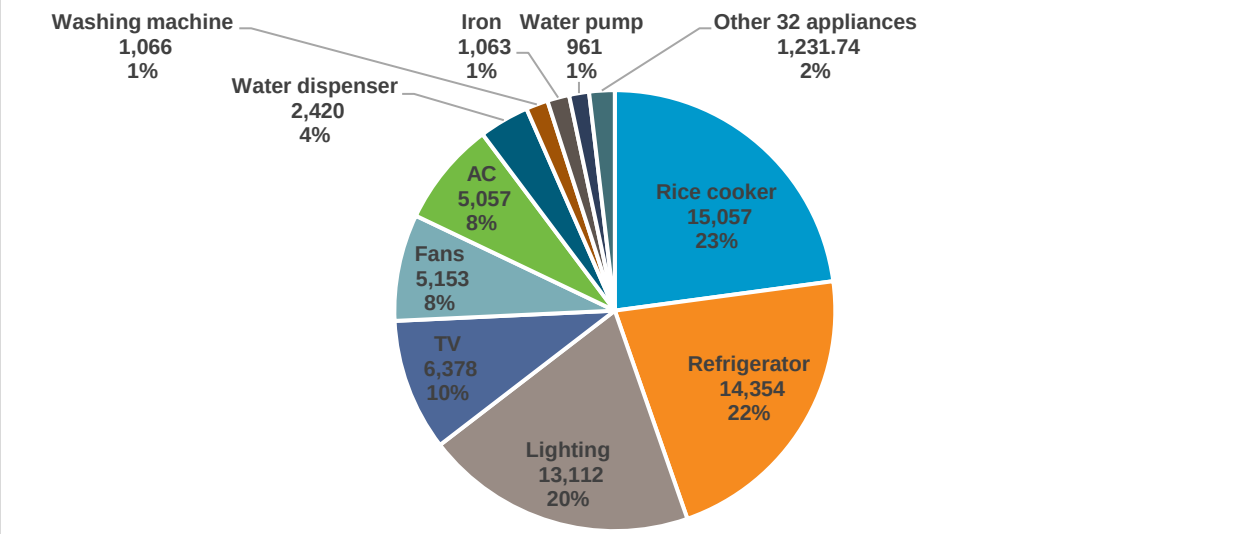


Figure 3: Shares of electricity consumption estimates for 42 electrical appliances (in GWh and %)

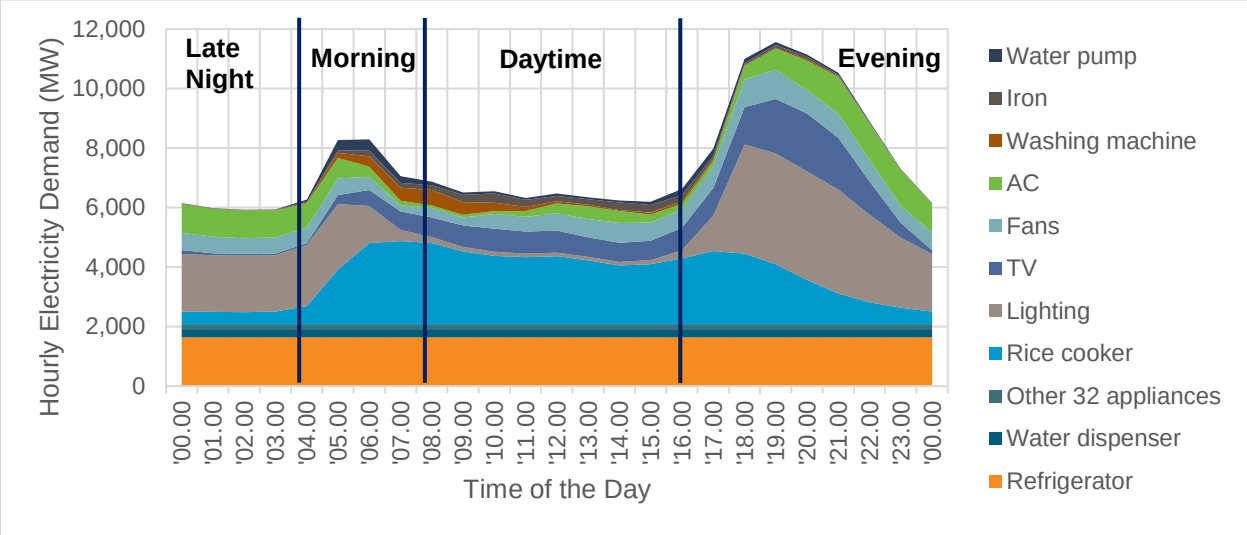


Figure 4: Hourly electricity consumption trends for the 42 electrical appliances

Rice cookers and refrigerators were estimated to consume comparable amounts of energy at the national level. The survey found similar level of penetration and ownership for both appliances. Refrigerators have always been perceived to be energy-consuming due to their continuous use, while awareness of the extent of rice cooker energy consumption was limited. At the national level, 45.6 million rice cookers were estimated to be used for cooking at least once per day and kept active to warm the rice for a duration of 6.4 hours per day.

Fans are the most commonly used cooling appliances in Indonesia. Fans were owned by 64% of the surveyed households, with an average of 1.3 units per owning household—in contrast, only 5% own ACs, with an average of 1.2 units. ACs were reported to be in use for 8 hours per day, slightly higher than fans at 6.4 hours per day.

ACs were identified to have the highest electricity consumption per percentage of household penetration, estimated at 958 GWh annually per 1% penetration. On the other hand, electric fans were projected to consume less than one-tenth of the energy consumed by ACs annually at 80 GWh per 1% penetration. Rice cookers and refrigerators follow, at 218 GWh and 209 GWh, respectively. The high national electricity consumption of these appliances will continue to grow as incomes and household penetration increase, making them a good target for energy efficiency policies.

Most households own a TV, making it the fourth most electricity consuming appliance nationally. Nearly 60% of all TVs in use were cathode ray tube TVs, though these must have been either old appliances or purchased used, since according to Euromonitor, sale of new tube TVs in Indonesia stopped in 2016.

LPG cookstoves were identified as the highest energy-consuming non-electrical appliance, used in 77% of all households and consuming 36.7 million barrels of oil equivalent (BOE) or approximately 60,000 GWh[9] in 2019, more than any electrical appliance. The two dominant fuel sources used in residential cooking were LPG (80%) and biomass (15%). While all electrified households have access to grid-powered lighting, kerosene lamps were still used in 2% of all households.

The survey also asked about consumer considerations when purchasing appliances and found that energy savings is the top priority when purchasing most new household electrical appliances. In the absence of energy labels, most consumers refer to the power rating and wattage listed on the nameplate of the product or ask the salesperson to understand the energy consumption.

Energy labels are currently only required for two products, compact fluorescent lamps (CFLs) and ACs. MEMR energy labeling programs released in 2014 for CFL and 2018 for ACs are still not well recognized, as the survey revealed only 6.5% recognized the label nationally. Despite this fact, 88% of the 6.5% understood the label correctly as “the more stars, the more energy efficient.”

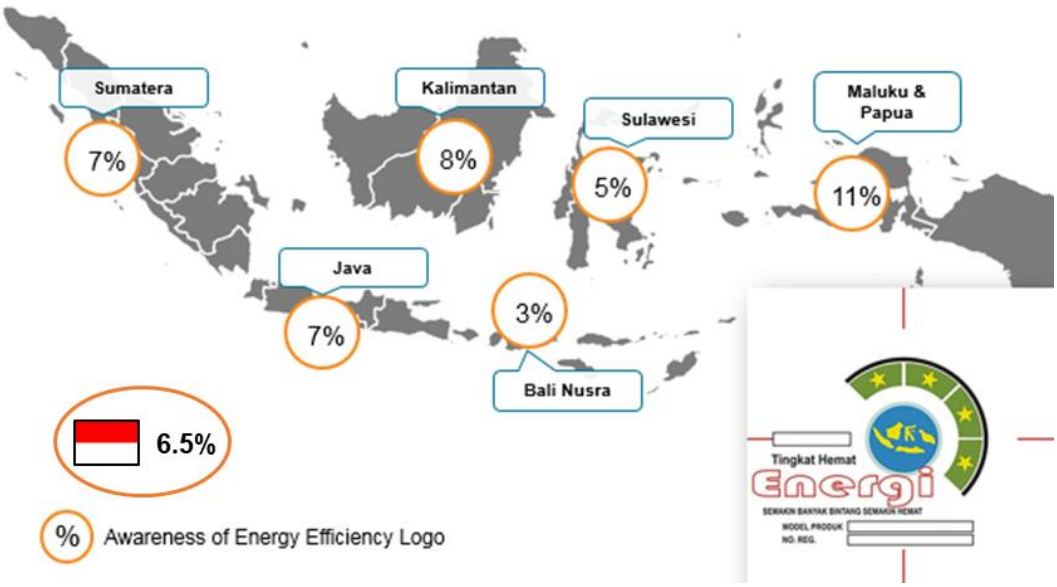


Figure 5: Energy labeling program awareness rate in Indonesia major islands

The findings from this survey indicate that an expanded and well-promoted energy labeling program could pay huge dividends in terms of energy savings impact, given that consumers are already conscious of and make purchasing decisions based on (perceived) energy efficiency. With the existing labels for lighting and air conditioning as a foundation, the standards and labeling program should expand to promote the most efficient technologies among the top energy-consuming products.

[9] Assuming 0.6130 MWh per barrel of oil. MEMR, “Handbook of Energy & Economic Statistics of Indonesia”, 2018, p. 129.

A modest 15% improvement in the efficiency of electrical appliances, enabled by standards and labeling could reduce national electricity consumption by 10,000 GWh per year. In addition, optimized efficiency of gas cookstoves could advance a shift towards a more beneficial cooking fuel distribution for emissions mitigation and consumer savings.

Ringkasan Eksekutif

Indonesia adalah negara keempat terbesar di dunia, dengan lebih dari 265 juta jiwa pada tahun 2018.[10] Produk Domestik Bruto (PDB) telah tumbuh sekitar 5% per tahun selama dekade terakhir,[11] sementara pendapatan per kapita telah secara bersamaan tumbuh hampir 4% per tahun.[12] Pertumbuhan ekonomi yang stabil di Indonesia telah berkontribusi menaikkan konsumsi listrik dua kali lipat, dari 129 TWh pada tahun 2008 menjadi 256 TWh pada tahun 2018.

Sektor perumahan adalah pengguna listrik yang utama, menyumbang hampir 40% dari konsumsi, diikuti oleh industri (37%), komersial (23%), dan transportasi (0,11%).[13] Batubara adalah bahan bakar utama dalam pembangkit listrik, yang menyumbang 58% dari energi primer yang dikonsumsi, diikuti oleh gas alam (27%), energi terbarukan (air, panas bumi, tenaga surya, dan angin; 8%) dan minyak bumi (6%).[14]

Berdasarkan Perjanjian Paris, Indonesia berkomitmen untuk mengurangi emisi gas rumah kaca (GRK) sebesar 29% di bawah *baseline* Bisnis-Seperti-Biasa (BSB) di tahun 2030, atau 38% di bawah BSB pada tahun 2030 dengan dukungan internasional. Mencapai target tanpa syarat dan bersyarat ini, akan memerlukan pengurangan konsumsi energi 19% dan 24% di bawah BSB.[15]

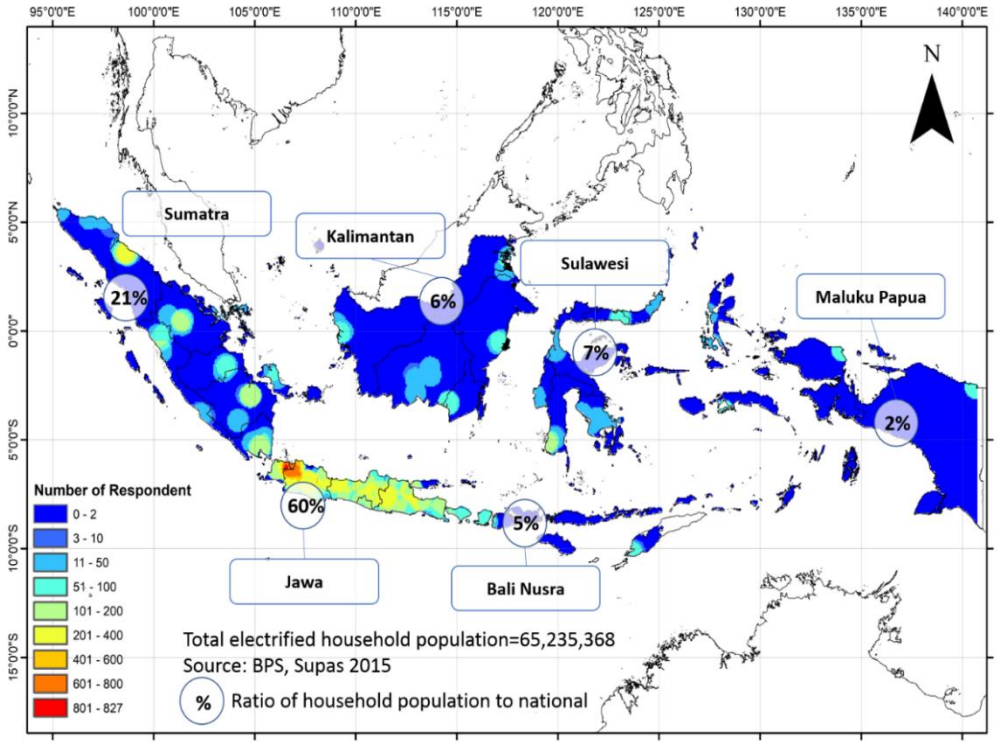
Kementerian Energi dan Sumber Daya Mineral (KESDM), melalui Direktorat Jenderal Energi Baru Terbarukan dan Konservasi Energi (EBTKE), bertujuan untuk mengurangi konsumsi energi nasional di semua sektor sebesar 17% pada tahun 2025 dibandingkan dengan kondisi BSB melalui berbagai kebijakan,[16] termasuk kebijakan efisiensi energi untuk peralatan listrik umum rumah tangga. Peraturan efisiensi energi untuk AC dan lampu neon ringkas (*Compact Fluorescent Lamp*, CFL) sudah berjalan, dan KESDM berencana untuk mengeluarkan Peraturan Menteri tambahan tahun ini untuk mengurangi konsumsi energi rumah tangga lebih lanjut.

Sebagai perwakilan suara dan sumber daya internasional terkemuka untuk kebijakan efisiensi alat dan inisiatif percepatan pasar, CLASP, bersama dengan mitranya di Indonesia, Ipsos, melakukan survei nasional pertama yang berbeda dengan survei sejenis lainnya tentang penggunaan peralatan rumah tangga di Indonesia. Survei ekstensif ini memberikan wawasan tentang kepemilikan dan penggunaan peralatan di tingkat rumah tangga untuk mendukung upaya di dalam proses pembuatan kebijakan efisiensi energi sehingga memaksimalkan dampak dan penghematan bagi konsumen rumah tangga, produsen, dan negara.

Tim Ipsos melakukan survei ini di 34 provinsi di Indonesia, baik di daerah perkotaan maupun di daerah pedesaan. Tim Ipsos mengunjungi 5.443 rumah tangga untuk mewawancarai orang yang memahami penggunaan peralatan rumah tangga dan rata-rata pembayaran listrik bulanan di rumah tangga tersebut. Informasi penting yang dikumpulkan melalui survei ini termasuk kepemilikan peralatan, spesifikasi peralatan, serta waktu dan durasi penggunaan.

Survei ini mewakili populasi rumah tangga yang memiliki akses listrik di Indonesia. Jawa memiliki proporsi populasi nasional terbesar (60%), diikuti oleh Sumatera (21%), Kalimantan (6%), Bali dan Nusa Tenggara (5%), Sulawesi (7%), Maluku dan Papua (2%). Pemetaan yang menunjukkan distribusi cakupan survei yang dihasilkan dari pengambilan sampel acak di seluruh negara dapat dilihat pada Gambar 6.

[10] KESDM, Buku Pegangan Statistik Energi & Ekonomi Indonesia, 2018, p. 3.
[11] Pertumbuhan PDB (tahunan %) - Indonesia. (n.d.). Data Terbuka Bank Dunia | Data. https://data.worldbank.org/indicator/NY.GDP.MKTP.KD.ZG?end=2018&locations=ID&start=1961&view=chart
[12] Cuplikan Ekonomi Indonesia. http://www.oecd.org/economy/indonesia-economic-snapshot/
[13] KESDM, Buku Pegangan Statistik Energi & Ekonomi Indonesia, 2018, pp. 41-53.
[14] Laporan Statistik 2018. PLN. https://www.pln.co.id/stakeholder/laporan-statistik
[15] Pemerintah Indonesia, Kontribusi Republik Indonesia yang Pertama Ditentukan Secara Nasional , November 2016, p.10.
[16] Presiden Indonesia, Peraturan Presiden Nomor 22 tahun 2017 tentang Rencana Umum Energi Nasional (RUEN), p. 30.



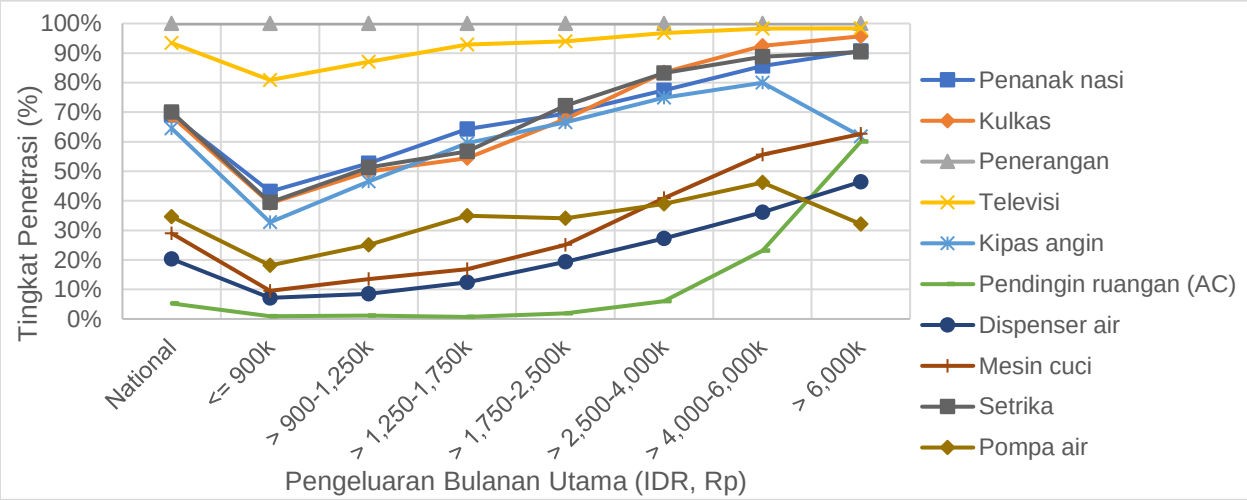
Gambar 6: Peta sebaran cakupan survei dan populasi rumah tangga Indonesia dengan akses listrik

Melalui survei ini ditemukan bahwa semua rumah tangga yang mempunyai akses listrik memiliki penerangan, dengan jumlah rata-rata 5,4 titik per rumah (lampu bohlam dan tabung). Untuk peralatan umum lainnya, survei ini menemukan bahwa rumah tangga yang memiliki televisi (TV) mencapai 93%, ponsel 78%, setrika listrik 70%, kulkas 69%, penanak nasi 69%, dan kipas angin 64%. Peralatan lainya yang kurang umum, dengan tingkat penetrasi di bawah 40%, adalah pompa air di 35%, mesin cuci di 29%, dan blender di 27%. Sebagian besar peralatan ini digunakan setiap hari, kecuali untuk setrika, mesin cuci, dan blender, yang hanya digunakan setiap 2 hingga 3 hari. Tabel 3 mencantumkan penetrasi dan jumlah peralatan yang dimiliki, serta durasi penggunaan harian untuk peralatan rumah tangga yang paling umum.

Tabel 3. Kepemilikan peralatan rumah tangga dan penggunaan bulanan untuk 10 peralatan rumah tangga listrik paling umum

Peralatan Rumah Tangga	Tingkat Penetrasi (%)	Jumlah Peralatan yang Dimiliki per Rumah Tangga (unit)	% Hari Peralatan Digunakan per Bulan
Penerangan	100%	5.4	100%
Televisi	93%	1.1	95%
Telepon selular	78%	1.9	98%
Setrika	70%	1	37%
Kulkas	69%	1	97%
Penanak nasi	69%	1	95%
Kipas angin	64%	1.3	89%
Pompa air	35%	1	93%
Mesin cuci	29%	1	55%
Blender	27%	1	42%

Rumah tangga dengan status sosial ekonomi yang lebih tinggi umumnya memiliki peralatan dengan daya yang lebih tinggi, yang akan memberikan dampak konsumsi energi yang lebih tinggi. Pendingin udara (*AC*) khususnya dimiliki oleh rumah tangga yang mampu, dengan pengeluaran rata-rata di atas 6 juta Rupiah per bulan (sekitar 430 Dollar Amerika Serikat). Hanya 5% dari jumlah rumah tangga nasional yang mempunyai *AC*. Tren serupa juga diamati untuk peralatan dispenser, mesin cuci, dan pompa air. Seperti yang ditunjukkan pada Gambar 7, kesenjangan kepemilikan peralatan rumah tangga terlihat berkurang untuk TV, penanak nasi, lemari es, setrika, dan kipas.



Gambar 7: Tingkat penetrasi dari 10 peralatan rumah tangga pengguna listrik tertinggi di berbagai rentang pengeluaran bulanan utama

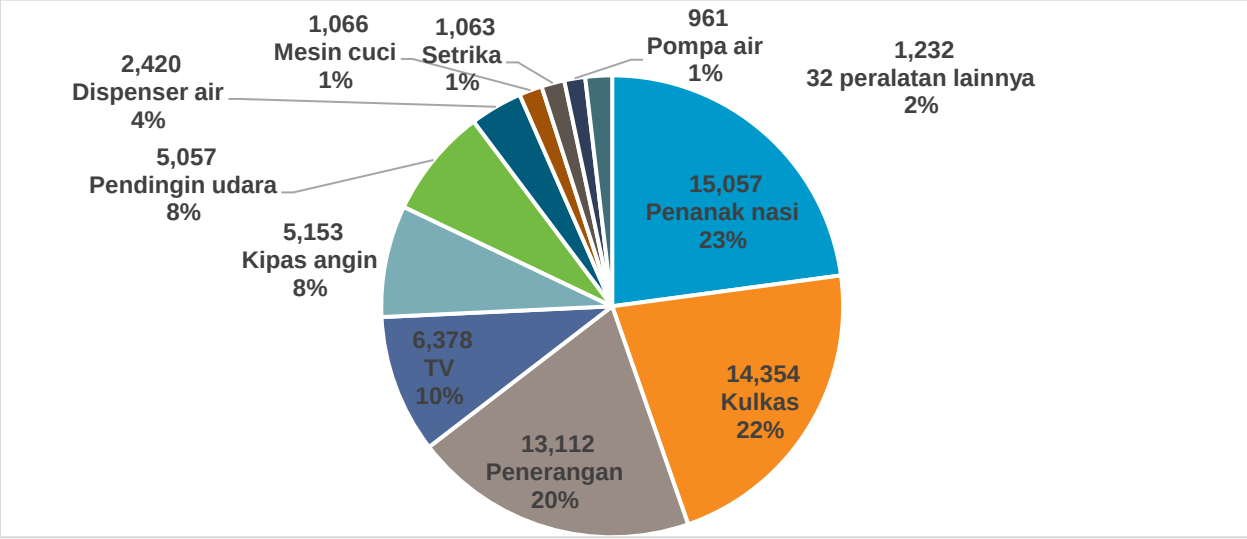
Berdasarkan tingkat penetrasi, kepemilikan, penggunaan, watt, dan asumsi operasi beban penuh, CLASP telah mengidentifikasi 10 peralatan rumah tangga dengan konsumsi listrik tinggi, yang bertanggung jawab atas 98% dari konsumsi energi sektor rumah tangga di Indonesia. Peralatan yang tercatat memiliki dampak energi yang tinggi di daftar ini sedikit berbeda dari daftar peralatan yang paling umum, yang tertera di Tabel 3, karena ada beberapa peralatan yang jarang digunakan (seperti blender) dan yang mengkonsumsi energi lebih rendah per unitnya (seperti telepon selular). Perkiraan konsumsi energi untuk peralatan ini tertera pada Tabel 4 dan Gambar 8, serta dampak terhadap kebutuhan energi per jamnya pada Gambar 9.

Tabel 4. Kepemilikan rumah tangga dan konsumsi listrik dari 10 peralatan rumah tangga pengguna listrik peringkat teratas

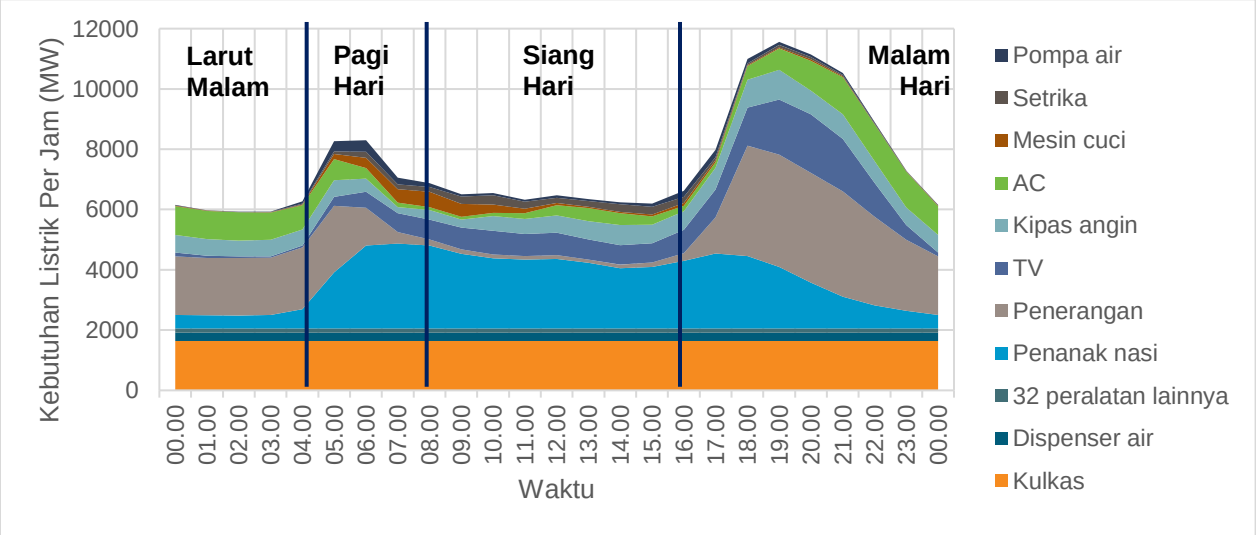
Peralatan Rumah Tangga	Tingkat Penetrasi (%)	Penggunaan Listrik Tahunan (GWh/tahun)	Est. Penggunaan Listrik Tahunan per 1% Penetrasi (GWh/1%)[17]	Est. Jumlah Unit Setara per 1% Penetrasi (unit)
Penanak nasi	69%	15,057	218	659,941
Kulkas	69%	14,354	209	664,235
Penerangan	100%	13,112	131	3,518,335
TV	93%	6,378	68	699,976
Kipas angin	64%	5,153	80	859,720
AC	5%	5,057	958	752,108
Dispenser air	20%	2,420	119	654,335
Mesin cuci	29%	1,066	37	656,106

[17] Dampak dari peralatan dengan peningkatan tingkat penetrasi nasional sebanyak 1 poin persentase.

Peralatan Rumah Tangga	Tingkat Penetrasi (%)	Penggunaan Listrik Tahunan (GWh/tahun)	Est. Penggunaan Listrik Tahunan per 1% Penetrasi (GWh/1%)[17]	Est. Jumlah Unit Setara per 1% Penetrasi (unit)
Setrika	70%	1,063	15	655,180
Pompa air	35%	961	28	654,250



Gambar 8: Estimasi untuk fraksi konsumsi listrik dari 42 peralatan (dalam unit GWh dan %)



Gambar 9: Profil konsumsi listrik per jam untuk 42 peralatan

Penanak nasi dan kulkas diperkirakan mengkonsumsi energi dalam jumlah yang sebanding di tingkat nasional. Survei ini menemukan tingkat penetrasi dan kepemilikan yang sama untuk kedua peralatan ini. Kulkas selalu dianggap sebagai peralatan rumah tangga yang memakan energi yang tinggi karena penggunaannya yang terus-menerus, sementara kesadaran akan tingkat konsumsi energi penanak nasi masih sangat terbatas. Di tingkat nasional, 45,6 juta penanak nasi diperkirakan digunakan untuk memasak nasi setidaknya sekali sehari dan tetap diaktifkan untuk menghangatkan nasi selama 6,4 jam per hari.

Kipas angin adalah peralatan pendingin yang paling umum digunakan di Indonesia. Kipas angin dimiliki oleh 64% rumah tangga yang disurvei, dengan rata-rata kepemilikan 1,3 unit per rumah tangga—sebaliknya, hanya 5% yang memiliki AC, dengan rata-rata kepemilikan sebanyak 1,2 unit. AC dilaporkan digunakan selama 8 jam per hari, sedikit lebih tinggi dari kipas angin di 6,4 jam per hari.

AC diidentifikasi memiliki konsumsi listrik tertinggi per persentase penetrasi rumah tangga, diperkirakan sejumlah 958 GWh per tahun per persentasi penetrasi. Di sisi lain, kipas angin diproyeksikan untuk mengkonsumsi kurang dari sepersepuluh energi yang dikonsumsi oleh AC setiap tahunnya pada 80 GWh per 1% penetrasi. Berikutnya adalah penanak nasi dan kulkas, yang diestimasi masing-masing sejumlah 218 GWh dan 209 GWh. Konsumsi listrik nasional yang tinggi dari peralatan ini akan terus tumbuh karena pendapatan dan penetrasi rumah tangga yang meningkat, menjadikannya target yang tepat untuk penerapan kebijakan efisiensi energi.

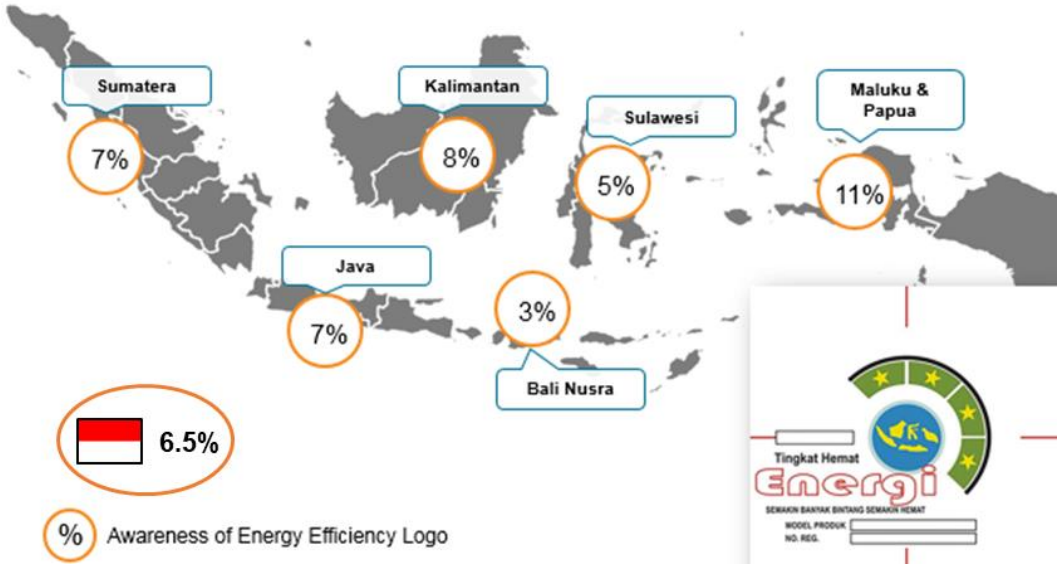
Sebagian besar rumah tangga memiliki TV, menjadikannya peralatan keempat yang paling banyak mengonsumsi listrik secara nasional. Hampir 60% dari semua TV yang digunakan adalah TV tabung katoda, namun sebagian besar merupakan TV lama atau TV yang dibeli bekas, karena berdasarkan data Euromonitor, penjualan TV tabung baru di Indonesia telah dihentikan sejak akhir tahun 2016.

Kompor gas LPG telah diidentifikasi sebagai peralatan non elektrik yang mengkonsumsi energi tertinggi, yang digunakan di 77% rumah tangga dan mengkonsumsi 36,7 juta barel setara minyak (BOE) atau kurang lebih 60,000 GWh[18] pada tahun 2019, lebih dari peralatan listrik lainnya. Dalam penggunaan energi yang setara, dua sumber bahan bakar masak dominan yang digunakan di sektor residensial adalah LPG (80%) dan biomassa (15%). Meskipun semua rumah tangga dengan akses listrik memiliki penerangan, lampu minyak tanah masih digunakan di 2% rumah tangga.

Survei ini juga menanyakan pertimbangan konsumen ketika membeli peralatan. Penghematan energi disebutkan sebagai prioritas utama konsumen dalam pembelian sebagian besar peralatan rumah tangga baru. Karena keberadaan label energi masih terbatas untuk peralatan rumah tangga yang umum, sebagian besar konsumen menggunakan peringkat daya yang tercantum pada papan nama produk sebagai acuan atau meminta petunjuk dari penjual untuk memahami dampak konsumsi energi.

Label energi saat ini hanya diwajibkan untuk dua produk, lampu fluorescent kompak (*CFL*) dan AC. Program pelabelan energi KESDM yang dirilis pada tahun 2014 untuk *CFL* dan 2018 untuk AC masih belum dikenali dengan baik, karena survei mengungkapkan hanya 6,5% yang mengenali label energi secara nasional. Meskipun demikian, 88% dari 6,5% tersebut dapat memahami label dengan benar sebagai "semakin banyak bintang, semakin efisien energi."

[18] Dengan assumsi 0.6130 MWh per barel setara minyak (BOE). MEMR, “Handbook of Energy & Economic Statistics of Indonesia”, 2018, p. 129.



Gambar 10: Tingkat kesadaran terhadap program pelabelan energi di pulau-pulau besar di Indonesia

Temuan dari survei ini menunjukkan bahwa program pelabelan energi yang diperluas dan dipromosikan dengan baik dapat memberikan dampak penghematan energi yang besar, mengingat tingkat kepekaan konsumen dan pengambilan keputusan yang berdasarkan efisiensi energi (dari presepsi) dalam pembelian peralatan baru. Dengan adanya fondasi dari program label yang sudah terlaksana untuk penerangan dan pendingin udara, program standar dan pelabelan harus diperluas untuk mempromosikan teknologi paling efisien untuk peralatan rumah tangga dengan konsumsi energi tertinggi.

Peningkatan konservatif sebesar 15% dalam efisiensi energi terhadap peralatan elektrik, yang dapat tercapai dari program standar dan pelabelan diestimasi untuk dapat mengurangi konsumsi energi nasional sebesar 10.000 GWh per tahunnya. Selain itu, optimisasi efisiensi kompor gas LPG dapat memajukan pergeseran menuju distribusi bahan bakar memasak yang lebih bermanfaat untuk mitigasi emisi nasional dan penghematan konsumen.

Approach and Methodology

1 Background and Introduction

Indonesia is home to over 265 million people.[19] It is the fourth most populous country in the world and its rapidly expanding economy is the largest in Southeast Asia. GDP per capita has risen by 70% during the past two decades. Although the end of the commodity price boom has weighed on the national incomes and the government revenues, GDP has continued to grow at around 5% per year, while per capita income has grown at almost 4% per year.[20]

The manufacturing sector has played an important role in the country's development and it is positioned as the engine of economic growth for the national economy.[21] Home appliances segment in particular has benefited from the investments made by multinational corporations such as LG, Sharp, and Panasonic.

According to the Ministry of Trade, Indonesia was home to 235 companies in electronics and home appliance manufacturing business (including component makers) in 2014.[22] The country has one of the strongest manufacturing sectors in the world, accounting for 20.5% of GDP in 2018.[23] The Asian Development Bank expects Indonesia's GDP growth rate to average around 6% between 2020 and 2024 due to its growing manufacturing sector.[24]

The historical trends of electricity consumption in residential, commercial, public, and industrial sectors are illustrated in Figure 11. Residential electricity consumption grew from 49,790 GWh in 2008 to almost double in 2016 at 95,329 GWh. As illustrated in Figure 12, this number is projected to double again over the next decade, rising to 183,600 GWh in 2027.

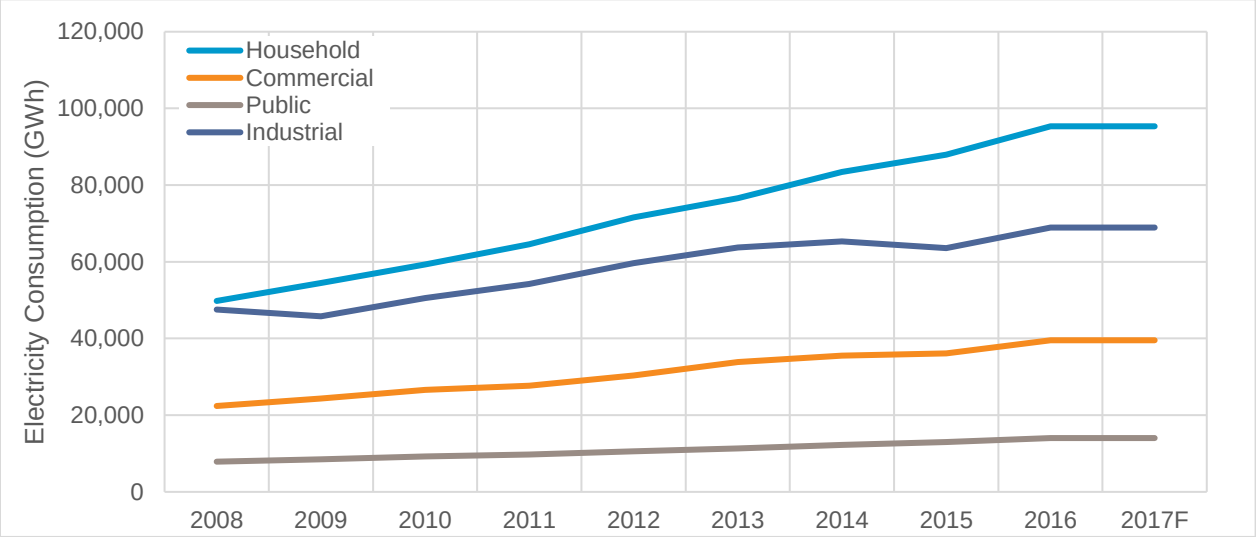


Figure 11: Indonesia national electricity consumption sectoral outlook from 2008 to 2017[25]

[19] Ministry of Energy and Mineral Resources, Republic of Indonesia, Handbook of Energy & Economic Statistics of Indonesia, 2018
[20] Indonesia Economic Snapshot. http://www.oecd.org/economy/indonesia-economic-snapshot/
[21] The Jakarta Post, Business; https://www.thejakartapost.com/news/2019/02/11/manufacturing-sector-to-drive-indonesias-economy-bappenas.html (accessed on 22 May 2019)
[22] Global Business Guide, Indonesia; http://www.gbgindonesia.com/en/manufacturing/article/2015/electronics_and_home_appliances_manufacturing_in_indonesia_finding_its_edge_11128.php (accessed on 22 May 2019)
[23] The Jakarta Post, Business; https://www.thejakartapost.com/news/2018/12/31/manufacturing-sectors-contribution-to-gdp-above-world-average-minister.html (accessed on 22 May 2019)
[24] The Jakarta Post, https://www.thejakartapost.com/news/2019/02/11/manufacturing-sector-to-drive-indonesias-economy-bappenas.html (accessed on 22 May 2019)
[25] PLN, Electricity Supply Business Plan (Rencana Usaha Penyediaan Tenaga Listrik (RUPTL)", 2018. https://www.pln.co.id/statics/uploads/2018/04/RUPTL-PLN-2018-2027.pdf

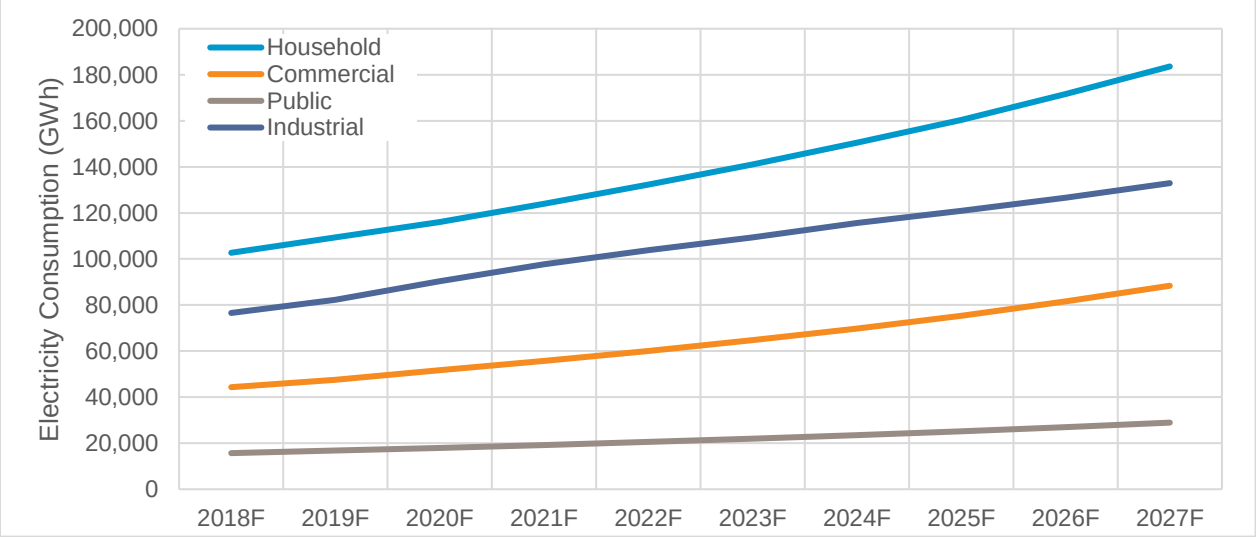


Figure 12: Projection of Indonesia national electricity consumption from 2018 to 2027[26]

Electricity is the main form of energy used in the residential sector, contributing 63.2% of final energy consumption. It is followed by natural gas (36.4%), kerosene (0.4%), and bioenergy (biomass) (0.3%). As seen in Figure 13, the ratio of electricity consumption is projected to increase to 70.2% in 2025 and 84.0% in 2050.[27]

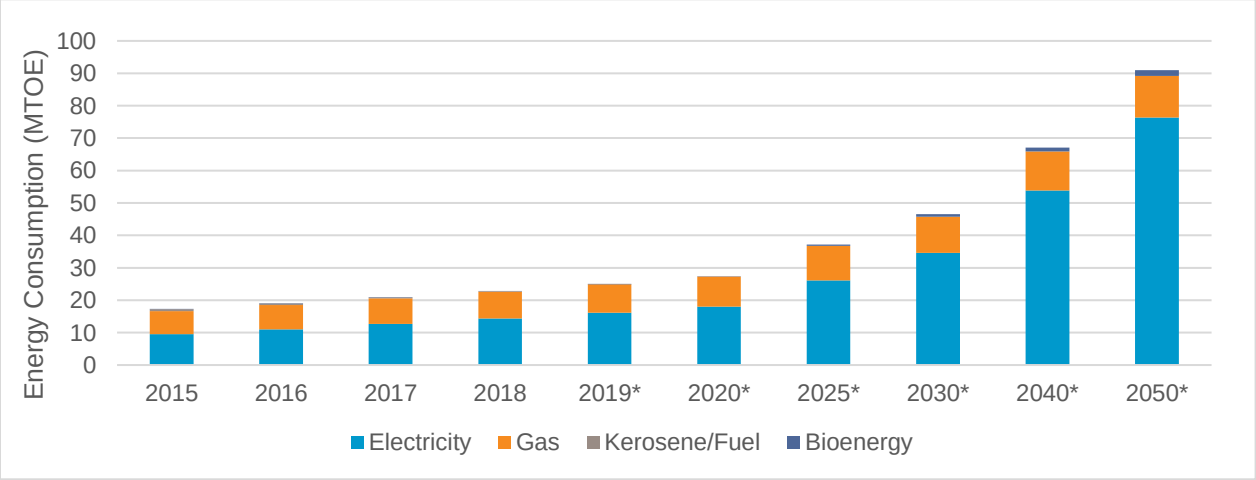


Figure 13: Household energy consumption forecast modeling, from 2015 to 2050 (RUEN, 2017)

Such significant growth is accompanied by significant greenhouse gas (GHG) emissions. Indonesia is currently the world's fifth largest GHG emitter, and 13th for emissions from energy use.[3] Indonesia's success in achieving its national climate pledges will be critical to keeping the planet's temperature rise below the 2°C (3.6°F) threshold, that was called for in the Paris Agreement.

Per the Nationally Determined Contributions (NDCs) of Indonesia, energy efficiency is one of the key measures to reduce GHG emissions from the energy sector. In its NDC, Indonesia committed to reducing

[26] PLN 2018. https://www.pln.co.id/statics/uploads/2018/04/RUPTL-PLN-2018-2027.pdf
[27] President of Indonesia, "National Energy General Plan (Rencana Umum Energi Nasional/ RUEN)", 2017.

GHG emissions by 29% below a business-as-usual (BAU) baseline by 2030, or 38% below BAU with international support.[28]

Figure 14 illustrates the projected share of energy sources used in electricity generation from 2018 to 2027. Coal is the main fuel in electricity generation, responsible for 58% of primary energy consumed, followed by natural gas (27%), renewables (hydro, geothermal, solar, and wind; 8%) and oil (6%).[29] As shown, coal is expected to remain as the country's primary fuel source for the next decade.

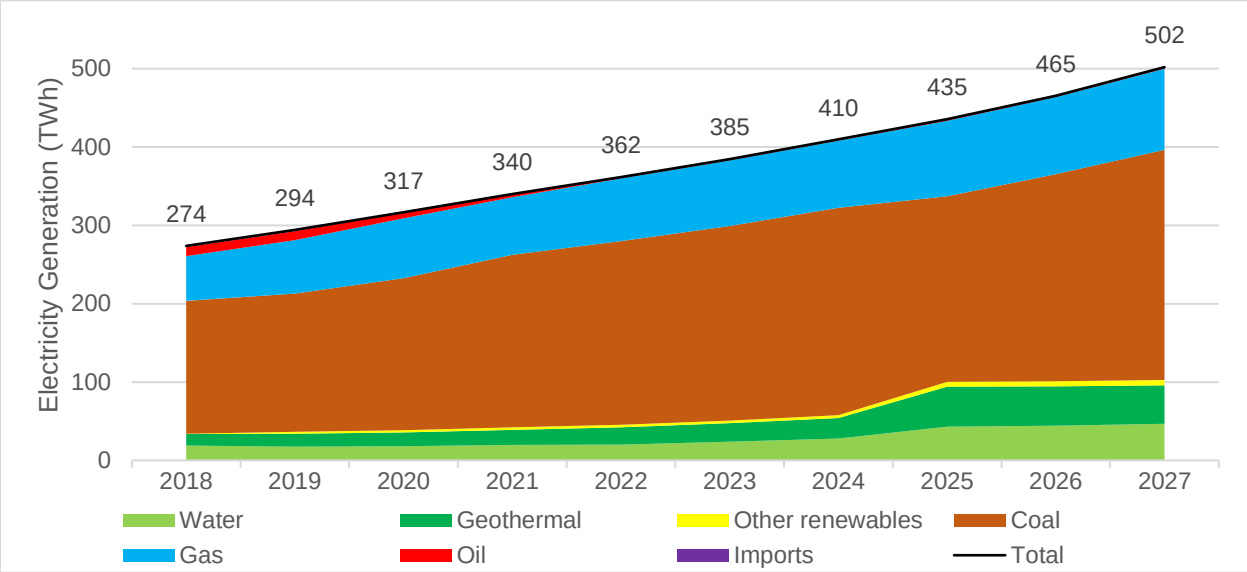


Figure 14: Projected national distribution of fuel sources used in electricity generation[30]

To achieve the reduction targets and mitigate the growing greenhouse gas emissions, EBTKE under MEMR is implementing policies targeted at both energy supply and demand, including the efficiency of household products.

Relevant regulations issued by MEMR to achieve energy conservation targets include;

- MEMR Ministerial Regulation No. 13 Year 2012 regarding Electricity Savings[31]
    - The regulation is advisory in nature and only targets government properties and high-level officials.
    - It aims for 20% lower energy consumption compared the average of 6 months electricity usage.
    - Government officials are asked to report their progress semi-annually.
    - The regulation also suggests actionable improvement on technical level, for example, temperature setting in Air Conditioner to be set to 24°C to 27°C; and the use of lighting with the lowest 250 lux and 7 W/m^2 for living room, toilets, and kitchen. However, this regulation doesn't mention any punishment/enforcing value even if the officials fail to comply.

[28] Government of Indonesia, First Nationally Determined Contribution Republic of Indonesia, November 2016, p.10.
[29] Statistics Report 2018. PLN. https://www.pln.co.id/stakeholder/laporan-statistik
[30] RUPTL-PLN 2018. https://www.pln.co.id/statics/uploads/2018/04/RUPTL-PLN-2018-2027.pdf
[31] Peraturan Menteri Energi dan Sumber Daya Mineral Republik Indonesia Nomor 13 Tahun 2012 tentang Penghematan Pemakaian Tenaga Listrik

- Regulation of Ministry of Energy and Mineral Resources No. 18 Year 2014 regarding of Energy Saving Labelling for Lighting[32]
    - This regulation enforces the energy-saving label for any business entities that market their Lighting products in Indonesia.
    - Any Lighting product which is traded in Indonesia is required to be certified.
    - The label is based on the efficacy value in the unit of lumen/W.
- Regulation of Ministry of Energy and Mineral Resources No. 57 Year 2017 regarding Implementation of Minimum Energy Performance and Energy Saving Label for Air Conditioner[33]
    - Similar to Regulation No. 18 Year 2014 regarding Energy Saving Labelling for Lighting, this regulation also enforces any Air Conditioner product which is traded in Indonesia to be certified.

According to Point 6 in the Presidential Regulation No. 22 of 2017 about General Planning of National Energy (*Rencana Umum Energi Negara*, (RUEN)), reliable data is needed as basis for policy analysis. The data should include detailed and comprehensive information on appliances ownership and usage in Indonesia. Currently, limited or non-existent data on the appliances market makes it challenging for MEMR to estimate the CO_2 reduction potential of household products, to be used as the basis for product selection for new MEPS levels and compliance efforts.

As the leading international voice and resource for appliance efficiency policies and market acceleration initiatives CLASP, together with its Indonesian partner Ipsos, conducted a one-of-its-kind survey on household appliances in Indonesia. This extensive survey will provide the necessary insights on appliances ownership and usage at the household level, providing a reliable and robust dataset that can be used to support appropriate regulations that maximize energy and CO_2 reductions and savings for household consumers, manufacturers, and the nation.

The first portion of the survey report is dedicated to the methodology applied in the survey. The second portion focuses on the survey findings and the outcome of the analysis performed based on the survey data.

Approach and Methodology:

- **Section 1** provides an introduction to the survey, the background, and the objectives;
- **Section 2** explains the approach and the methodology applied in the survey, classified into four main tasks; preparation, data collection, data processing, and secondary research supplement;

Findings and Analysis:

- **Section 3** presents an overview and additional insights on the household respondents that participated in the survey;
- **Section 4** summarizes the main findings from the survey, including penetration rate, appliance-specific information, and usage frequency and trends;
- **Section 5** describes the current state of public awareness regarding energy efficiency;
- **Section 6** presents the results of the energy consumption analysis;
- **Section 7** contains the recommendations and conclusion.

[32] Peraturan Menteri ESDM No. 18 Tahun 2014 Tentang Pembubuhan Label Tanda Hemat Energi Untuk Lampu Hemat Energi
[33] Peraturan Menteri Energi dan Sumber Daya Mineral Nomor 57 Tahun 2017 Tentang Penerapan Standar Kinerja Energi Minimum dan Pencantuman Label Tanda Hemat Energi Untuk Peranti Pengkondisi Udara

2 Survey Methodology

This survey covers 34 provinces of Indonesia and aims to capture insights in appliance energy use in over 65 million households across Indonesia. The survey covers both the urban and rural population and includes all household appliances, starting from high wattage appliances, such as AC, rice cooker, and refrigerator, relatively lower wattage appliances such as lighting, television, fans, and others, to the other most commonly used non-electrical appliances.

The methodology applied in this survey consisted of 4 stages (a timeline is included in Appendix A);

1. Preparation
2. Data collection
3. Data processing
4. Analysis

In the preparation stage, Ipsos defined the sampling methodology, followed by instrument design, resource allocation, and tools and training. At the completion of this stage, Ipsos started the data collection process in the form of in-person interviews. After the data collection was complete, IPSOS conducted data processing through sequential steps of data cleaning, data projection to the national population, and data tabulation in Excel. As a final step, CLASP and Ipsos conducted analysis to estimate national energy consumption of each appliance and draw other insights.

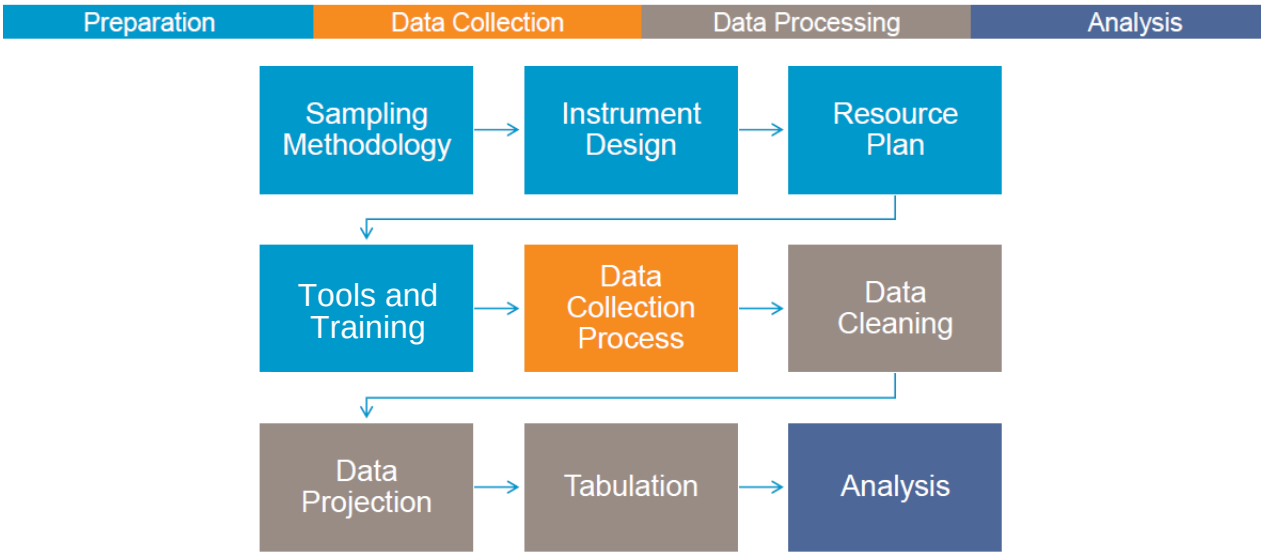


Figure 15: General overview of the survey methodology

Task 1: Preparation

Sampling Methodology

The objective of this survey is to understand the prevalence, types, and usage of household appliances in Indonesia to understand their impact on residential energy consumption. Initially, 5,000 samples were allocated to represent all households with access to electricity in Indonesia. Referring to the most recent national Intercensal Population Survey (*Survei Penduduk Antar Sensus,* SUPAS) from 2015 conducted by the Central Bureau of Statistics (*Badan Pusat Statistik*, BPS),[34] the total number of households with access to electricity in Indonesia is 65,235,368 across all provinces. Within this total count, 35,302,343 households are located in urban areas and 29,933,025 in rural areas.

This survey has a Margin of Error (MoE) of 1.4% with 95% Confidence Interval (CI). MoE specifies by how many percentage points the survey results differ from the real population value. Meanwhile, CI represents how likely the survey result is to fall within the MoE range.[35] In this survey, the value of MoE is primarily used as a design parameter in determining the extent of statistical precision or the expected error of the results obtained from the sample, with the goal of minimizing it as feasible.

The higher the number of samples, the smaller the value of MoE, the closer the sample is expected to represent the actual distribution of the population.[36]

With an infinitely large population (n), a simple MoE calculation formula can be used:

$$MoE_{95} = z_{0.95}\sqrt{\frac{\sigma_P^2}{n}}$$

Where *n* is the number of samples defined for the survey, σ^2_P is the square of the standard error with a maximum value of 0.25, and $z_{0.95}$ is the standardized z-score at 95% confidence level which is 1.959963984540 or 1.96.[37] As illustrated in Figure 16, the value of MoE falls dramatically between 100 and 1,000 samples.

[34] BPS Supas 2015. https://www.bps.go.id/publication/2016/11/30/63daa471092bb2cb7c1fada6/profil-penduduk-indonesia-hasil-supas-2015.html
[35] Margin of Error/ Credibility Interval, AAPOR, https://www.aapor.org/Education-Resources/Election-Polling-Resources/Margin-of-Sampling-Error-Credibility-Interval.aspx
[36] Memahami Margin of Error dan Metode Sampling Pada Survey, https://tirto.id/memahami-margin-of-error-dan-metode-sampling-pada-survei-cmWe
[37] Margin of Error, Wikipedia, https://en.wikipedia.org/wiki/Margin_of_error

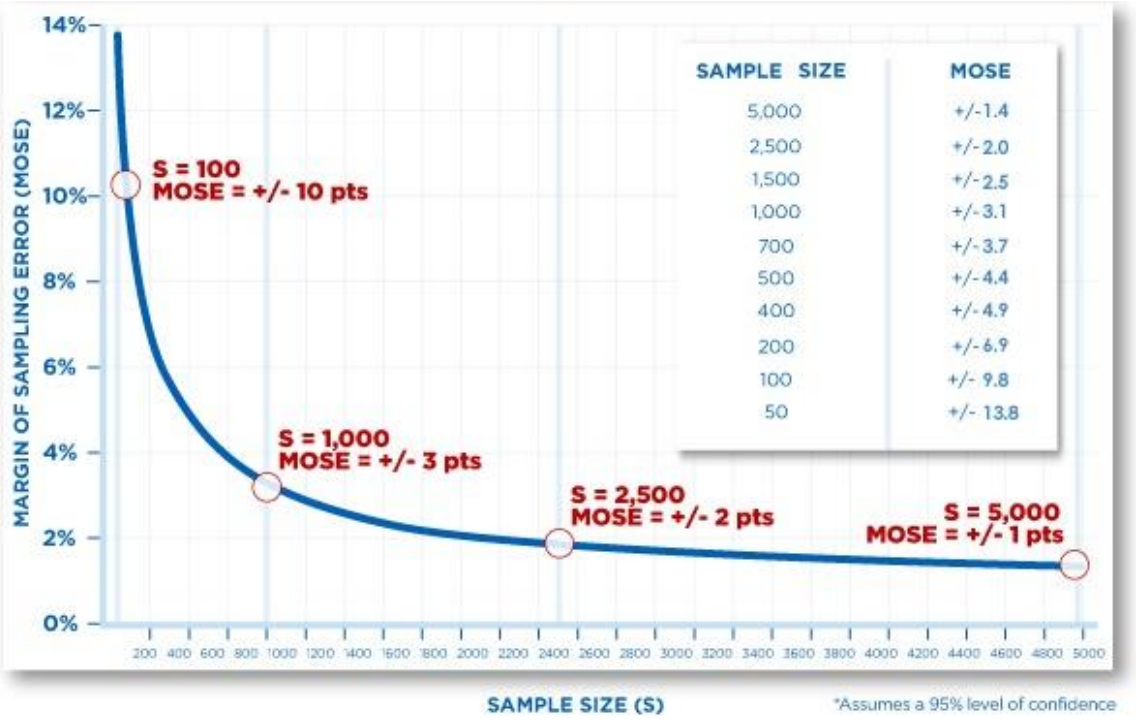


Figure 16: Margin of sampling error (MOSE) correlation with sample size[38] (AAPOR)

Doubling of the sample size from 1,000 to 2,500, and subsequently to 5,000, has less significant impact on error reduction, as MoE is reduced by a single percentage point. With above calculation, doubling the sample from 5,000 to 10,000 only will reduce the MoE by 0.4 percentage point, while doubling the cost and time to execute the survey.

Therefore, 5,000 sample size was selected as the initial target of this survey to obtain best possible results in timely and cost-efficient manner. The calculated value of MoE for a sample of 5,000 is 1.386% or 1.4 percentage points.

$$MoE_{95} = 1.96\sqrt{\frac{0.25}{5000}}$$

Ipsos surveyed additional households, increasing the final sample size to 5,443, so the final MoE of the survey is 1.328% or 1.3 percentage point at the national level. Additional information on the sampling is included in Appendix B.

[38] Margin of Error/ Credibility Interval, AAPOR, https://www.aapor.org/Education-Resources/Election-Polling-Resources/Margin-of-Sampling-Error-Credibility-Interval.aspx

Instrument Design

A questionnaire was developed by Ipsos as the survey instrument. CLASP and EBTKE provided feedback throughout the design process to make sure all essential information was captured.

Key information covered in the questionnaire include appliance ownership, number of appliances used in the household, appliances specifications including wattage, type, technology, and capacity, and lastly time and duration of usage. Additional information was also added in the questionnaire to capture other factors that affect electric appliance usage and purchasing.

Table 5. Key information in survey instrument and purpose of inclusion

Key information	Purpose of inclusion
Ownership of appliances	Measure stock available in the market
Specification (especially wattage)	Measure energy consumption
Time of usage	Determine hourly peak usage
Duration of usage	Measure energy consumption

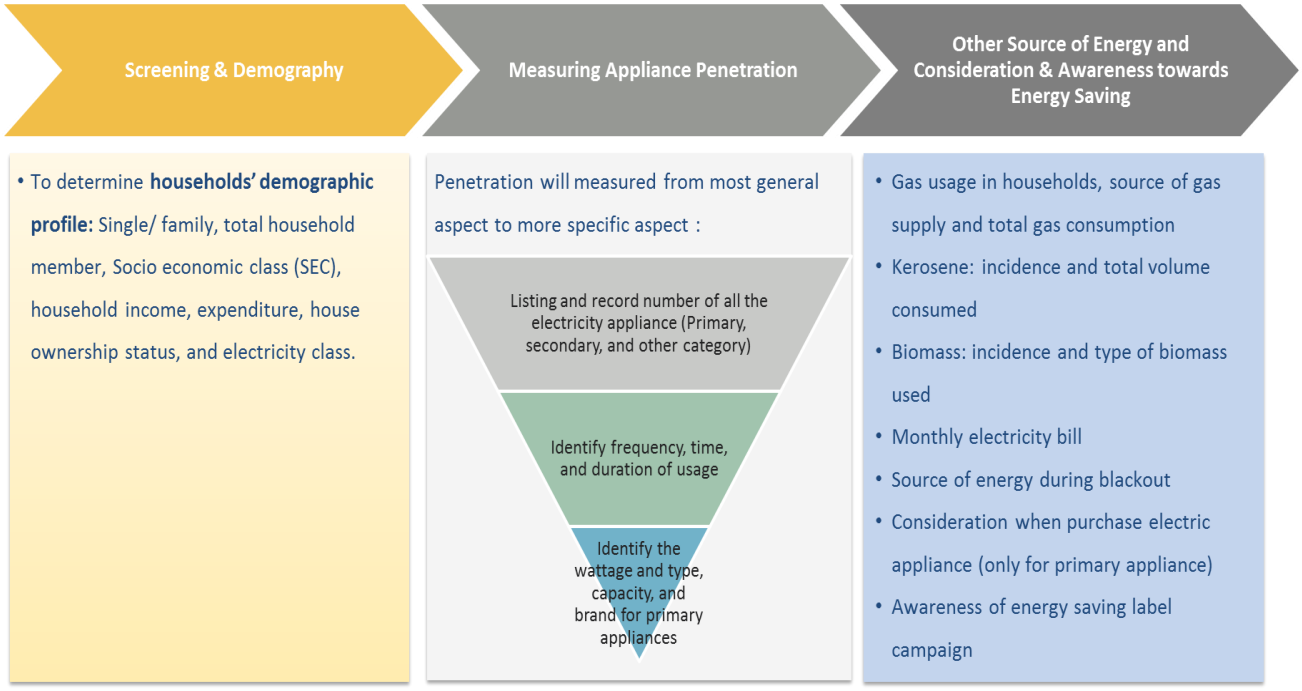


Figure 17: Interview flow defined for the survey instrument

This survey covers all energy-consuming appliances used in households. To maintain acceptable length of interview, the instrument only asked detailed questions for primary appliances. Primary appliances were expected to have high incidence, high wattage, or high usage. The full survey instrument is included in Appendix C.

Table 6. List of electric appliances covered in the survey.

Appliances Covered	
PRIMARY APPLIANCE Lighting Refrigerator Air conditioner Television Electric fan Rice cooker/warmer **SECONDARY APPLIANCE** Electric Iron Vacuum cleaner Washing machine Dispenser Electric water heater **COOKING/ HH APPLIANCE** Water pump Microwave Electric oven Cooktop Blender Juicer Toaster Mixer Kitchen exhaust **CLEANING APPLIANCE** Dishwasher machine **BEAUTY APPLIANCE** Hair iron Hair dryer	**OFFICE/ SCHOOL APPLIANCE** Desk lamp Personal computer (PC) Laptop Printer **ENTERTAINMENT** Set Top Box Speaker DVD/ VCD Player Radio Compo/ mini compo (audio system) Wifi router **COMMUNICATION APPLIANCE** Tablet Cell phone Phone (Home) **OTHER APPLIANCES** Decorative water pump/ Outdoor water feature Aquarium water pump circulation Electric bike Segway **OTHER ENERGY APPLIANCES** Gas stove Kerosene stove Traditional (biomass) stove LPG water heater Kerosene lamp ***And other electrical appliances that are available in the household but not mentioned above***

Respondent & House Selection

To obtain targeted information, the survey team made sure to interview the key person in the household familiar with appliance usage. The team used the following criteria to screen the respondent;

- Member of household,
- Age between 18 to 60 years old,
- Aware of daily usage of household appliance in their house, and
- Aware of the average monthly electrical bill in their house.

During the interview, a respondent in a household might not recall all information of appliance purchase, usage behavior, and electricity bill. Some appliances may only be used by certain household member(s). Each household member may also have different roles regarding electricity use and appliance purchase decisions. For instance, one member is in charge of the electricity bill, while another is the decision maker for the purchase.

To avoid the lack of knowledge from one respondent and maintain the level of answer quality, multiple respondents might be involved in the interview. This ensures that all collected data is provided by household members that are well aware of electricity and appliances use. Interviewers were also instructed to take pictures of household appliances for validation, since it might not be possible for a respondent to recall all appliance characteristics.

Ipsos further screened houses using the following criteria to minimize bias in the data projection stage from unique houses (each respondent represented on average 10,798 households in the area):

- The dwelling unit should not be used for business activity, for instance: workshop, salon, laundry, minimarket, juice center, restaurant, etc.
- Only one electricity customer identification should be assigned to surveyed dwelling unit, in order to accurately account for electricity usage of the household.
- Dwelling units that are rented or leased to other households, but the electric bills are routed to a single common account should not participate in the survey due to unaccounted electricity usage.

Respondents were selected based on random sampling method. Interviewers were guided by Ipsos statistics team, to correctly define respondents based on primary sampling unit (PSU) selection. Ipsos statistics team randomly selected each PSU through a systematic method.

After selecting the PSU down to the village division level, which is the lowest administrative division in Indonesia, or *Rukun Tetangga* (RT), interviewer asked permission from the RT leader and started the interview from the first house located to the left of RT leader. The households were selected with a 4- to 6-household interval depending on density of the neighborhood. After data was collected from the first household, the interviewer skipped 4 to 6 houses to find the second household.

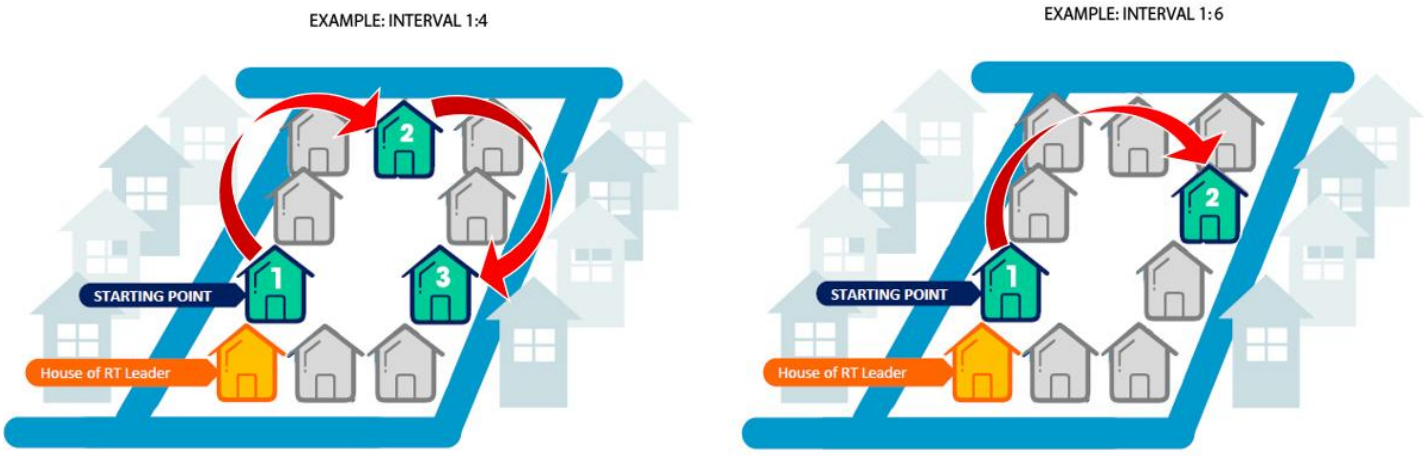


Figure 18: Example of household sample selection pattern

The steps used in defining the PSU and houses to sample, are summarized below:

- **Step 1**: Ipsos conducted a search in the database of the targeted city or *Kabupaten* to draw Primary Sampling Unit. Random sampling process is done at every level of coverage, including *Kecamatan, Kelurahan, Rukun Warga (RW), RT,* ranked from highest to lowest administrative division.
- **Step 2**: Random sampling was conducted to assign RW and RT as the survey samples.
- **Step 3**: From the database, Ipsos randomly selected the RT and sought to interview 5 eligible households, spaced 4 to 6 houses apart based on the neighborhood density.
- **Step 4**: Within the RT, interviewer visited the houses according to the defined interval.
- **Step 5**: When the interviewer found the selected house, the interviewer identified the eligible respondent based on the previously listed criteria.

Perusahaan Listrik Negara (PLN) is Indonesia's state-owned electricity distributor which exclusively manages all aspects of electricity generation, utilization, and distribution in the country. PLN defines household or residential consumers in 7 electricity classes based on the applied rate (subsidized, partially subsidized, non-subsidized) and the maximum power supply capacity (R-1, 2200 VA and below; R-2, 3500 to 5500 VA; R-3, 6600 VA and above).

The primary limitation of the applied random sampling described above, is that it leads to fewer representative data from households classified as R-2 and R-3. Only 2.2% of residential PLN customers were categorized as R-2 and R-3 in 2019, with the remainder classified as R-1. Therefore, the resulting projected sample distribution was dominated by households categorized as R-1.

To gain information from R-2 and R-3 electricity classes, Ipsos collected an additional booster sample of up to 30 households. Due to the low incidence of R-2 and R-3 households acquired from the random sampling, the data booster was instead collected from purposive sampling. Interviewers were instructed to collect data specifically from R-2 and R-3 households and conducted the interview without applying the previous method of PSU selection and interval sampling.

Survey Pre-Testing

After developing the survey instrument, Ipsos conducted pre-testing interviews to evaluate data collection in a realistic setting. These pilot interviews were designed to collect information on how to further refine and optimize the survey instrument. After the pilot interviews, CLASP, EBTKE, and Ipsos conducted a discussion to finalize the survey instrument and make sure that the questionnaire would comprehensively cover all the target information.

The pre-testing was conducted in Central Jakarta. The households involved had power supply capacity of 2200 VA. Ipsos found 16 types of electric appliances across the households (in descending order of ownership): lighting, cellphones, electric fan, television, refrigerator, air conditioner, electric iron, washing machine, rice cooker, water pump, blender, mixer, laptop, printer, DVD player, and hair dryer.

Ipsos received positive feedback. Participants stated that the questionnaire was easy to understand, and they demonstrated willingness to remain engaged throughout the duration of the interview. One piece of negative feedback related to lighting, the most common appliance. The respondents were not able to correctly identify the type of lighting. Additionally, there were difficulties in identifying the wattage of cell phone chargers and laptops.

In general, respondents were only able to recall 50% of wattage information of their appliances, and interviewers had to ask for permission to physically check the nameplate wattage.


Figure 19: Pre-testing interview process

To overcome the problem, Ipsos provided help cards as a visual guide to help the respondents identify different types of appliances. These help cards are provided in Appendix D. In addition, Ipsos also provided additional questions that could be used as help parameters in identifying the wattage. For instance, Ipsos added questions to identify size and type of television. These additional data could be used to narrow down the wattage range of the reported television unit.

Another finding that surfaced during pre-testing was that some appliances that are owned by one family are used by multiple families that reside in one household. This observation was found for electric iron, washing machine, and refrigerator.

Resource Plan

Resources for this residential end-use survey were allocated to meet Ipsos standard of data quality control. Ipsos specified the ratio of coordinators to interviewers not to exceed 1:20. In addition, each interviewer was only allowed to conduct up to 25 interviews. Therefore, the number of coordinators assigned to each area was based on coverage and the number of target respondents. To cover these requirements, 21 area coordinators were selected to supervise 287 interviewers, as shown in Table 7.

Table 7. Fieldwork resource allocation

No.	Province	Target Samples	Area Coordinator	Number of Interviewers
1	Aceh	90		5
2	Sumatra Utara	240	1	15
3	Sumatra Barat	90		5
4	Riau	110		8
5	Kepulauan Riau	50	1	4
6	Jambi	60		4
7	Sumatra Selatan	140		10
8	Bengkulu	50	1	4
9	Lampung	150		10
10	Kepulauan Bangka Belitung	50		4
11	DKI Jakarta	190	1	10
12	Jawa Barat	910	2	40
13	Jawa Tengah	660	2	30
14	DI Yogyakarta	80	1	8
15	Jawa Timur	780	2	30

No.	Province	Target Samples	Area Coordinator	Number of Interviewers
16	Banten	210	1	10
17	Bali	80	1	5
18	Nusa Tenggara Barat	100	1	8
19	Nusa Tenggara Timur	60		6
20	Kalimantan Utara	50	1	4
21	Kalimantan Timur	60		5
22	Kalimantan Barat	70	1	7
23	Kalimantan Tengah	50		4
24	Kalimantan Selatan	80		5
25	Sulawesi Utara	50	1	4
26	Gorontalo	50		4
27	Sulawesi Tengah	50	1	4
28	Sulawesi Barat	50		4
29	Sulawesi Selatan	140	1	10
30	Sulawesi Tenggara	50		4
31	Maluku	50	1	4
32	Maluku Utara	50		4
33	Papua Barat	50	1	4
34	Papua	50		4
	TOTAL	**5,000**	**21**	**287**

Tools and Training

This survey was designed to collect 5,000 responses across 34 provinces in Indonesia. To accommodate this need, the survey used Computer Assisted Personalized interview (CAPI). Ipsos iField was used as the CAPI platform. There are several benefits in using Ipsos iField. The platform allows the survey to be conducted online and offline, so there is no dependence on a network connection. Survey results can be uploaded when internet access becomes available, so the data can be accessed instantaneously as soon as it is uploaded by the interviewer. This is advantageous as some of the interviews might take place in remote areas where there is limited access to an internet connection. Lastly, there was no need for manual data entry which helps to minimize errors.

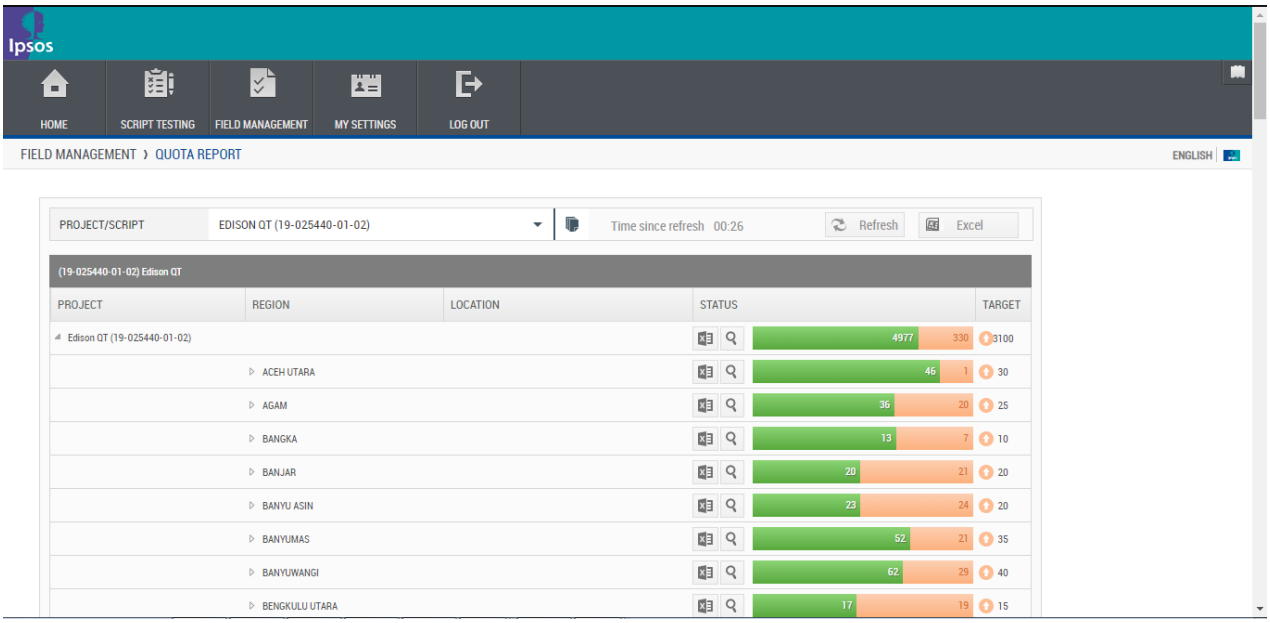


Figure 20. Real-Time Quota Report

There are 5 key features available through Ipsos iField for fieldwork management:

1. Geolocation: GPS tracking identifies the location of the interviewer when internet access is available.
2. Passive Voice Recording: Passive voice recording allows responses to be recorded at selected, pre-determined points. The interviewer does not know when the recording is activated.
3. Complete Visibility: Fieldwork managers can monitor progress of each interviewer by sample point; for instance, through GPS location and timestamp.
4. Interviewer Management: Ipsos iField incorporates an interviewer management system that stores each interviewer's details, experience, skills, and performance score, so Ipsos can select competent interviewers for this survey.
5. Interviewer Engagement: With iField, interviewers can track and manage their assignments. They can view their achieved quota and focus on filling the gaps. In-built skip patterns and logic checks allow them to focus on keeping the respondents engaged.

Barriers in a CAPI survey usually appear when interviews have to be done in an area with limited internet access. iField allows the interview to be done in offline mode, by saving the data in the tablet until the device has internet access to upload.

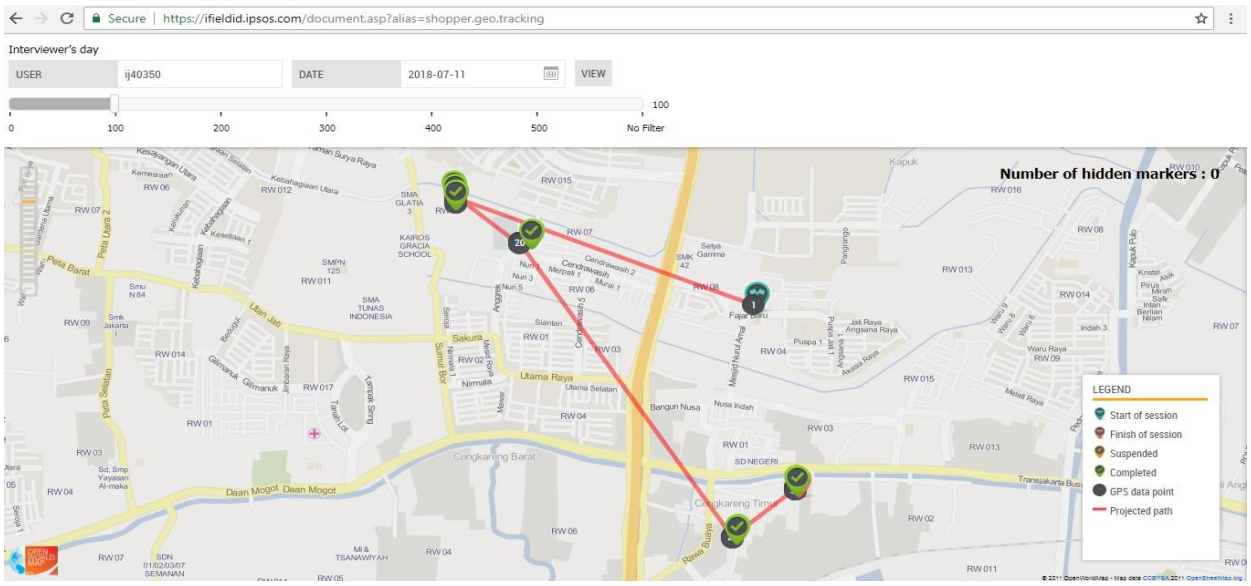


Figure 21: GPS location of surveyed households

After finalizing the instrument and the program in CAPI devices, systematic preparation was conducted to make sure the whole team had good knowledge about the survey. Detailed information and instructions about the instrument were passed on to the interviewer team through a centralized briefing in Jakarta. All interviewers of Greater Jakarta and all area coordinators attended this briefing. The area coordinators in turn were responsible for conducting a similar briefing with each interviewer in their area.

Ipsos also considered the possibility that interviewers outside Jakarta who did not have a chance to attend the centralized briefing in person, would have a different understanding for certain parts of the questionnaire. As a mitigation, Ipsos researchers made sure that all area coordinators receive a high level of understanding about the instrument by conducting role-play interview with all area coordinators. In addition, Ipsos researchers visited several areas during early data collection process and audited the interview process in selected areas to make sure the information was indeed gathered using the standard data collection method.

Task 2: Data Collection

Data Collection

To gather information from all household types, Ipsos made sure that every selected house that was eligible and willing to participate was interviewed. If the selected house was closed, while according to the RT leader, there are people living in the house, the interviewer revisited the house until they met the respondent and interviewed them if allowed.

Figure 22: Interview process and site visit

One barrier was identified in the data collection process for apartments. Due to the enforced security and scheduling conflicts, difficulties were expected in interviews with households residing in apartments. However, vertical living arrangement is only prominent in Jakarta and Surabaya, approximately at a share of less than 3% of the national household count. Population of households residing in apartment units in Jakarta is less than 10% of total households with access to electricity. In Surabaya, the share is lower, at less than 1% of the total household population in East Java. To cover vertical households, samples were allocated for Jakarta and Surabaya only.

Table 8. Sample allocation for apartment households

City	Total Sample	Allocation Sample for Apartment
Jakarta	160	20
Surabaya	80	10
TOTAL		**30**

Another key issue that usually appears in consumer research is factuality. It is caused by answers that come from claim-based data and will impact the accuracy of the data. To check how far the respondent's claim is from their actual behavior, subsamples of 100 households were collected. These households were asked to record their usage behavior in a diary after the main interview was finished. The error between the

claimed data and the recorded diary was used as a reference to measure how far the claimed answers deviate from the actual condition. Diaries were distributed in 6 big cities in Indonesia.

Table 9. Sample allocation for diary

City	Total Sample	Allocation Sample for Diary
Jakarta	160	20
Bandung	150	20
Semarang	80	15
Surabaya	80	15
Medan	70	15
Makassar	60	15
TOTAL	**600**	**100 (17% out of the total sample)**

These 100 households were derived from existing households interviewed in the main survey. With the same information on ownership and number of appliances used in the household, the diaries allowed Ipsos and CLASP to validate the hourly time usage of each appliance. The objective is to compare the actual energy consumption derived by claim and by diary recording.

Based on the diaries, it appears that most appliances were used for a shorter duration than claimed during the interviews. ACs, TVs, and electrics iron were recorded as used for approximately 25% less time than claimed; fans, 15% less; and lighting and washing machines, approximately 10% less. Meanwhile, rice cookers were used 60% longer than claimed.

Table 10. Diary result: deviation between claimed usage and diary record of time usage

Type	Total Hours of Use		Deviation of Diary Usage Compared to Claimed
	Claimed	Diary Recorded	
Lighting	8.6	7.8	-9%
Air Conditioner	11.1	8.1	-27%
Electric Fan	10.5	8.9	-15%
TV	9.9	7.4	-25%
Washing Machine	1.5	1.4	-7%
Electric Iron	1.5	1.1	-27%
Rice Cooker	6.8	10.9	**+60%**

Quality Control (QC)

Data quality control was maintained in all three stages of the survey; **pre-survey**, **in-survey**, and **post-survey**. Some information was previously covered in the 'Preparation' Section.

Pre-Survey

In pre-survey, Ipsos maintained data quality by controlling the resource and multiple instrument checking.

- Control ratio between supervisors to interviewer at or below 1:20
- No more than 25 interviews conducted by 1 interviewer

In-Survey

In-survey quality control using picture, random audio recording, raw data checking, and in-person interview evaluation at the early stage of the survey.

- Interviewer took pictures of household appliances for validation and direct type checks using iField. These pictures are recorded for specific respondents
- Voice recording in some parts of the questionnaire using built-in recording from Ipsos iField used for validation
- Regular monitoring of raw data to check for outliers; for example, incomplete interview, patterned answers, lack of answers, etc.
- Each interviewer was accompanied by an area supervisor to audit the interview process. Feedback was then provided to interviewer on any parts that should be improved.

Post-Survey

- QC team did back-check using callback by phone to 30% of total respondent using QC questionnaire checklist previously logged in Ipsos iField. The team verified the responses and reported the result directly to iField system.
- After data collection was finished, the data was rechecked and processed using in-house software, MRDCL.
- QC team also reviewed several data recordings for additional validation.

A respondent who didn't pass the QC checking would be dropped from respondent list. When this occurs, the fieldwork team must replace the dropped respondent with a new respondent. Information covered during callback check includes general questions and some parts of specific questions.

General checks consist of identity (name, address, age, birth date, phone number, and social economic class), screening question (role in household and awareness of electricity usage), and actual interview (if the respondent was interviewed by Ipsos, length of interview, incentive received). Specific questions consist of appliance ownership and specific brands for high priority appliances.

In QC, respondents who didn't have mobile phone or were difficult to reach were visited by the QC teams to enable an alternative form of call-back checks. The teams utilized the provided address in the interviewer report and visited the respondents in-person in their houses.

Task 3: Data Processing

Data Processing

After data collection, Ipsos's data processing team extracted the raw data from the iField platform. All Open-Ended (OE) answers are coded to be combined, so that all responses can be inputted correctly. A systematic data cleaning process ensured all responses followed the instrument guideline an all required questions had been answered. If the data processing team found any blank or unreliable answers, the team informed the field team and requested call-backs to collect answers from the respondents.

Using the weighting projection factor provided by Ipsos statistics team, the raw data was then projected to total household population. The team utilized reference datasets that define demographic areas and their specific urban and rural regions to project the survey samples to the national level. The final excel table can then be generated to be interpreted and analyzed at the national population level.

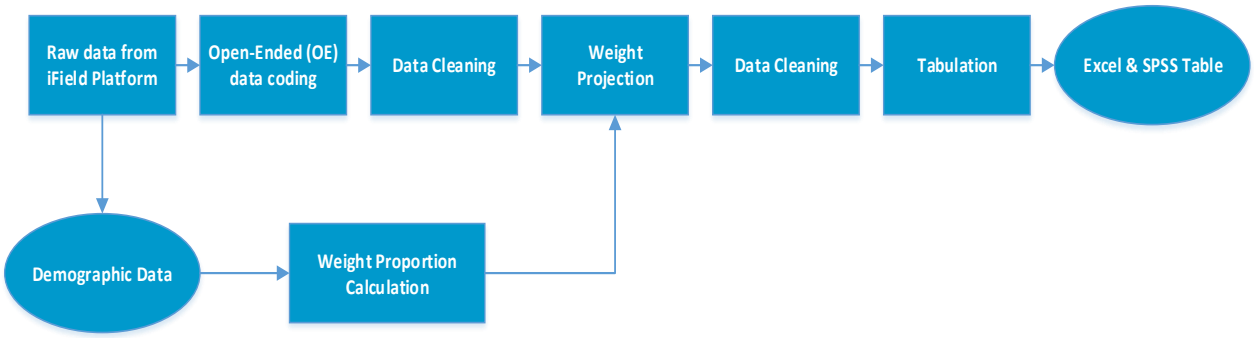


Figure 23: Data processing flow

Data Projection

From the 5,000 target samples, Ipsos team achieved a total of 5,443 respondents across Indonesia. The excess of respondent number is used as the mitigation for possible bad quality respondent data. The ratio of sample to total households in each area varies, depending on the population ratios in each province and region. This ratio is referred to as the Weighting Factor.

The Weighting Factor defined by Ipsos statistics team is used to generate the national-level data, representing 65,235,368 households from the sample. This implies that 1 household will represent the respective total household projected by the assigned Weighting Factor in specific provinces and areas (urban and rural). Urban and rural areas were defined in *Kelurahan* level or subdistrict level based on Registry of Village Potential (*Pendataan Potensi Desa*, PODES) released by BPS for 2018.[39]

Table 11. Weighting factor for each province by urban and rural

	Population			Achievement Samples			Weighting Factor	
Provinsi	**Urban**	**Rural**	**Total**	**Urban**	**Rural**	**Total**	**Urban**	**Rural**
Aceh	363,516	834,547	1,198,063	31	60	91	11,726	13,909
Sumatera Utara	1,726,895	1,527,053	3,253,948	145	122	267	11,910	12,517
Sumatera Barat	538,864	668,962	1,207,826	40	55	95	13,472	12,163
Riau	615,331	891,254	1,506,585	46	78	124	13,377	11,426

[39] Hasil Pendataan Potensi Desa (Podes) 2018 (No. 99/12/Th. XXI, 10 Desember 2018)

	Population			Achievement Samples			Weighting Factor	
Provinsi	**Urban**	**Rural**	**Total**	**Urban**	**Rural**	**Total**	**Urban**	**Rural**
Jambi	262,012	567,067	829,079	20	40	60	13,101	14,177
Sumatera Selatan	689,286	1,263,460	1,952,746	63	95	158	10,941	13,300
Bengkulu	151,452	318,591	470,043	21	44	65	7,212	7,241
Lampung	571,661	1,525,485	2,097,146	44	114	158	12,992	13,381
Kepulauan Bangka Belitung	187,587	169,628	357,215	31	20	51	6,051	8,481
Kepulauan Riau	447,212	76,777	523,989	42	11	53	10,648	6,980
DKI Jakarta	2,672,327	0	2,672,327	216	0	216	12,372	-
Jawa Barat	8,981,491	3,689,573	12,671,064	725	262	987	12,388	14,082
Jawa Tengah	4,404,084	4,803,338	9,207,422	331	357	688	13,305	13,455
DI Yogyakarta	797,871	312,465	1,110,336	64	20	84	12,467	15,623
Jawa Timur	5,435,070	5,407,912	10,842,982	448	477	925	12,132	11,337
Banten	2,040,650	880,769	2,921,419	166	69	235	12,293	12,765
Bali	725,143	372,073	1,097,216	50	30	80	14,503	12,402
Nusa Tenggara Barat	618,281	748,315	1,366,596	42	62	104	14,721	12,070
Nusa Tenggara Timur	237,224	575,312	812,536	25	43	68	9,489	13,379
Kalimantan Barat	360,300	666,914	1,027,214	32	40	72	11,259	16,673
Kalimantan Tengah	240,519	387,156	627,675	20	30	50	12,026	12,905
Kalimantan Selatan	486,751	587,112	1,073,863	43	44	87	11,320	13,343
Kalimantan Timur	574,431	285,375	859,806	41	22	63	14,011	12,972
Kalimantan Utara	70,189	70,730	140,919	30	20	50	2,340	3,537
Sulawesi Utara	300,240	312,578	612,818	25	33	58	12,010	9,472
Sulawesi Tengah	186,370	459,784	646,154	20	30	50	9,319	15,326
Sulawesi Selatan	779,450	1,163,639	1,943,089	61	80	141	12,778	14,545
Sulawesi Tenggara	181,431	349,033	530,464	21	31	52	8,640	11,259
Gorontalo	105,319	155,386	260,705	21	33	54	5,015	4,709
Sulawesi Barat	57,467	216,679	274,146	10	40	50	5,747	5,417
Maluku	144,278	168,796	313,074	21	30	51	6,870	5,627
Maluku Utara	75,280	149,024	224,304	33	17	50	2,281	8,766
Papua Barat	78,429	101,928	180,357	0	54	54	3,340	3,340
Papua	195,932	226,310	422,242	51	1	52	8,120	8,120
TOTAL	**35,302,343**	**29,933,025**	**65,235,368**	**2,979**	**2,464**	**5,443**		

From all 5,443 respondents, Ipsos achieved 11 respondents from the upper two PLN electricity classes (R-2 and R-3). These respondents consist of 7 households for the R-2 group (3500 VA, 4400 VA, 5500 VA) and 4 households for the R-3 group (6600 VA and above). In order to obtain sufficient statistical sample for analysis, booster respondents were added to achieve a target of 30 samples. Unfortunately, the team was only able to obtain a total of 28 respondents.

With this set of data booster for R-2 and R-3 groups, analysis can be done with a total of 39 samples; 11 from random sampling and 28 from purposive sampling. Data booster for R-2 and R-3 were not projected into the national total for which all samples were obtained through random sampling. Separate tabulations and discussions are provided for R-2 and R-3 groups.

Based on the experience of conducting purposive sampling in R-2 and R-3 households, most of PLN customers in these groups utilize their buildings for business purposes, despite being registered as household customers. Out of 144 R-2 and R-3 households contacted, 42% refused to be interviewed, 20% were categorized under two PLN electricity tariff classes, and 22% were using their buildings for business purposes. Only 15%, or 28 households were found eligible as this survey's respondents.

Table 12. Respondents from R-2/R-3 electricity class in main and booster sample

Electricity Class	Main Sample (Random)	Booster Sample (Purposive)	TOTAL
R-2	7	28	35
R-3	4	-	4
TOTAL			**39**

Total respondents from R-2 and R-3 groups represent upper electricity class users residing in larger cities in Indonesia, with highest contribution from Jakarta, Surabaya, and Medan.

Table 13. Area distribution for R-2/R-3 electricity class (main + booster sample)

Area	Share
	Sample Size, 39 households
Jakarta Greater	46%
Kota Surabaya	23%
Kota Medan	10%
Other Cities (Kota *Batam, Kota Tegal, Kab. Situbondo, Kota Denpasar, Kab. Bulungan, Kab. Kolaka, Kab. Bone Bolango, Kab. Manokwari*)	21%
TOTAL	**100%**

Task 4: Secondary Research Supplement

Ipsos collected secondary data to validate and compare results obtained from this survey. These sources are listed in Table 14.

Table 14. Secondary research supplement for data validation

Variable	Source of Secondary Data	Institution	Reason for Selecting
Incidence of refrigerator, air conditioner, and water heater	National Social Economics Survey *Survei Sosial Ekonomi Nasional (Susenas)* 2015, 2016, 2017, 2018, 2019	*Badan Pusat Statistik* (Central Bureau of Statistic)	To compare deviation of survey result from actual national data of household appliance penetration
Energy Consumption	Electricity Distributed to Consumers based on Tariff Class (GWh) 1995 - 2017	*Badan Pusat Statistik* (Central Bureau of Statistic)	To compare deviation of survey result from actual national data on energy consumption
Comparative Result	CLASP Market Study Reports, forthcoming in 2020 (for rice cooker, lighting, electric fan, and refrigerator) Representing 2019 market	*Collaborative Labeling and Appliance Standards Program (CLASP)*	To derive calculation of total energy consumption from survey data
Electricity consumption past, present and projection	National Electricity Procurement Plan *Rencana Usaha Penyediaan Tenaga Listrik (RUPTL)* 2018 - 2027	PLN (State Owned Electricity Enterprise)	To compare deviation of survey result from actual national data on energy consumption
Energy Consumption 2019	Direct contact with PLN representative January 2020	PLN (State Owned Electricity Enterprise)	To compare deviation of survey result from actual national data on energy consumption
Urban and Rural Definition by subdistrict, *Kelurahan and/or* village, *Desa*	Registry of Village Potential *Pedataan Potensi Desa* 2018	*Badan Pusat Statistik* (Central Bureau of Statistics)	To identify urban & rural from survey based on definition of BPS in subdistrict or K*elurahan* level

Survey Limitations

This survey had several limitations that affect the applicability of the results. First, the number of samples is lower than the National Social Economics Survey (*Susenas*). Second, this survey limited the survey strictly to cover households with specific criteria. Third, the survey instrument did not have granularity to record usage below 1 hour, which was a problem for some appliances use briefly. Finally, the energy consumption of the appliances was not measured. The team addressed these limitations as follows.

1. Total sample of this survey is 16% to total sample of yearly Susenas conducted by central bureau of statistic (*BPS*) which had 320,000 sample. However, Susenas took twice as long to conduct.

Table 15. Comparison of Residential End Use Survey with Susenas by BPS

Variable	Residential End Use Survey	Susenas 2019 BPS
Household samples	5,000	320,000
Number of provinces	34	34
Number of cities / districts	98	514
Period of survey (months)	7	14 (Oct – Dec)

Table 16 shows the sample size for residential end-use surveys conducted in the top 3 countries with the highest populations. As can be seen, a 5,000-household sample is comparable to that used in other countries, where it has provided valuable information about the ownership and usage of electric appliances in households and can do so across Indonesia in a time- and cost-effective manner.

Table 16. Sample reference from other studies in other big population countries.

Country	Sample	Coverage
China (CRECS, 2014)	3,863	Urban and rural across China
India (Residential End Use Study, 2019)	5,242	Urban areas across India
USA (RECS, 2015)	5,686	Primary occupied households across the US, projected to 118,208,250 households

2. The survey did not include households that also use their building for business activity (e.g., workshop, salon, laundry, etc.), and dwelling units that are rented or leased to other households, but their electricity bills are routed to a single common account. These types of houses used for business are expected to consume more energy than regular households. Consequently, total energy calculation was expected to be lower than energy consumption reported by PLN for all “residential” customers (R-1, R-2, and R-3).
3. The survey instrument did not have granularity to record usage below 1 hour, which was a problem for some appliances used briefly, such as printers and blenders. CLASP therefore applied an *Hour Fraction Factor*, an assumption that reduced the effective usage. The factor ranged from 0 to 1. A value of 1 was assigned to appliances that operate for at least 1 hour during each use; for instance, lighting, fans, and washing machine. A value less than 1 was assigned to appliances that operate for less than 1 hour during each use; for instance, blender and microwave (0.0167 for a typical 1-minute operation per use) and hair dryer (0.25 for a typical 15-minute operation per use). Thus, if a microwave is reported as being

used twice at the 12:00 hour and 18:00 hour, its use would be recorded as 2 minutes, rather than 2 whole hours. The assumptions were based on CLASP's experience with these products.

4. The energy consumption of appliances is not indicated on the appliance itself, and so it cannot be collected directly through a residential survey. This is one of the information gaps that labeling programs and product registries try to solve. Some surveys try to overcome this gap by metering appliances (costly). Others by recording the device characteristics and then comparing the products against product registries or other databases of typical products on the market (no such databases in Indonesia, except for rice cookers, refrigerators, and water pumps). Still, others by estimating the consumption through statistical methods by comparing usage of all appliances in a large number of households against their electric bills (reliable bill data could not be collected). Finally, the default of using the appliance nameplate power is not realistic because the nameplate usually represents the maximum power draw of an appliance, rather than its average, which could be several times lower.

   CLASP addressed this by applying a *UEC Adjustment Factor,* an assumed ratio of the actual power draw and the theoretical maximum power draw as specified on the appliance nameplate. CLASP assigned these based on individual reviews of each appliance and our experience with these products. *UEC Adjustment Factor* ranges from 0 to 1. A value of 1 was assigned to appliances that mostly operate at steady power draw, primarily at the listed nameplate power rating; for instance, lighting and fans. A value less than 1 was assigned to appliances that primarily operate in cycles or are designed to draw power at partial load; for instance, washing machine was estimated at 0.5, TV at 0.6, and blender 0.9.

   The formula for wattage-based calculation is as follows:

   $$UEC = Wattage \times Use\ Frequency \times Hour\ Fraction\ Factor \times UEC\ Adjustment\ Factor,$$

   Where:
   UEC is the annual energy consumption per appliance unit in kWh/year,
   $Wattage$ is the reported power rating in W,
   $Use\ Frequency$ is the total hours in-use per year, and
   $Hour\ Fraction\ Factor$ and $UEC\ Adjustment\ Factor$ are dimensionless factors, which are CLASP assumptions designed to reflect actual in-use duration and power draw.

A full list of assigned Hour Fraction Factors and UEC Adjustment Factors is provided in Appendix H. Variables utilized in both calculation methods are listed in Appendix E.

Findings and Analysis

3 Survey Overview and Coverage

This survey was designed to statistically represent the national household population in Indonesia. Java is the island with the highest population count, with 60% of the national population, followed by Sumatra with 21%, and Kalimantan, Bali Nusra, Sulawesi, and Papua together with 19%. Figure 24 shows the locations of the randomly sampled 5,443 households that participated in the survey.

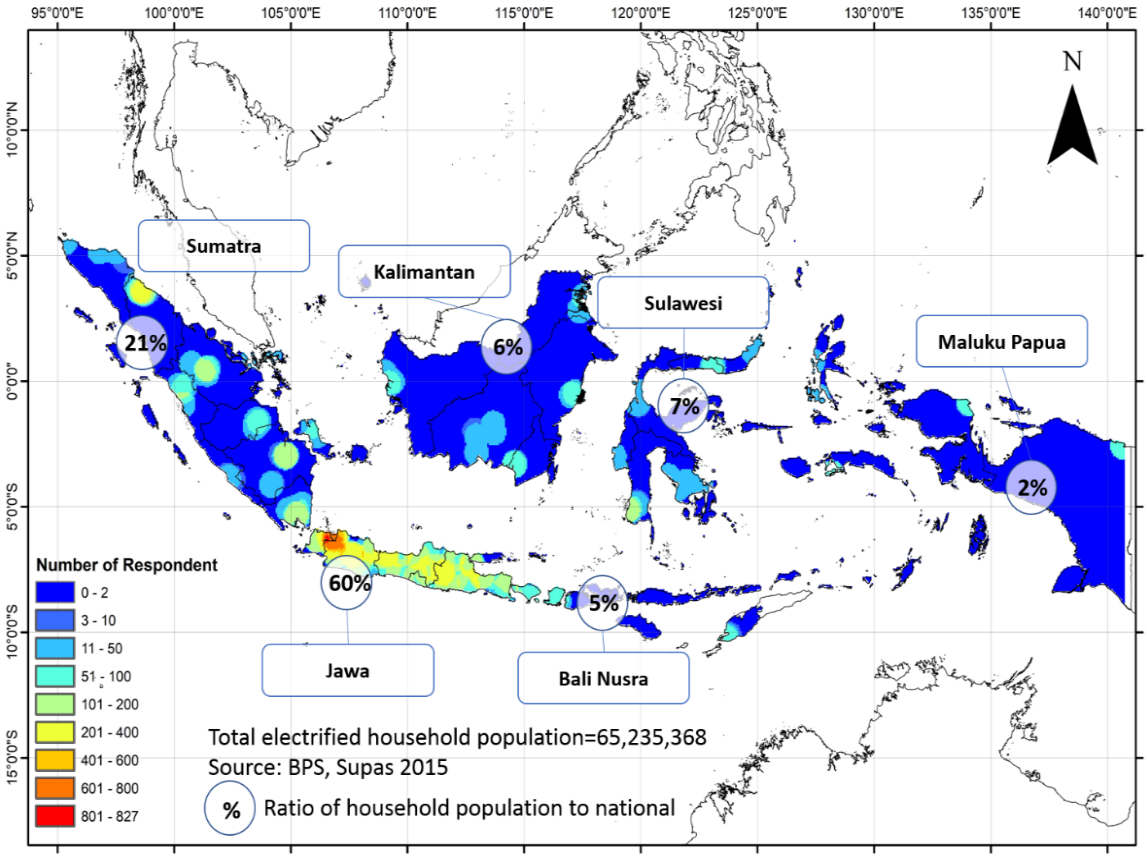


Figure 24: Distribution of household population with access to electricity (Inter-census Survey 2015, BPS) and the residential end-use survey coverage across the 34 provinces

The number of people living a household is typically 4 to 5. Over 80% of households consist of a couple and their children. The majority (at around 85%) had a single person considered as the head of the family, while the remaining 15% had more than one head of the family which imply that multiple families can be part of one household.

The average monthly expenditure for primary needs (e.g., staple food, clothes, transportation, electricity), is around Rp 2,500,000. Based on this survey, only 18% of the total projected number of households spend more than this average, while the majority of 82% spends less. This amount excludes large and irregular expenditures, such as annual rent, furniture, household appliances, recreation, or entertainment.

Nearly 90% the surveyed households own their dwelling units, while the remaining 10% are renters or lessees. Based on the installed electrical capacity, 32.8% of the surveyed households come from the subsidized R-1/450 VA class, 16.3% from the subsidized R-1/900 VA class, 35.5% from the non-subsidized R-1/900VA class, and the remaining 15.4% from R-1/1300 VA and above. In comparison, PLN customer data has lower shares of subsidized and non-subsidized R-1/900 VA households, and higher shares for the remaining residential electricity classes, as listed in Table 17. Lower percentage of higher electricity class customers was expected to result from the exclusion of dwelling units with commercial use.

Table 17. Distribution of PLN residential customers in 2019 in comparison with the surveyed households

	This Survey		PLN 2019		Deviation[40]
PLN Electricity Class and Tariff	**Projected Households**	**(in %)**	**Reported Customers**	**(in %)**	**(percentage points)**
R-1/450 VA (Subsidized) Rp 415 / kWh	21,391,145	32.8%	23,787,682	34.2%	-1.4
R-1/900 VA (Subsidized) Rp 586 / kWh	10,613,700	16.3%	7,235,841	10.4%	**5.9**
R-1/900 VA-RTM (Non-Subsidized) Rp 1352 / kWh	23,172,283	35.5%	22,333,542	32.1%	**3.4**
R-1/1300 VA (Non-Subsidized) Rp 1467,28 / kWh	9,170,226	14.1%	11,593,273	16.7%	-2.6
R-1/2200 VA (Non-Subsidized) Rp 1467,28 / kWh	790,815	1.2%	3,176,056	4.6%	-3.4
R-2/3500 VA, 4400 VA, 5500 VA (Non-Subsidized) Rp 1467,28 / kWh	67,560	0.1%	1,235,564	1.8%	-1.7
R-3/6600 VA and above (Non-Subsidized) Rp 1467,28 / kWh	29,640	0.0%	257,364	0.4%	-0.4

Out of all households, 36% of electricity bills are pre-paid, while 64% are post-paid. 100% of respondents in Bangka Belitung and Nusa Tenggara Timur use pre-paid.

Table 18. Type of installed electricity by province

Province	Base Respondents	Projected Households	Electricity Bill Payment Method	
			Pre-paid	**Post-paid**
Aceh	91	1,198,063	66%	34%
Sumatera Utara	267	3,253,948	23%	77%
Sumatera Barat	95	1,195,880	25%	75%
Riau	124	1,458,665	23%	77%
Jambi	60	829,079	28%	72%
Sumatera Selatan	158	1,902,063	24%	76%
Bengkulu	65	470,043	68%	32%
Lampung	158	2,097,146	36%	64%
Kepulauan Bangka Belitung	51	357,215	100%	0%
Kepulauan Riau	53	523,989	13%	87%
DKI Jakarta	216	2,672,327	24%	76%
Jawa Barat	987	12,671,064	42%	58%
Jawa Tengah	688	9,207,422	31%	69%
DI Yogyakarta	84	1,110,336	13%	87%
Jawa Timur	925	10,842,982	34%	66%

[40] In reference to PLN consumer data count in 2019

Province	Base Respondents	Projected Households	Electricity Bill Payment Method	
			Pre-paid	Post-paid
Banten	235	2,838,849	41%	59%
Bali	80	1,097,216	71%	29%
Nusa Tenggara Barat	104	1,366,596	74%	26%
Nusa Tenggara Timur	68	812,536	100%	0%
Kalimantan Barat	72	1,027,214	31%	69%
Kalimantan Tengah	50	627,675	21%	79%
Kalimantan Selatan	87	1,073,863	18%	82%
Kalimantan Timur	63	859,806	49%	51%
Kalimantan Utara	50	140,919	69%	31%
Sulawesi Utara	58	612,818	15%	85%
Sulawesi Tengah	50	646,154	50%	50%
Sulawesi Selatan	141	1,943,089	7%	93%
Sulawesi Tenggara	52	530,464	43%	57%
Gorontalo	54	260,705	46%	54%
Sulawesi Barat	50	274,146	38%	62%
Maluku	51	313,074	15%	85%
Maluku Utara	50	224,304	47%	53%
Papua Barat	54	183,760	95%	5%
Papua	52	439,132	92%	8%
TOTAL	**5,443**	**65,062,542**	**36%**	**64%**

Nearly 57% of households have monthly expenditures ranging from Rp 1,750,000 to Rp 4,000,000. There is a correlation between the household's socioeconomic class and their PLN power supply capacity and electricity class. In general, households with access to higher power supply capacity have higher monthly expenditure.

Table 19. Monthly primary expenditure compared to electricity class

	TOTAL	R-1/ 450 VA (Subsidy)	R-1/900 VA (Subsidy)	R-1/900 VA (RTM)	R-1/1300 VA	R-1/2200 VA	R-2 & R-3 >3500 VA
Base (n)	**5443**	**1,658**	**694**	**2,182**	**829**	**69**	**39 (R+B)**
Projected HH	**65,235,368**	**21,391,145**	**10,613,700**	**23,172,283**	**9,170,226**	**790,815**	**-**
> Rp 6,000,000	2%	0%	0%	1%	6%	18%	77%
> Rp 4,000,000 - Rp 6,000,000	8%	2%	6%	8%	20%	23%	8%
> Rp 2,500,000 - Rp 4,000,000	28%	17%	23%	37%	38%	33%	5%
> Rp 1,750,000 - Rp 2,500,000	29%	31%	30%	31%	20%	16%	3%
> Rp 1,250,000 - Rp 1,750,000	18%	26%	23%	13%	10%	5%	0%
> Rp 900,000 - Rp 1,250,000	7%	11%	11%	4%	4%	2%	3%
<= Rp 900,000,000	8%	13%	7%	5%	2%	2%	5%

4 Survey Findings on Appliances

Since the majority of the household appliances covered in the survey were electrical appliances, this section provides findings on national appliances penetration, ownership, usage frequency, wattage, and distribution of types and capacities only for electrical appliances. Detailed information regarding non-electrical appliances usage were instead incorporated in Section 6.5 for non-electrical energy consumption estimates.

4.1 Penetration of Appliances

All of the surveyed households with access to electricity have lighting—on average 5.4 lighting points per household. As for the other common appliances, the highest penetration rates quantified through this survey are 93% for television, 78% for cell phone, 70% for electric iron, 69% for refrigerator, 69% for rice cooker, and 64% for electric fan. The penetration rate for AC, for which energy efficiency policy has been enforced since 2018, is 5%. Most of the households that own these appliances have 1 unit.

Among these appliances mostly found in households, electric iron is used the least frequently at 20 hours/month, while other appliances are used almost every day. Refrigerator, water dispenser, Wifi router, aquarium circulation pump, and home phone are used for the highest number of hours each month.

In this survey, usage frequency was quantified in number of days per month and number of hours per day. Lighting, refrigerator, air conditioner, television, rice cooker, and water pump are used for more than 27 days per month. Other appliances are used fewer days in a month, reducing average yearly usage. Penetration, projected number of stock, average number of appliances owned by the owning households, and use frequency are provided in Table 20.

Table 20. Summary of national electrical appliances penetration, ownership count, and frequency of use

Appliance	Penetration	Projected Stock (unit)	Number of Appliances per Owning Household (unit)	Daily Hours of Use on Days Used (hour/day)	Daily Hours of Use on Average for the Year (hour/day)	Adjusted Daily Hours of Use on Average for the Year[41] (hour/day)
Lighting	100%	351,833,537	5.39	7.5	7.4	7.4
Television	93%	65,413,797	1.07	6.7	6.5	6.5
Cell phone	78%	96,736,064	1.90	4.7	4.6	0.9
Electric Iron	70%	45,847,996	1.00	1.8	0.7	0.4
Rice cooker / warmer	69%	45,586,664	1.01	6.4	6.0	6.0
Refrigerator	69%	45,545,264	1.02	24.0	23.3	23.3
Electric fan	64%	55,444,825	1.32	6.4	5.8	5.8
Water pump	35%	22,651,598	1.00	2.8	2.6	2.6
Washing machine	29%	18,982,099	1.01	2.1	1.2	1.2
Blender	27%	17,867,035	1.00	1.5	0.7	0.01
Dispenser	20%	13,257,061	1.00	24.0	19.9	19.9
DVD/VCD Player	14%	9,198,319	1.01	2.0	0.5	0.5
Speaker	12%	8,393,072	1.12	2.4	1.0	1.0
Mixer	9%	6,199,148	1.00	1.6	0.2	0.01

[41] This column includes the Hour Adjustment Factor, CLASP's assumption regarding the typical fraction of an hour that each appliance is used. It corrects for a limitation in the survey instrument which only captured usage in full hour increments. See Section 2 on Survey Methodology, under Survey Limitations.

Appliance	Penetration	Projected Stock (unit)	Number of Appliances per Owning Household (unit)	Daily Hours of Use on Days Used (hour/day)	Daily Hours of Use on Average for the Year (hour/day)	Adjusted Daily Hours of Use on Average for the Year[41] (hour/day)
Laptop	9%	6,296,511	1.07	2.9	1.9	1.9
Air Conditioner	5%	3,970,392	1.15	8.0	7.2	7.2
Radio	4%	2,924,816	1.01	2.7	1.4	1.4
Tablet	4%	2,575,966	1.12	4.0	3.4	3.4
Printer	2%	1,152,623	1.02	1.6	0.7	0.0
Compo/ mini compo	2%	1,062,133	1.01	2.2	1.0	1.0
Emergency lamp	2%	1,291,485	1.27	2.3	1.9	1.9
Personal computer	1.3%	923,572	1.07	3.8	2.2	2.2
Wifi router	1.3%	856,866	1.00	17.7	17.3	17.3
Desk lamp	1.1%	739,347	1.06	3.2	2.9	2.9
Hair iron	1.1%	702,080	1.01	1.6	0.5	0.1
Juicer	1.0%	654,109	1.00	2.7	0.7	0.04
Hair dryer	1.0%	659,977	1.02	1.5	0.5	0.1
Electric water heater	0.9%	659,711	1.08	1.9	1.9	0.1
Electric oven	0.7%	433,643	1.00	2.8	0.7	0.7
Vacuum cleaner	0.6%	400,861	1.00	1.8	0.5	0.3
Aquarium pump	0.5%	354,557	1.06	18.1	18.0	18.0
Toaster	0.5%	326,228	1.00	2.5	0.7	0.1
Microwave	0.5%	301,249	1.00	2.9	1.2	0.0
Set Top Box	0.4%	243,683	1.00	5.4	4.8	4.8
Decorative water pump	0.3%	213,079	1.00	5.3	5.0	5.0
Cooktop	0.3%	198,448	1.00	3.6	2.2	1.1
Home phone	0.1%	91,566	1.00	24.0	19.2	3.3
Kitchen exhaust	0.1%	99,112	1.14	11.7	10.3	10.3
Electric bike	0.05%	31,577	1.00	2.8	0.7	0.7
Dishwasher machine	0.04%	23,867	1.00	13.5	1.7	1.7
Segway	0.01%	6,859	1.00	2.0	1.9	1.9

Table 21 below illustrates the range of penetration rate for each appliance across the seven PLN residential electricity classes. The darker blue cells indicate higher penetration rates. As illustrated, penetration generally increases in households with higher power supply capacity. Significant increase across the residential PLN class can be observed for AC, ranging from 0 to 2% in subsidized households with access to 450 and 900 VA, to 5%, 18%, 44%, and 82% for households with 900, 1300, 2200, and 3500 VA and higher power supply capacity, respectively. Based on this information, higher electricity consumption can be expected in households with higher power supply capacity.

Table 21. Penetration of electrical appliances by electricity class (higher penetration rate in darker blue cell)

PLN Residential Tariff Class / Appliance Penetration Rate	National	R-1/ 450 VA (S)	R-1/900 VA (S)	R-1/900 VA (RTM)	R-1/1300 VA	R-1/2200 VA	R-2&R-3
Projected Household	**65,235,368**	**21,391,145**	**10,613,700**	**23,172,283**	**9,170,226**	**790,815**	**R+B**
Lighting	100%	100%	100%	100%	100%	100%	100%
Television	93%	91%	93%	95%	95%	93%	97%
Cell phone	78%	75%	75%	82%	78%	88%	56%
Iron	70%	55%	67%	80%	80%	84%	92%
Rice cooker/warmer	69%	61%	71%	75%	68%	82%	85%
Refrigerator	69%	51%	64%	79%	86%	97%	90%
Electric fan	64%	56%	62%	70%	72%	81%	87%
Water pump	35%	31%	31%	39%	37%	29%	69%
Washing machine	29%	14%	23%	38%	46%	60%	87%
Blender	27%	15%	31%	31%	39%	60%	90%
Water dispenser	20%	8%	21%	24%	35%	47%	77%
DVD/ VCD Player	14%	11%	15%	15%	15%	33%	67%
Speaker	12%	9%	12%	13%	13%	16%	62%
Mixer	9%	4%	10%	11%	16%	24%	72%
Laptop	9%	3%	7%	11%	17%	43%	82%
Air Conditioner	5%	0%	2%	5%	18%	44%	82%
Radio	4%	4%	4%	5%	4%	9%	33%
Tablet	4%	2%	3%	5%	5%	10%	33%
Printer	2%	0%	0%	2%	4%	6%	56%
Compo/ mini compo	2%	1%	1%	2%	1%	6%	31%

PLN Residential Tariff Class / Appliance Penetration Rate	National	R-1/ 450 VA (S)	R-1/900 VA (S)	R-1/900 VA (RTM)	R-1/1300 VA	R-1/2200 VA	R-2&R-3
Emergency lamp	2%	1%	1%	2%	2%	5%	5%
Personal computer	1.3%	0%	0%	2%	3%	8%	44%
Wifi router	1.3%	0%	1%	1%	3%	10%	44%
Desk lamp	1.1%	0%	0%	1%	2%	8%	54%
Hair iron	1.1%	0%	1%	1%	2%	3%	15%
Juicer	1.0%	1%	1%	1%	2%	9%	56%
Hair dryer	1.0%	0%	1%	1%	1%	7%	23%
Electric water heater	0.9%	1%	1%	1%	1%	1%	13%
Electric oven	0.7%	0%	0%	0%	3%	7%	49%
Vacuum cleaner	0.6%	0%	0%	1%	2%	6%	62%
Aquarium pump	0.5%	0%	0%	1%	0%	1%	10%
Toaster	0.5%	0%	0%	1%	1%	6%	67%
Microwave	0.5%	0%	0%	0%	2%	8%	67%
Set top box	0.4%	0%	0%	0%	1%	3%	26%
Decorative pump	0.3%	0%	0%	0%	1%	0%	3%
Cooktop	0.3%	0%	0%	0%	1%	3%	36%
Home phone	0.1%	0%	0%	0%	0%	3%	5%
Kitchen exhaust	0.1%	0%	0%	0%	0%	0%	31%
Electric bike	0.05%	0%	0%	0%	0%	0%	0%
Dishwasher machine	0.04%	0%	0%	0%	0%	2%	8%
Segway	0.01%	0%	0%	0%	0%	0%	0%

In addition to PLN electricity class, correlation between appliances penetration and monthly expenditure was also assessed. As shown in Table 22, the higher the monthly expenditure, the higher the penetration and the variety of appliances owned by the household. Penetration of AC and other high wattage appliances are significantly higher in households with expenditures above Rp 6,000,000.

Table 22. Penetration of electrical appliances across monthly primary expenditure (higher penetration rate in darker blue cell)

Monthly Primary Expenditure / Appliance Penetration Rate	National	<= Rp 900,000	> Rp 900,000 - Rp 1,250,000	> Rp 1,250,000 - Rp 1,750,000	> Rp 1,750,000 - Rp 2,500,000	> Rp 2,500,000 - Rp 4,000,000	> Rp 4,000,000 - Rp 6,000,000	> Rp 6,000,000
Projected Household	**65,235,568**	**4,976,748**	**4,877,815**	**11,995,797**	**18,878,090**	**8,375,542**	**5,105,853**	**1,025,638**
	100%	**8%**	**7%**	**18%**	**29%**	**28%**	**8%**	**2%**
Lighting	100%	100%	100%	100%	100%	100%	100%	100%
Television	93%	81%	87%	93%	94%	97%	98%	98%
Cell phone	78%	58%	62%	74%	82%	84%	86%	89%
Iron	70%	39%	51%	57%	72%	83%	89%	90%
Rice cooker/warmer	69%	43%	53%	64%	69%	77%	86%	91%
Refrigerator	69%	39%	50%	54%	68%	83%	92%	96%
Electric fan	64%	33%	47%	59%	67%	75%	80%	62%
Water pump	35%	18%	25%	35%	34%	39%	46%	32%
Washing machine	29%	10%	13%	17%	25%	41%	56%	63%
Blender	27%	10%	16%	16%	25%	38%	48%	48%
Dispenser	20%	7%	8%	12%	19%	27%	36%	46%
DVD/VCD Player	14%	5%	8%	11%	15%	15%	22%	36%
Speaker	12%	9%	11%	10%	11%	11%	17%	18%
Mixer	9%	3%	4%	4%	8%	12%	25%	28%
Laptop	9%	5%	6%	4%	6%	11%	25%	51%
Air Conditioner	5%	1%	1%	1%	2%	6%	23%	60%
Radio	4%	5%	3%	6%	5%	3%	6%	4%
Tablet	4%	2%	2%	2%	3%	4%	8%	18%
Printer	2%	0%	1%	1%	1%	2%	5%	9%
Compo/mini compo	2%	1%	2%	1%	2%	2%	2%	4%
Emergency lamp	2%	1%	0%	1%	1%	2%	3%	2%
Personal computer	1.3%	0.3%	0.4%	0.5%	0.8%	1.6%	2.7%	16.7%

Monthly Primary Expenditure / Appliance Penetration Rate	National	<= Rp 900,000	> Rp 900,000 - Rp 1,250,000	> Rp 1,250,000 - Rp 1,750,000	> Rp 1,750,000 - Rp 2,500,000	> Rp 2,500,000 - Rp 4,000,000	> Rp 4,000,000 - Rp 6,000,000	> Rp 6,000,000
Wifi	1.3%	0.2%	0.5%	0.3%	0.6%	1.9%	4.4%	10.8%
Desk lamp	1.1%	0.3%	0.3%	0.9%	0.6%	1.1%	2.9%	9.7%
Hair iron	1.1%	1.7%	1.0%	0.5%	0.6%	0.9%	3.1%	5.7%
Juicer	1.0%	0.2%	0.6%	0.3%	0.6%	1.0%	3.8%	9.6%
Hair dryer	1.0%	0.8%	0.5%	0.5%	0.7%	0.9%	2.8%	6.8%
Electric water heater	0.9%	0.3%	0.6%	0.5%	0.7%	1.3%	1.4%	5.8%
Electric oven	0.7%	0.1%	0.2%	0.3%	0.2%	0.6%	2.8%	8.3%
Vacuum cleaner	0.6%	0.0%	0.2%	0.0%	0.2%	0.4%	2.4%	15.3%
Aquarium pump	0.5%	0.5%	0.0%	0.2%	0.6%	0.7%	1.0%	0.0%
Toaster	0.5%	0.2%	0.3%	0.0%	0.4%	0.4%	1.3%	9.4%
Microwave	0.5%	0.0%	0.2%	0.0%	0.2%	0.2%	0.9%	15.4%
Set Top Box	0.4%	0.6%	0.0%	0.3%	0.2%	0.2%	0.8%	7.2%
Decorative pump	0.3%	0.5%	0.0%	0.1%	0.2%	0.4%	0.9%	2.3%
Cooktop	0.3%	0.0%	0.0%	0.1%	0.0%	0.4%	1.0%	5.7%
Home phone	0.1%	0.0%	0.0%	0.0%	0.0%	0.1%	0.9%	2.3%
Kitchen exhaust	0.1%	0.0%	0.2%	0.0%	0.0%	0.0%	1.3%	1.2%
Electric bike	0.05%	0.0%	0.0%	0.0%	0.1%	0.1%	0.0%	0.0%
Dishwasher machine	0.04%	0.0%	0.0%	0.0%	0.0%	0.1%	0.0%	1.2%
Segway	0.01%	0.0%	0.0%	0.0%	0.0%	0.0%	0.1%	0.0%
Average count of appliance types per household	**8.2**	**5.7**	**6.4**	**7.2**	**8.1**	**9.2**	**10.5**	**12.7**

Comparative References

A comparison for the penetration rates of refrigerator, AC, flat-screen TV, and water heater in Indonesia is provided in Table 23. Penetration rate of refrigerator reported in Susenas has been shown to steadily increase over the years. The most recent refrigerator penetration rate obtained through Susenas in 2019 at 59% is nearly 10% lower than the rate obtained through this survey.

Similar observation applies for AC, where penetration rate steadily increases. However, the rate identified through this survey is 5%, which is 4 percentage points lower compared to the most recent AC penetration rate for 2019.

Water heater penetration rate in Susenas fluctuate throughout the past 5 years. The reported rate in 2019 is 2%, 1% higher than the penetration rate identified in this survey. Since no further description was provided in Susenas on the fuel source used to power the water heater, the reported percentage may cover all types of water heater, namely electric-, solar-, and gas-powered units. Part of the discrepancy may be due to higher margin of error in the current survey, the exclusion of certain homes.

Table 23. Comparison with Susenas 2015 – 2019 from BPS

	Susenas 2015	Susenas 2016	Susenas 2017	Susenas 2018	Susenas 2019	This Survey
Number of samples	300,000	285,908	300,000	300,000	320,000	**5,443**
Number of provinces	34	34	34	34	34	**34**
Number of cities/ districts	511	511	514	514	514	**98**
Refrigerator	48.25%	51.49%	53.77%	56.55%	59.12%	**69%**
AC	6.70%	7.25%	7.98%	8.36%	8.75%	**5%**
Water heater	3.97%	2.32%	1.86%	2.26%	2.00%	**0.9% (electric) 0.3% (LPG)**

4.2 Appliance Wattage

To obtain reliable information on the power rating of the appliances, Ipsos collected two datasets, namely based on interviewer's observation and based on respondent's claim. About 10% of the data were recorded based on the listed wattage on the nameplate, while the remaining 90% were based entirely on the respondent's claim due to limited access to the appliance. It should also be noted that at times, nameplate information was not available. Table 24 compares the claimed and observed wattages for the eight primary appliances. The two datasets were generally consistent, though respondents slightly underclaimed the power rating for most of the listed appliances, except for fans, water pump, and AC.

Table 24. Summarized wattage datasets obtained for the main common electrical appliances

Appliance	Number of Households	Share of Each Type of Wattage Data		Average Wattage		% Wattage Deviation
		Claim	Observation	Claim	Observation	
Lighting	351,833,537	89%	11%	14	16	**+14.7%**
Television	65,413,797	86%	14%	69	72	**+4.8%**
Electric Fan	55,444,825	88%	12%	53	50	-5.3%
Refrigerator	45,545,264	85%	15%	107	114	**+6.6%**
Rice Cooker	45,586,664	87%	13%	305	310	**+1.5%**
Water Pump	22,651,598	91%	9%	417	385	-7.6%
Dispenser	13,257,061	89%	11%	232	245	**+5.8%**
AC	3,970,392	91%	9%	554	506	-8.4%

4.2.1 Rice Cooker

The majority of respondents owned rice cookers with wattage between 300 and 350 W (55%). Most units had 1 to 2 L of dry rice capacity (88%). Most respondents used 1:1 or 1:2 ratio of rice to water (69%).

Table 25. Distribution of rice cookers by wattage, dry rice cooking capacity, and rice & water ratio (3,765 units in sample representing 45,573,697 nationally)

Wattage		Capacity		Rice & Water Ratio	
<300 W	28%	**< 1 L**	10%	**Rice:Water (1:1)**	25%
300 - 350 W	55%	**1 – 1.5 L**	46%	**Rice:Water (1:2)**	44%
351 - 400 W	12%	**1.6 – 2 L**	32%	**Rice:Water (1:3)**	8%
400 - 500 W	4%	**2.1 – 3 L**	6%	**Rice:Water (2:3)**	3%
> 501 W	1%	**3.1 – 4 L**	2%	**Can't measure**	20%
		4.1 – 5 L	3%		
		> 5 L	1%		

Figure 25 shows that rice cooker dry rice capacity shares obtained in this survey show a similar distribution to those in CLASP's contemporaneous Indonesia Rice Cooker Market Study,[42] which analyzed units sold in the market. The only major difference observed was in the 2 to 3 L bracket, where CLASP's market study identified nearly 15% higher share. These larger units could be used for commercial purposes making them less likely to be found in homes.

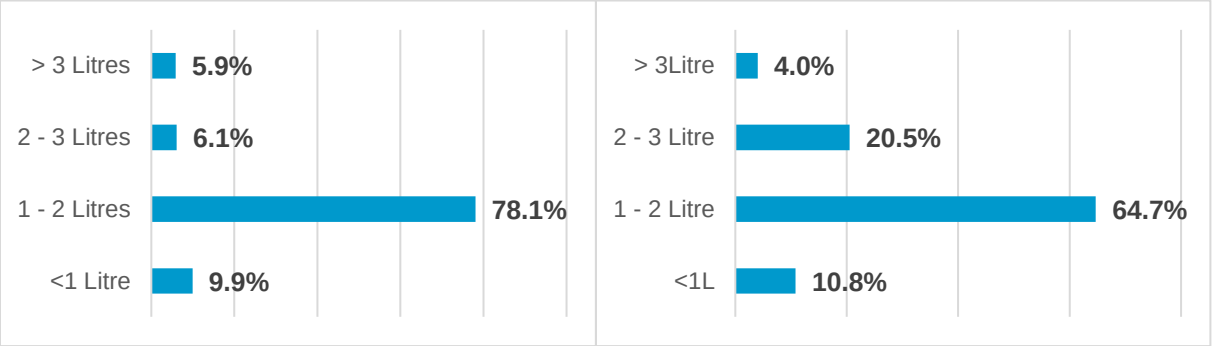


Figure 25: Volumes of rice cooker capacity assessed in this survey (left) and CLASP's contemporaneous Indonesia Rice Cooker Market Study (right)

Nearly all respondents reported daily use of rice cooker (95%). The survey confirms that rice cooker units remain active for a significant period in Indonesian households, with an average operating time of 6.4 hours nationally.

Separately, as part of CLASP's Rice Cooker Market Study, Ipsos conducted a 500-person survey of rice cooker usage and purchasing, which found that residential users cooked rice on average 1.4 times per day. If each cooking event is assumed to last 30 minutes, this implies an average daily warming time of 5.7 hours. At the national level, use of rice cookers begins at 05:00 and ends at 19:00. Reported peaks of cooking mode were at 04:00, 08:00, 13:00, 17:00, and 21:00, while warming continued throughout the day.

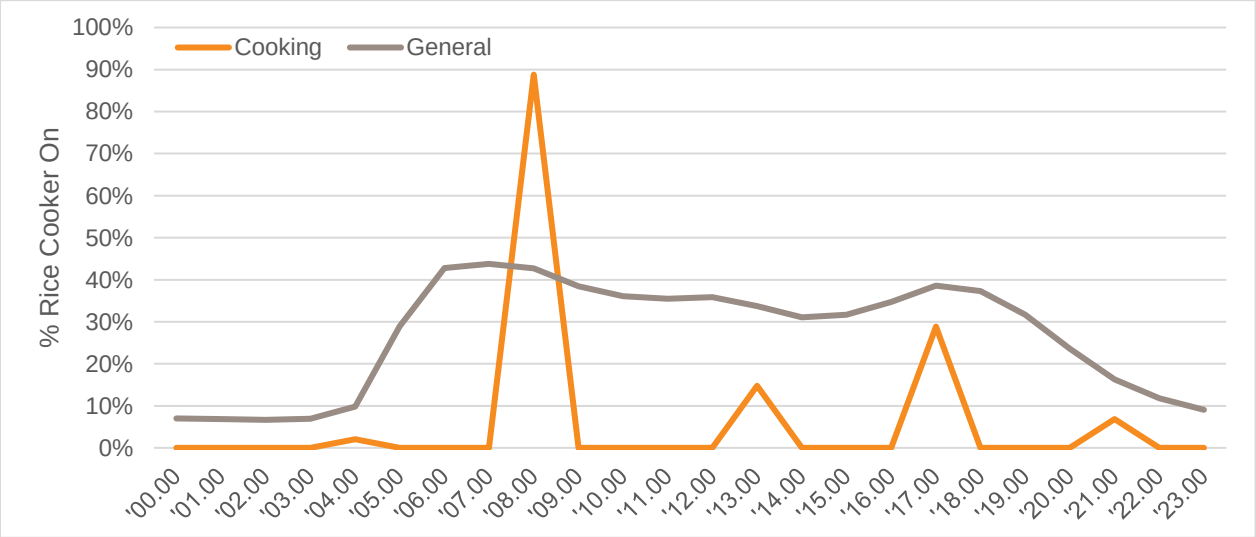


Figure 26: Share of rice cookers in-use at the given hour of the day

[42] CLASP Indonesia Rice Cooker Market Study and Policy Analysis. 2020.

Miyako, Cosmos, and Yong Ma brands comprised 77% of rice cooker units identified in the survey. The total number of brand names found for rice cookers was smaller compared to other appliances. There were 6 brands that cover 90% of the identified rice cookers in the households.

Table 26. Rank of brands comprising 90% of rice cookers in the surveyed households

Electric Fan Brand	Rank
MIYAKO	1
COSMOS	2
YONG MA	3
MASPION	4
KIRIN	5
PHILIPS	6

The average age of the rice cooker was 4.37 years, with most 6 years or younger.

Table 27. Age of rice cooker from the residential end use survey

Stock (million units) / Age of the Appliance	***45.57***
1 year	10%
2 years	17%
4 years	21%
5 years	13%
6 years	18%
>> 7 years	15%
Average (years)	**4.37**

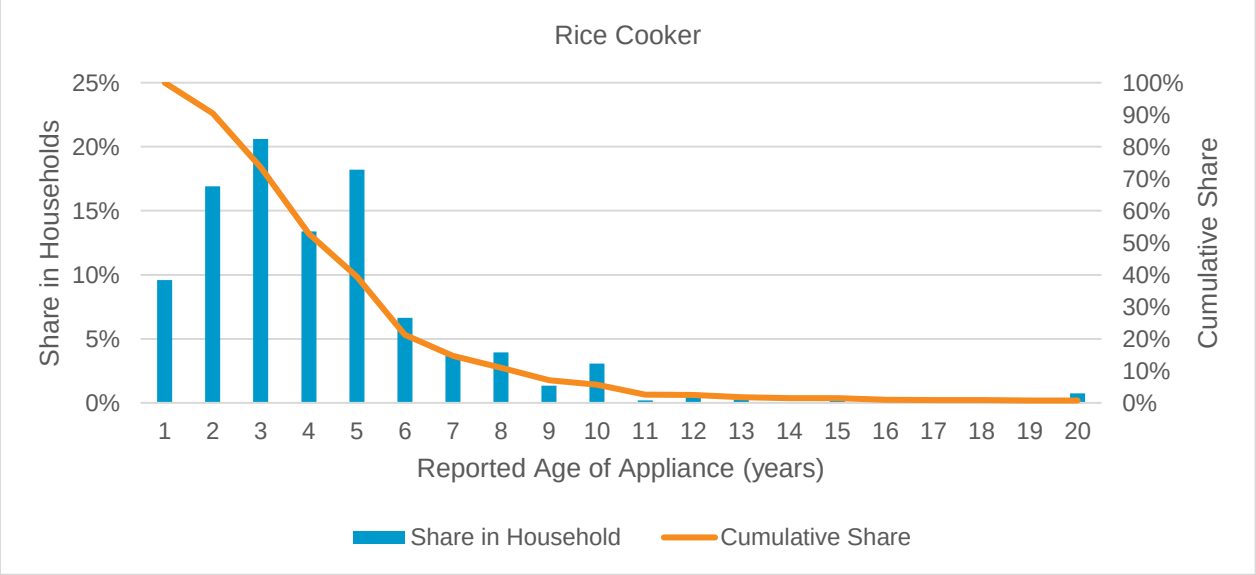


Figure 27: Distribution of rice cookers by age

4.2.2 Refrigerator

Most respondents (88%) use refrigerators with wattage between 50 and 150 W. Refrigerators with capacity less than 50 L (13% of total respondents) have comparable shares to those with capacity greater than 200 L (14% of total respondents). Most fall between 51 and 200 L (73%).

Table 28. Distribution of refrigerators by wattage and capacity (3,880 units in sample representing 45,523,426 units nationally)

Wattage		Capacity	
<50 Watt	3%	**<< 50 Liters**	13%
50 – 75 Watt	21%	**51 – 100 Liters**	19%
76 – 100 Watt	35%	**101 – 150 Liters**	14%
100 – 125 Watt	16%	**151 – 200 Liters**	30%
126 – 150 Watt	13%	**201 – 250 Liters**	8%
151 – 200 Watt	5%	**251 – 300 Liters**	2%
>200 Watt	7%	**301 – 400 Liters**	1%
		401 – 500 Liters	1%
		501 – 600 Liters	1%
		>600 Liters	0%
		Don't know	10%

These capacity findings are generally aligned with CLASP's contemporaneous Refrigerator Market Study.[43] However, the survey found a smaller share of refrigerators with capacity greater than 200 L. As was the case with rice cookers, this could imply commercial use, or because CLASP Refrigerator Market Study counted models available on the market rather than sales, it could imply that larger models are only sold in small quantities.

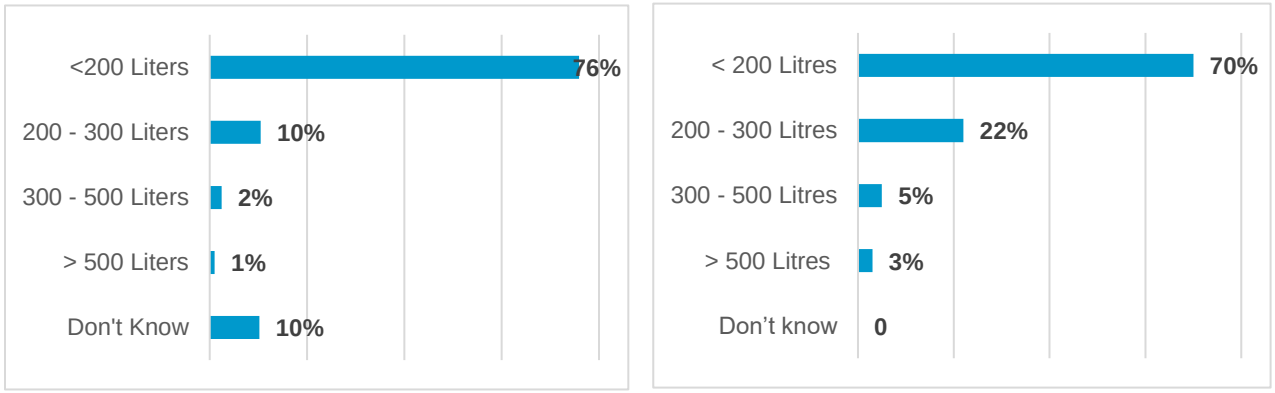


Figure 28: Volumes of refrigerator assessed in this survey (left) and CLASP's contemporaneous Indonesia Refrigerator Market Study (right)

Single-door refrigerators were most common among the surveyed households, comprising 78% of total stock, followed by double-door refrigerators with top freezer at 19%. This finding is also consistent with the shares reported in CLASP's Indonesia Refrigerator Market Study, where single-door and double-door

[43] CLASP Refrigerator Market Study and Policy Analysis 2020

refrigerators with top freezer are reported to hold over 98% of market share.[44] Provided in the subsequent Figure 30 are the common types found in Indonesian households.

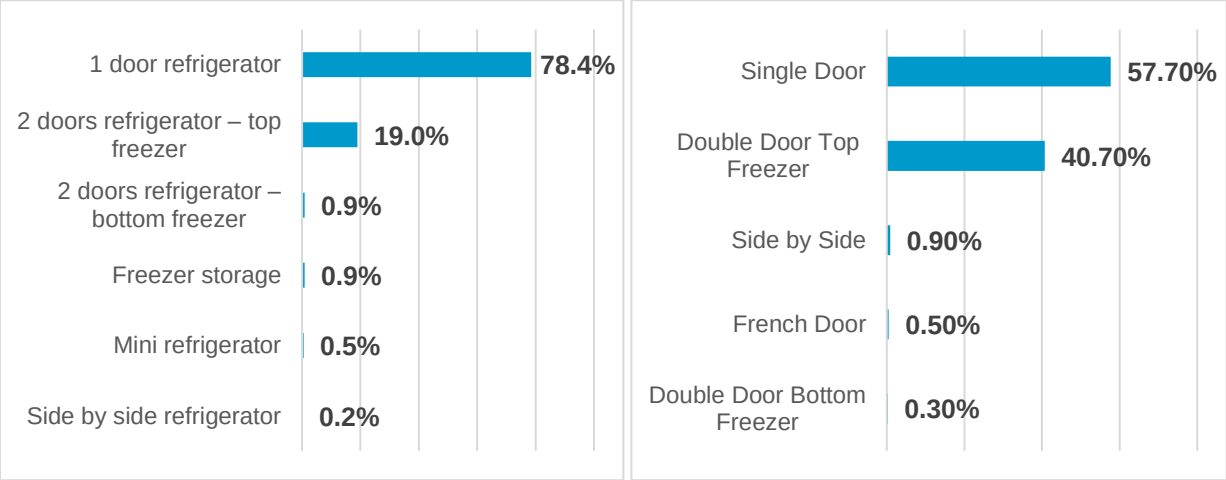


Figure 29: Types of refrigerator assessed in this survey (left) and CLASP's contemporaneous Indonesia Refrigerator Market Study (right)

Figure 30: Common types of refrigerators found in Indonesian households

[44] CLASP Indonesia Refrigerator Market Study and Policy Analysis. 2020

Sharp, LG, and Polytron are the top 3 brands, comprising 64% of the refrigerators found in the surveyed households. Table 29 lists all top players that make up nearly 90% of the surveyed refrigerators.

Table 29. Rank of brands comprising 90% of refrigerators in the surveyed households

Refrigerator Brands	Rank
SHARP	1
LG	2
POLYTRON	3
PANASONIC	4
TOSHIBA	5
SANYO	6
SAMSUNG	7
AQUA	8
MASPION	9

The average age of refrigerators was 5.75 years. The age did not vary much with wattage, implying that any trend toward larger refrigerators may be offset by efficiency.

Table 30. Age of refrigerator by wattage from the residential end use survey

	Wattage (Watt)								
	Total	**<50**	**50 – 75**	**76 – 100**	**100 – 125**	**126 – 150**	**151 – 200**	**>200**	**Don't know**
Stock Share / Age of the Appliance	**46.8**	**1.4**	**7.1**	**7.3**	**6.8**	**3.4**	**2.5**	**3.3**	**15.0**
1 year	7%	9%	8%	6%	5%	8%	7%	8%	7%
2 years	11%	14%	9%	11%	12%	15%	13%	11%	11%
3 years	16%	16%	15%	14%	18%	17%	17%	19%	16%
4 years	10%	9%	9%	12%	10%	10%	11%	7%	10%
5 years	19%	21%	21%	20%	15%	19%	16%	17%	19%
6 years	9%	4%	11%	8%	11%	9%	9%	6%	9%
7 years	5%	6%	6%	5%	6%	4%	9%	3%	5%
8 years	5%	5%	5%	6%	5%	5%	3%	5%	5%
9 years	2%	1%	1%	2%	3%	2%	0%	2%	2%
10 years	7%	7%	6%	8%	8%	7%	6%	10%	7%
> 10 years	8%	8%	9%	9%	6%	5%	8%	12%	8%
Mean score	**5.75**	**5.54**	**5.83**	**5.89**	**5.57**	**5.05**	**5.55**	**6.84**	**5.75**

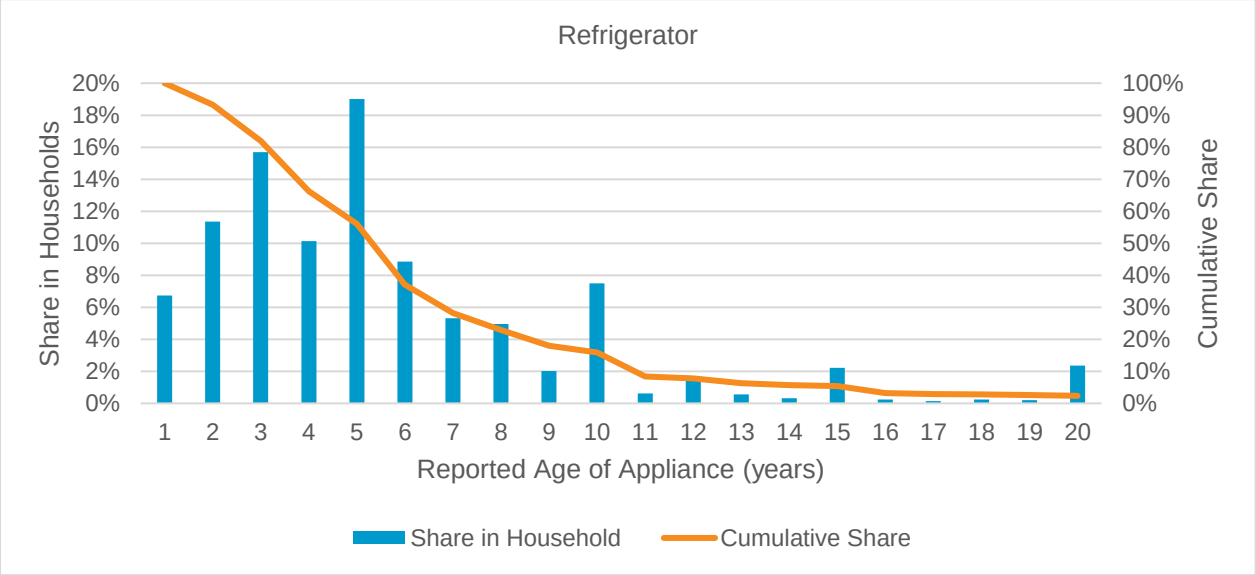


Figure 31: Distribution of refrigerators by age

4.2.3 Lighting

Nearly 60% all lighting found in surveyed households had wattage between 5 and 15 W, as shown in Table 31. The survey found that incandescent lamps comprised 21% of the stock, but the distribution of wattage was almost identical to lamps reported as compact fluorescent (CFL) or light emitting diode (LED). CLASP therefore suspects that despite a visual help card, lamps were misidentified.

Table 31. Lighting wattage distribution (24,705 units in sample representing 296,527,293 million units nationally)

Lighting Wattage	TOTAL
1 – 5 Watt	11%
5 – 10 Watt	37%
11 – 15 Watt	20%
16 – 20 Watt	14%
21 – 25 Watt	7%
> 25 Watt	8%
Don't know	3%
Average Watt	**14.0**

Instead CLASP assigned the lamps from the survey to the various lighting technologies based on the distribution of models available at retail. For example, lamps with wattage greater than 25 W were most likely incandescent as CLASP found that 57% of incandescent lamp models had wattage greater than 25 W, compared to only 8% of LED and 9% of CFL models. In contrast, lower wattage models, as well as the all models overall were dominated by CFL and LED, as seen in the distribution in Figure 32.

The resultant share of each technology was 6% or 21 million for incandescent and halogen, 41% or 145 million for CFL and 52% or 183 million for LED.

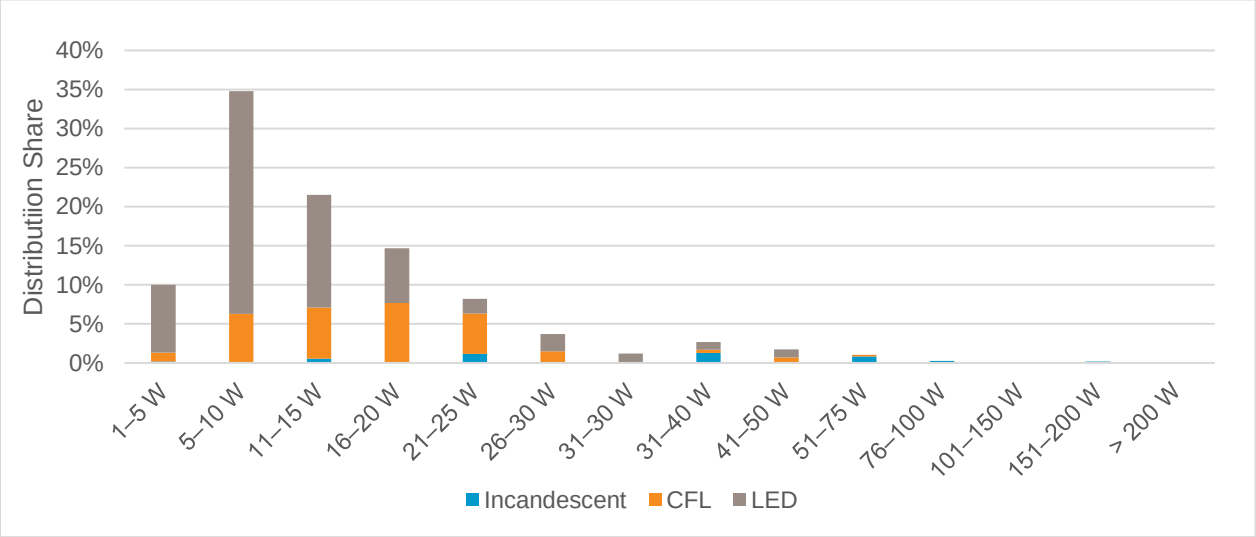


Figure 32: Distribution of lamps by technology based on wattage of models in the market found in CLASP's Lighting Market Study

Lighting consumes significant amount of energy nationally, due to its long use from 17:00 to 05:00 in the next morning, or 7.6 hours on average. Peak consumption is between 18.00 to 22.00. No significant difference is observed between weekdays and weekends.

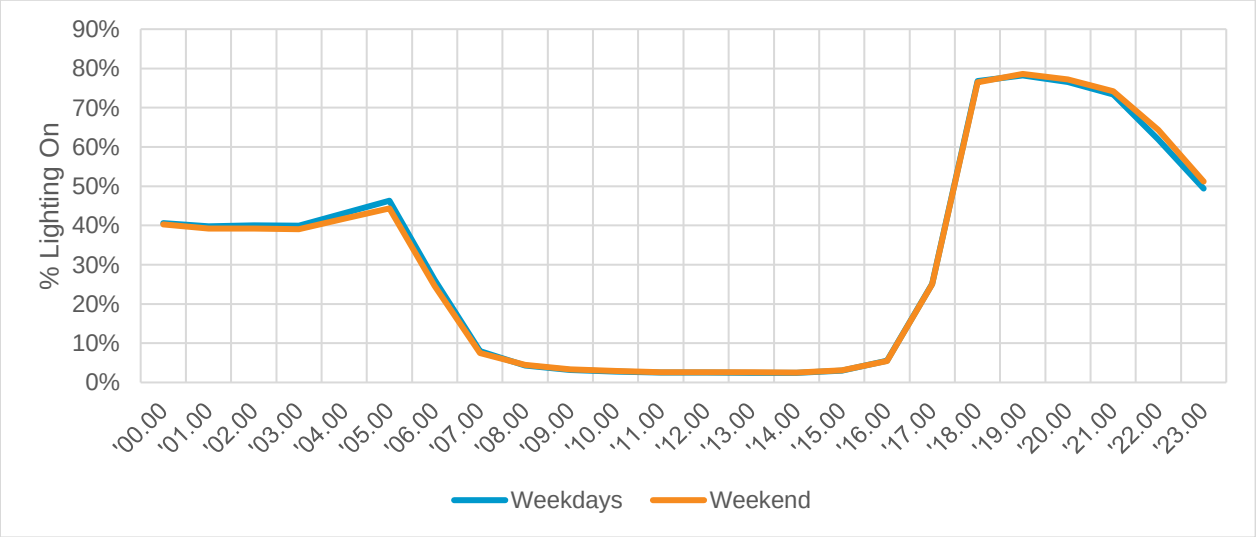


Figure 33: Share of lighting products in use at the given hour of the day

4.2.4 Television

Most of the respondents (80%) use television with wattage between 30 and 100 W. The Cathode Ray Tube (CRT) TV is still widely used in Indonesia as more than half of the respondents (58%) use this type of television.

Table 32. Distribution of television by wattage, size, and display type (5,468 units in sample representing 65,406,709 units nationally)

TV Wattage		Size		Display Type	
< 30 W	7%	**< 20 inch**	20%	**Tube TV**	58%
30 - 50 W	21%	**20 - 29 inch**	59%	**Flat Screen**[45]	41%
50 - 75 W	42%	**30 - 39 inch**	17%	**Don't know**	2%
76 - 100 W	16%	**40 - 49 inch**	3%		
101 - 125 W	6%	**50 - 59 inch**	1%		
126 - 150 W	4%	**> 60 inch**	0%		
> 151 W	3%				
Don't know	1%				

In general, hourly trends in TV usage during weekdays and weekends are similar, except for 07:00 to 11:00 when higher TV use time is reported on weekends compared to weekdays.

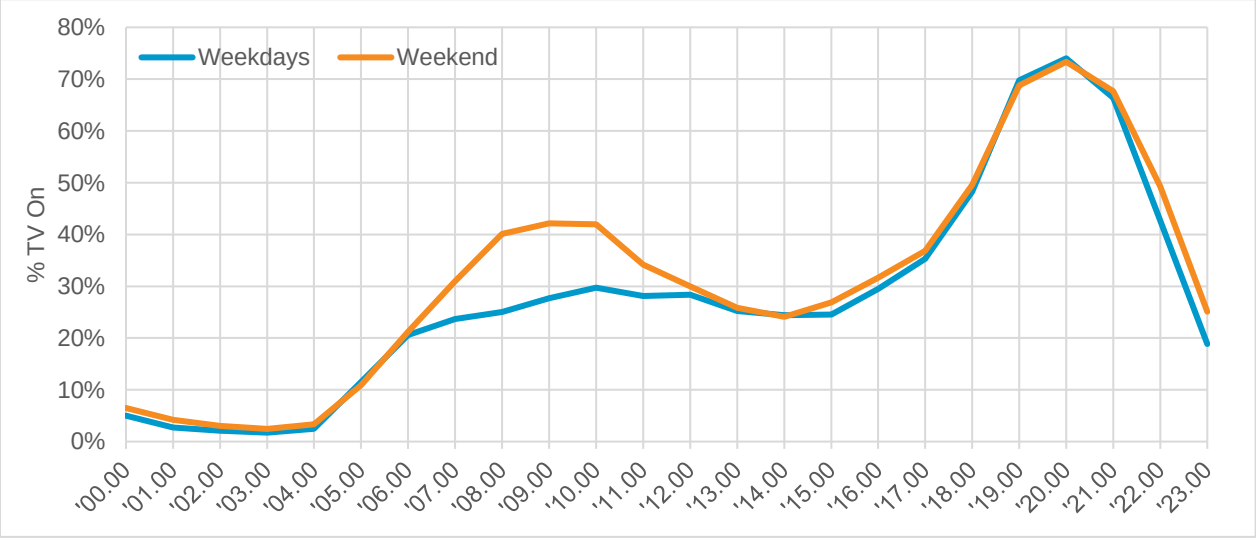


Figure 34: Share of televisions in use at the given hour of the day

[45] While respondents were asked to further separate TV into plasma, LED/LCD, and OLED, these distinctions are difficult to make and some responses regarding the age of the televisions indicated that they were not made correctly.

LG, Sharp, Polytron, and Samsung are the top television brands, comprising a total of 66% of TVs owned by the surveyed households. Up to 90% of TV brands found in Indonesia are listed in Table 33.

Table 33. Rank of brands comprising 90% of TVs in the surveyed households

Television Brands	Rank
LG	1
SHARP	2
POLYTRON	3
SAMSUNG	4
PANASONIC	5
TOSHIBA	6
AKARI	7
NOT IDENTIFIED	8
SANYO	9
CHANGHONG	10
SANKEN	11
SONY	12

The general preference for Tube TV might be due to its durability and low purchase price; however, as shown in Table 34, Tube TVs tend to be older than all televisions, indicating that they are being replaced by newer flat screen technologies such as LCD. Tube TV does tend to consume higher energy as compared to other TV technologies with the same screen size.[46]

Table 34. Distribution of TV by age and display type from the residential end use survey

	National	Tube	Plasma	LCE/ LED	OLED
Stock (million units) / Age of the Appliance	**65.91**	**36.53**	**4.98**	**22.98**	**0.41**
1 years	7%	3%	5%	13%	8%
2 years	11%	6%	14%	20%	10%
3 years	15%	10%	20%	21%	19%
4 years	10%	8%	11%	12%	6%
5 years	17%	16%	21%	16%	10%
6 years	7%	8%	9%	6%	16%
7 years	5%	7%	5%	3%	0%
8 years	6%	8%	6%	2%	7%
9 years	3%	3%	2%	1%	3%
>>10 years	20%	30%	7%	5%	21%
Average age	**6.15**	**7.47**	**4.77**	**4.13**	**6.16**

[46] Bhakar, Vikrant, et al. "Life cycle assessment of CRT, LCD and LED monitors." Procedia CIRP 29 (2015): 432-437.

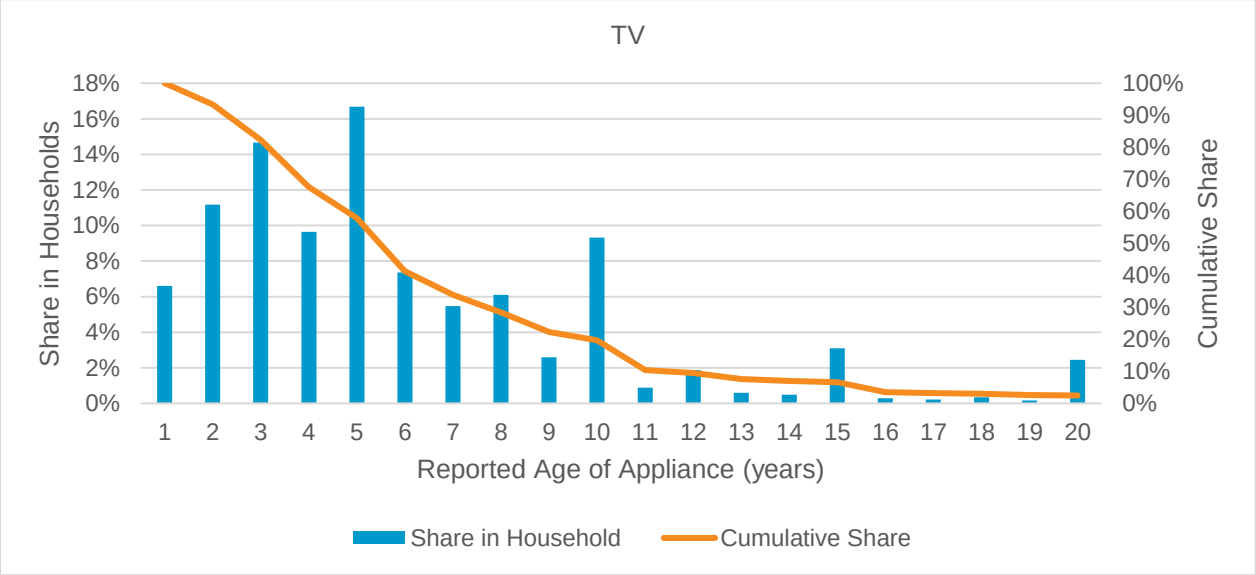


Figure 35: Distribution of TV by age

Further breakdown of the national TV distribution by age is provided in Figure 36, with the inclusion of Euromonitor shipment data from 2014 to 2019. Based on past shipments, both analogue or tube TV and plasma TV showed decreasing sales from 2019 to 2017, the last year of reported sales. This indicated that tube and plasma TVs with reported age of 3 years and less were likely to be used or refurbished units. In addition, the volume difference between the quantified stock units in this survey for tube and plasma TV with the new shipments was similarly accounted as used or refurbished units. Based on these available data, about 30% of all TV units surveyed in 2019 was used or refurbished tube and plasma TVs, with average age of 3.7 years.

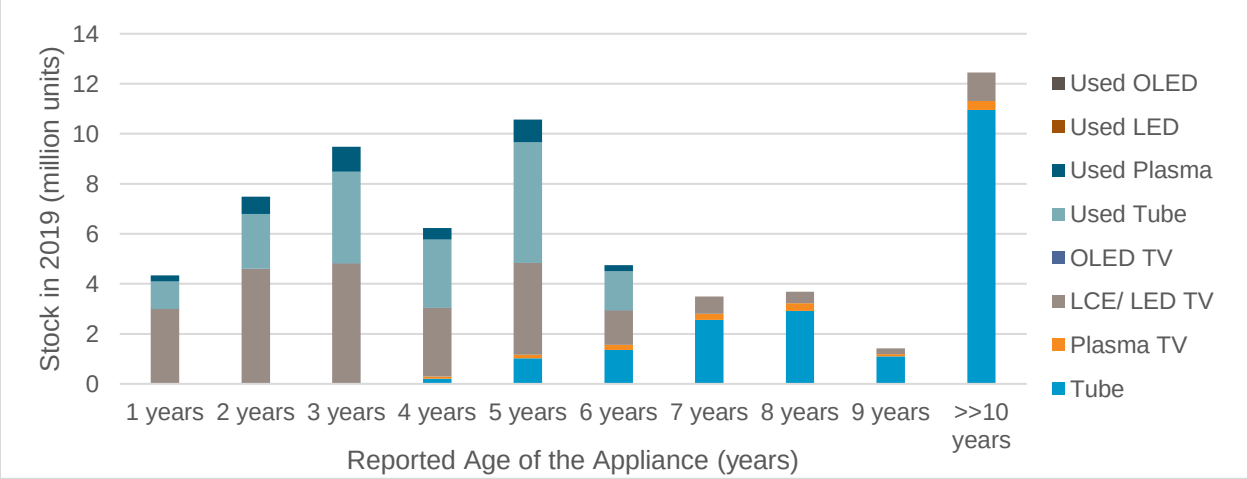


Figure 36: Distribution of TV by age and type[47]

[47] Compiled based on survey findings and Euromonitor Indonesia TV shipments from 2014 to 2019.

4.2.5 Electric Fan

Standing and floor fans are the most widely used types at 71% reported total share. Power rating of electric fans varies from less than 30 W up to 79 W. However, as a large proportion uses standing and floor fans, the weighted national average wattage for fans falls closely to typical floor fan wattage at around 44 W.

Table 35. Distribution of fans by wattage and type (4,782 units in sample representing 55,443,191 units nationally)

Wattage		Type	
<30 Watt	20%	**Standing fan**	48%
30 – 39 Watt	13%	**Floor fan**	24%
40 – 49 Watt	10%	**Wall fan**	14%
50 – 59 Watt	12%	**Ceiling fan**	7%
60 – 79 Watt	37%	**Multifunction fan**	4%
80 – 100 Watt	6%	**Portable fan**	2%
>100 Watt	2%	**Exhaust fan**	0%
Don't know	0%	**Bladeless fan**	0%
		Air (Evaporative) cooler	0%

The peak electricity consumption of electric fan is the highest during the daytime is at 13:00 and in the evening at 20:00, as shown in Figure 37.

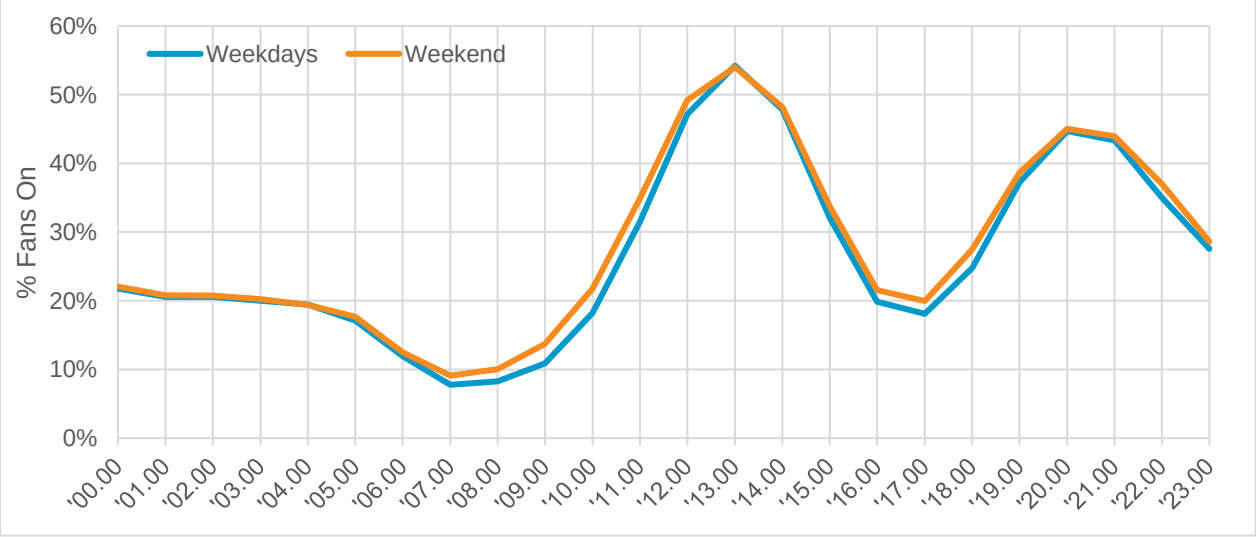


Figure 37: Share of electric fans in use at the given hour of the day

For electric fans, the top 3 brands, Maspion, Cosmos, and Miyako together comprise 54% of the stock in the surveyed households. Compared to other appliances such as AC, refrigerator, and television, the number of brands identified for electric fans that covers up to 90% of the stock is significantly higher. Nearly 7% of electric fan brands were unidentified.

Table 36. Rank of brands comprising 90% of electric fans in the surveyed households

Electric Fan Brands	Rank	Electric Fan Brands	Rank
MASPION	1	MITSUBISHI	18
COSMOS	2	KRISBOW	19
MIYAKO	3	SANYO	20
PANASONIC	4	MATSUNICHI	21
KIRIN	5	TRISONIC	22
MAYAKA	6	OKAYAMA	23
GMC	7	REFENCY	24
SEKAI	8	KENMASTER	25
ARASHI	9	UCHIDA	26
SANEX	10	AOYAMA	27
SANKEN	11	MIDEA	28
SHARP	12	VOLTRON	29
NIKO	13	CKE	30
NATIONAL	14	KDK	31
SOGO	15	TD	32
DENPOO	16	MIYOSHI	33
CHANGHONG	17		

The average age of electric fans was 4.07 years, as seen in Table 37, below.

Table 37. Age of electric fan from the residential end use survey

	Total
Stock (million units) / Age of the Appliance	**55.44**
1 year	14%
2 years	18%
3 years	22%
4 years	11%
5 years	16%
6 years	5%
>> 7 years	13%
Average (years)	**4.07**

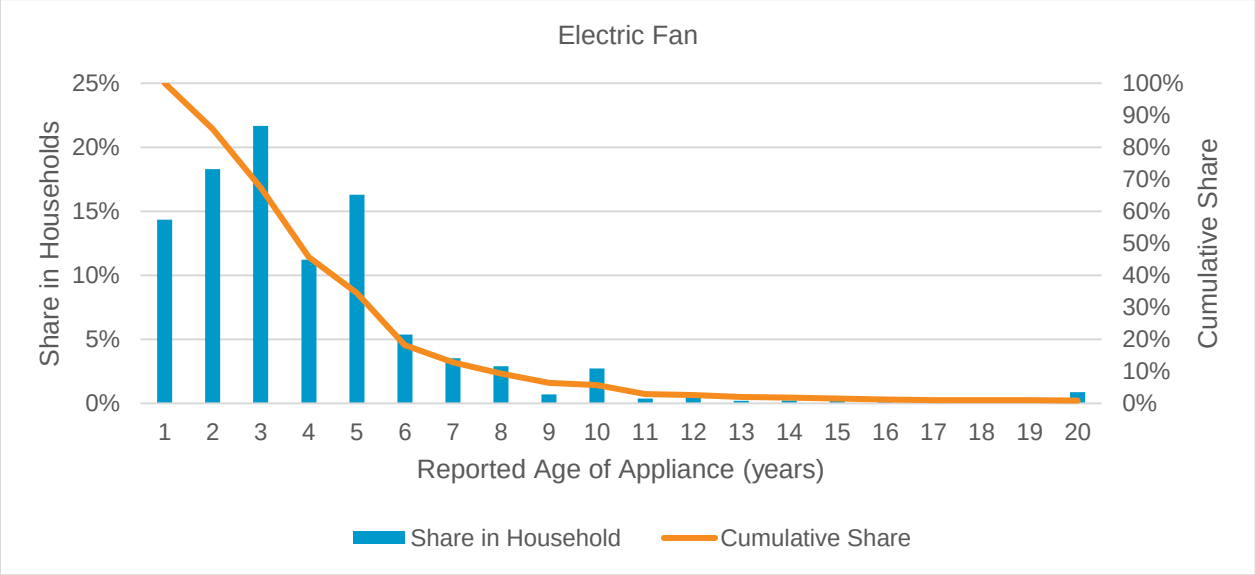


Figure 38: Distribution of electric fan by age

4.2.6 Air Conditioner

The most common AC type used in the surveyed households is the split AC with ½ PK capacity. The most commonly recognized refrigeration capacity unit in Indonesia is in the unit of paard kracht (PK), which is equivalent to 1 metric horsepower, or 735.5 W.[48] A 1 PK split AC can provide approximately 9,000 Btu/hr 2.6 kW of air conditioning capacity.[49]

Table 38. Distribution of AC products by wattage and type (382 units in the sample representing 3,970,392 units nationally)

Capacity		Type 1		Type 2	
½ PK	57%	**Standard**	54%	**Split**	82%
¾ PK	10%	**Inverter**	5%	**Window**	13%
1 PK (9,000 Btu/hr)	22%	**Don't know**	40%	**Portable**	2%
1.5 PK	2%			**Standing**	1%
2 PK	0%			**Other type**	2%
2.5 PK	1%				
Don't know	7%				

In a national impact assessment for air conditioners conducted by Lawrence Berkeley National Laboratory in 2019, it was estimated that small-capacity ACs with less than 1 refrigeration ton (RT), which is equivalent to 12,000 Btu/hr cooling capacity, constitute about 80% of the national market and are most common in households with low volt-ampere (VA) connections.[50] This assumption was validated through the findings

[48] National Institute of Standards and Technology. U.S. Department of Commerce. Guide for the Use of the International System of Units (SI). NIST Special Publication 811 2008 Edition.
https://nvlpubs.nist.gov/nistpubs/Legacy/SP/nistspecialpublication811e2008.pdf
[49] How to Calculate the Required for PK AC Usage for the Designated Room. National Elektronik.
https://www.nationalelektronik.com/2014/08/cara-menghitung-kebutuhan-pemakaian-pk-ac-sesuai-ruangan/
[50] Lawrence Berkeley National Laboratory. Technical Report 01/2020. Accelerating the Transition to More Energy Efficient Air Conditioners in Indonesia. https://ies.lbl.gov/publications/accelerating-transition-more-energy

obtained in the survey, where approximately 57% of ACs installed in the surveyed households have ½ PK capacity, followed by 10% with ¾ PK, and 22% with 1 PK, as seen in Table 38, for a total of 89% below 12,000 Btu/hr or 3.5 kW.

Using EBTKE data on the performance of ACs in the market in 2019, CLASP identified the power range of split AC models sold in the market. Figure 39 plots the tested cooling capacity values reported for the registered AC models against their input power, which depends on their energy efficiency ratio (EER).[51]

CLASP then took the PK capacities from the survey, converted them to Btu/hr, and assigned input power based on the distribution of performance in the market. Tabulated values are provided in Table 39. Units with unknown capacity (7% share) were assigned the weighted average wattage of the models with identified capacity.

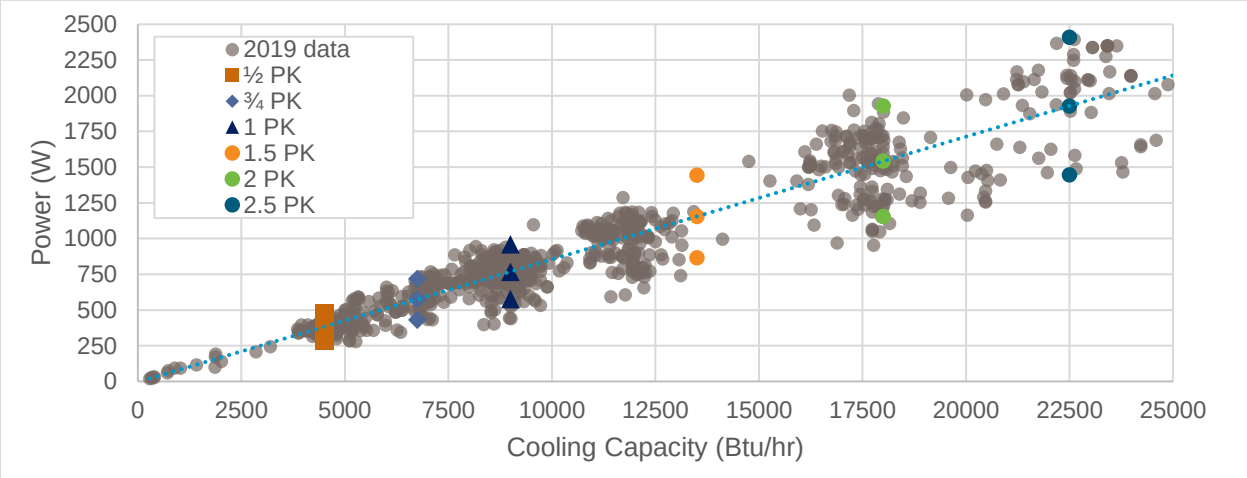


Figure 39: Performance data for AC in 2019, with upper, mean, lower power rating at varying capacities[52]

Table 39. Estimated power rating distribution for ACs in Indonesia based on 2019 market performance

Ref. Heat Removal Needs (BTU/h)	Cooling Capacity	Share	Market Mean Wattage (W)	Market Lower Wattage (W)	Market Upper Wattage (W)
4,500	½ PK	62%	382	287	478
6,750	¾ PK	11%	575	431	719
9,000	1 PK	24%	769	576	961
13,500	1.5 PK	2%	1155	866	1444
18,000	2 PK	0%	1542	1156	1927
22,500	2.5 PK	1%	1928	1446	2410

[51] EER is the ratio of the cooling capacity in Btu/h and the input electrical power in watts.
[52] Direct correspondence with MEMR EBTKE in Jan 2020. Active regulation Permen No. 57 Year 2017. Testing is conducted based on SNI 19-6713:2002, fully adopted from ISO 5151:1994.

Peak consumption of AC is between 19.00 in the evening to early morning at 05:00, though some respondents also use their ACs in the daytime from 12:00 to 15:00. For AC, the usage during the day on the weekend is significantly higher than usage on weekdays.

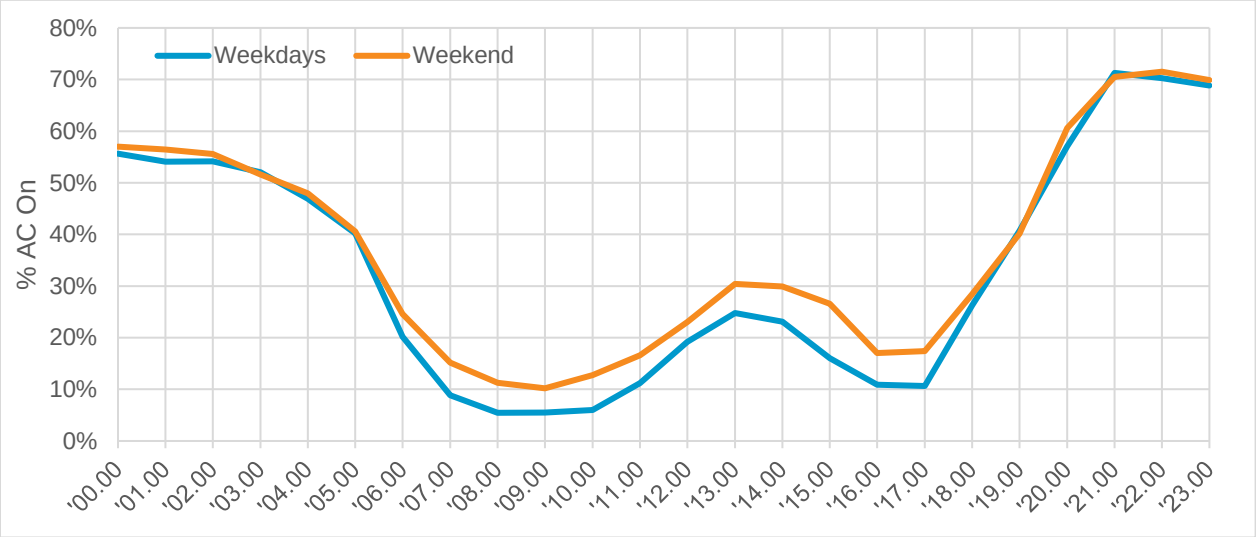


Figure 40: Share of ACs in use at the given hour of the day

Most ACs in the surveyed households are set at an average operating temperature of 20°C. While there is a general recommendation to set ACs at 24 to 25°C to increase energy efficiency, nearly 70% of ACs are set below 20°C, and only 15% are set above 25°C.

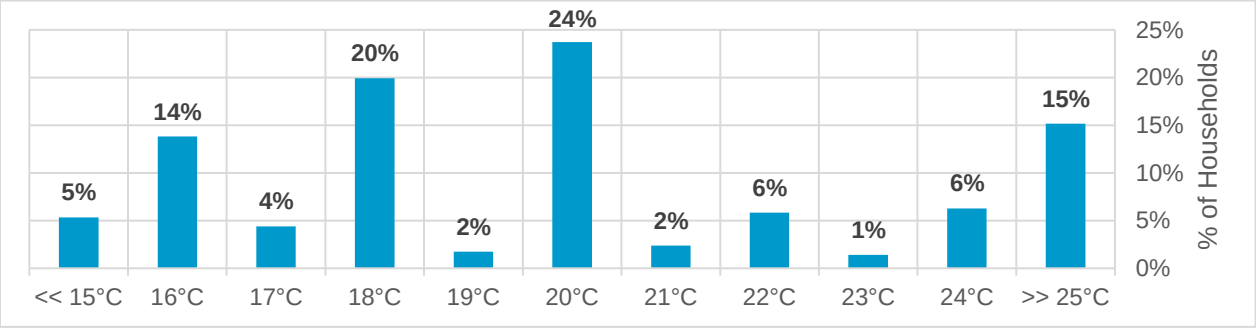


Figure 41: Temperature setpoints of AC in the surveyed households

The information on collected on temperature setpoints can be used as a reference for the government, to justify the need to release regulations or programs in cooperation with AC manufacturers to establish a default setting at an optimum temperature most suitable to Indonesian climate and thermal comfort preference. India has enforced a mandatory default setting at 24°C for all star-labeled room ACs in March 2020,[53] while Japan had initiated the "Cool Biz" campaign in 2005 to reduce electricity consumption for air conditioning by changing default office setting to 28°C and introduce dress codes that are suitable for warmer temperatures.[54]

[53] The Ministry of Power, the Bureau of Energy Efficiency, the Government of India. Star Labeling Program for Light Commercial Air conditioners – Schedule 24. Valid from March 2, 2020.
[54] Japan Ministry of Environment. CoolBiz. https://ondankataisaku.env.go.jp/coolchoice/coolbiz/article/2020_action_detail_004.html

Top brands identified in Indonesia are LG, Panasonic, Sharp, and Samsung. These brands comprise 75% of the AC stock in the market. Brands comprising up to 90% of the stock are listed in Table 40.

Table 40. Rank of brands comprising 90% of ACs in the surveyed households

Air Conditioner Brands	Rank
LG	1
PANASONIC	2
SAMSUNG	3
SHARP	4
POLYTRON	5
CHANGHONG	6
AUX	7
SANYO	8
MIDEA	9
MITSUBISHI	10
TOSHIBA	11
AQUA	12

Inverter AC is a new technology in Indonesia with relatively low prevalence in households. However, ACs marketed as “low watt” are relatively widely used, at around 30% of the surveyed ACs. On average, ACs used in households are 4 years old.

Table 41. Age of AC by technology in the residential end use survey

	Total	*Standard*	*Inverter*	*Other/Don’t know*
Stock (million units) / Age of the Appliance	***3.97***	***2.15***	***0.21***	***1.65***
1 years	10%	12%	10%	8%
2 years	23%	21%	41%	22%
3 years	22%	25%	40%	16%
4 years	13%	11%	0%	18%
5 years	14%	13%	6%	15%
6 years	5%	4%	3%	7%
7 years	3%	4%	0%	3%
8 years	3%	3%	1%	4%
9 years	0%	1%	0%	0%
>>10 years	6%	6%	0%	7%
Average (years)	**4.0**	**4.0**	**2.6**	**4.2**

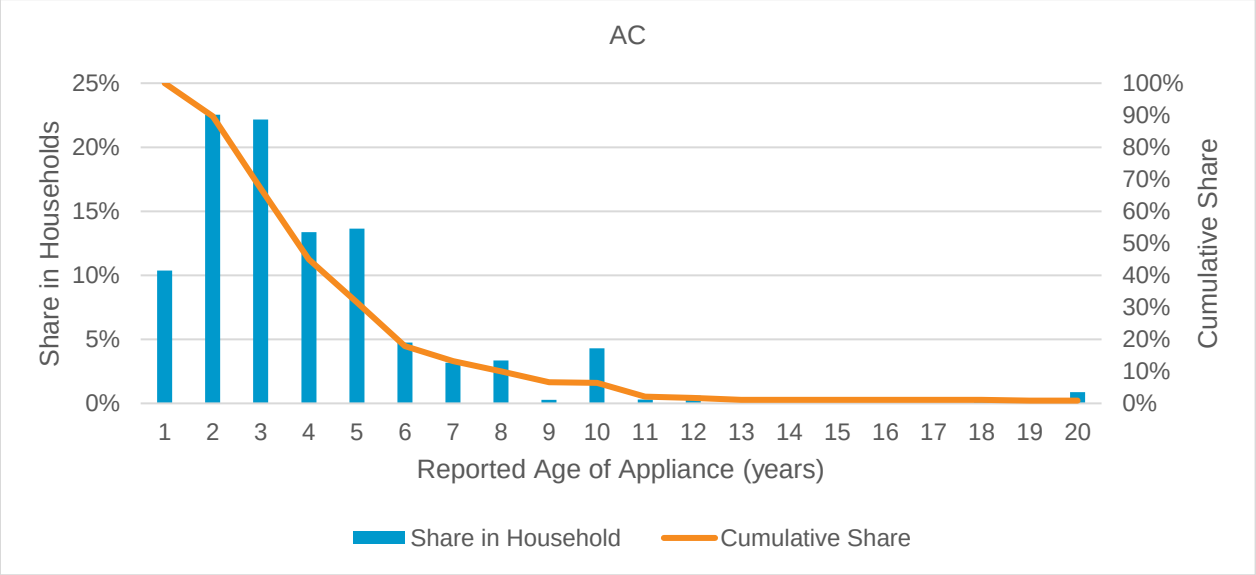


Figure 42: Distribution of AC by age

4.2.7 Water Dispenser

Nearly half of the respondents have water dispensers with wattage capacity up to 300 W. The most common type is top water storage with normal (room temperature) and hot water dispensing features. Variants of water dispenser types most commonly used in the surveyed households are shown in Figure 43, for dispensing features and bottle placement.

Table 42. Distribution of water dispenser by wattage, feature, and water placement (1,148 units in sample representing 13,252,214 nationally)

Wattage		Feature		Water Bottle Placement	
< 200 W	25%	**Normal and hot**	90%	**Top water storage**	97%
200 - 250 W	21%	**Normal, hot, and cold**	10%	**Bottom water storage**	3%
251 - 300 W	5%				
301 - 400 W	7%				
>400 W	3%				
Don't know	39%				

Dispensing feature:
normal and hot (left), normal, hot, and cold (right)

Bottle placement:
top storage (left), bottom storage (right)

Figure 43: Common water dispenser variants based on water dispensing feature and water bottle placement in Indonesia[55]

Water dispenser is used on a daily basis. Nearly half of the respondents unplug their water dispenser when the unit is not in use, indicating a raised awareness on energy conservation. This is a significant parameter to consider in the energy consumption estimates, in which 8 hours of inactivity was assumed for the reported frequency of unplugging.

This behavior should certainly be encouraged by the government and accommodated by the appliance industry through inclusion of energy-saving features that will further increase ease of operation and improve unit efficiency. In addition, the presence of policies and programs would help consumers better recognize efficient water dispensing units.

Table 43. Frequency of usage and unplugging for water dispenser (1153 units in sample reporting usage)

Frequency of Usage		Frequency of Unplugging	
Daily/ almost daily	77%	**Daily/ almost daily**	46%
3 – 4 times/ week	7%	**3 – 4 times/ week**	20%
1 – 2 times/ week	7%	**1 – 2 times/ week**	13%
1 – 3 times/ month	3%	**Less than 1 time/ week**	21%
Less than once in a month	6%		

[55] Retrieved from web stores.
https://www.lazada.co.id/catalog/?q=dispenser&_keyori=ss&from=input&spm=a2o4j.pdp.search.go.5d275137kkhkPv

4.2.8 Washing Machine

The majority (54%) of washing machines in surveyed households had wattage less than or equal to 300 W. Most washing machines were top loading with two drums (76%), where washing is done in the first drum and spin-drying in the second drum. Nearly one-fifth of households use the top loading type with one drum. Around half of the washing machine have capacity of 6 to 7 kg, with one third with higher capacity. Shown in the subsequent Figure 44 are the three most common types of washing machines.

Table 44. Distribution of washing machine products by wattage and type (1,638 units in sample representing 18,836,247 nationally)

Wattage		Type 1 – Loading Type		Type 2 – Capacity	
< 250 Watt	23%	**Washing machine 2 drum – top loading**	76%	**< 6 kg**	13%
250 – 300 Watt	31%	**Washing machine 1 drum – top loading**	21%	**6 – 7 kg**	54%
301 – 350 Watt	11%	**Washing machine – front loading**	3%	**8 – 9 kg**	27%
351 – 400 Watt	2%	**Other/Don't know**	10%	**> 9 kg**	5%
> 400 Watt	2%				
Don't know	32%				

2 drum – top loading **1 drum – top loading** **front loading**

Figure 44: Common types of washing machine in Indonesia[56]

In general, washing machines are used 16 days per month or once every 2 days. As for the hourly use trend, 37% of washing machines are used at 08:00 in the morning, which is the peak use time nationally.

[56] Pictures retrived from web stores. https://www.blanja.com/katalog/p/hap/mesin-cuci-aqua-qw-881xt-8kg-2-tabung-16752149, https://www.bhinneka.com/samsung-mesin-cuci-top-load-wa85h4000ha-skusku01214294, https://id.sharp/products/home-appliances/es-fl1073w

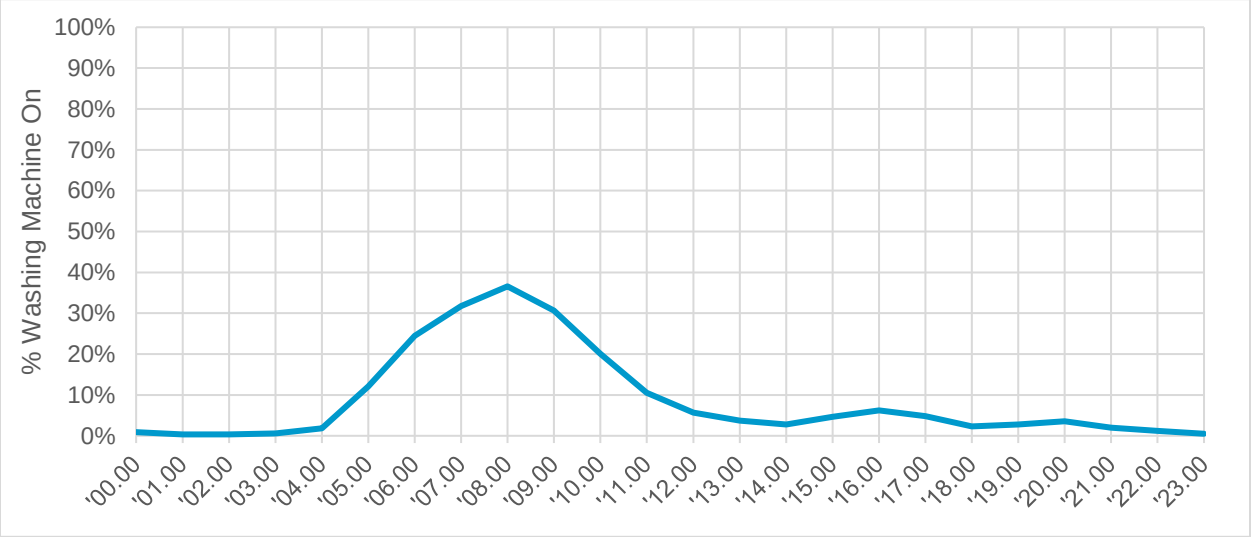


Figure 45: Share of washing machines in use at the given hour of the day

4.2.9 Electric Iron

Almost one third of electric irons have wattage less than 300 W, while the largest portion (44%) have power between 300 and 350 W. Penetration of electric irons is slightly higher than rice cookers, which implies that electric iron is one of the primary appliances in Indonesian households. Despite its high penetration and high wattage, frequency of use for electric iron is relatively low. Irons are generally used once every 3 days (12 days per month). Regular plate electric iron is the dominant type, at 98% of the stock share.

Table 45. Distribution of electric iron products by wattage and type (3,869 units in the sample representing 45,850,426 nationally)

Wattage		Type	
< 300 Watt	30%	**Regular (Plate)**	98%
300 – 350 Watt	44%	**Vapor**	1%
351 – 400 Watt	5%	**Plate & Vapor**	1%
401 – 500 Watt	1%		
> 500 Watt	1%		
Don't know	19%		

The usage of electric iron is distributed throughout the day, with peaks at 06:00, 10:00, and 14:00 to 15:00.

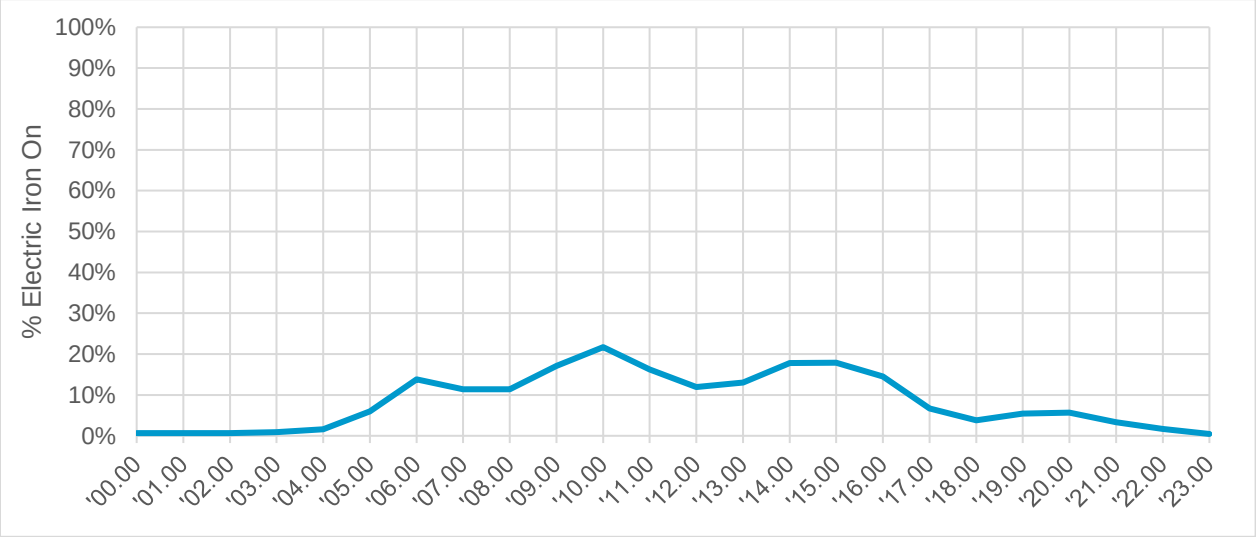


Figure 46: Share of electric iron in use at the given hour of the day

4.2.10 Water Pump

Water pumps are used on a daily basis. Unfortunately, 88% of water pumps did not have accurate wattage reported by the respondents. This average value was 414 W, averaged from 215 respondents who reported water pump wattage.

Table 46. Water pump wattage and use frequency (1,858 units in the sample representing 22,577,810 nationally)

Wattage		Frequency of Use	
< 200 W	0%	**Daily/ almost daily**	91%
200 – 500 W	9%	**3 – 4 times/ week**	4%
501 – 800 W	1%	**1 – 2 times/ week**	2%
> 800 W	0%	**1 – 3 times/ month**	1%
Don't know	89%	**Less than once in a month**	3%

Water pumps are mostly used early in the day, with the first peak from 05:00 to 06:00 and the second peak from 16.00 to 17.00. There is minimal usage in the nighttime, from 23.00 to 03:00.

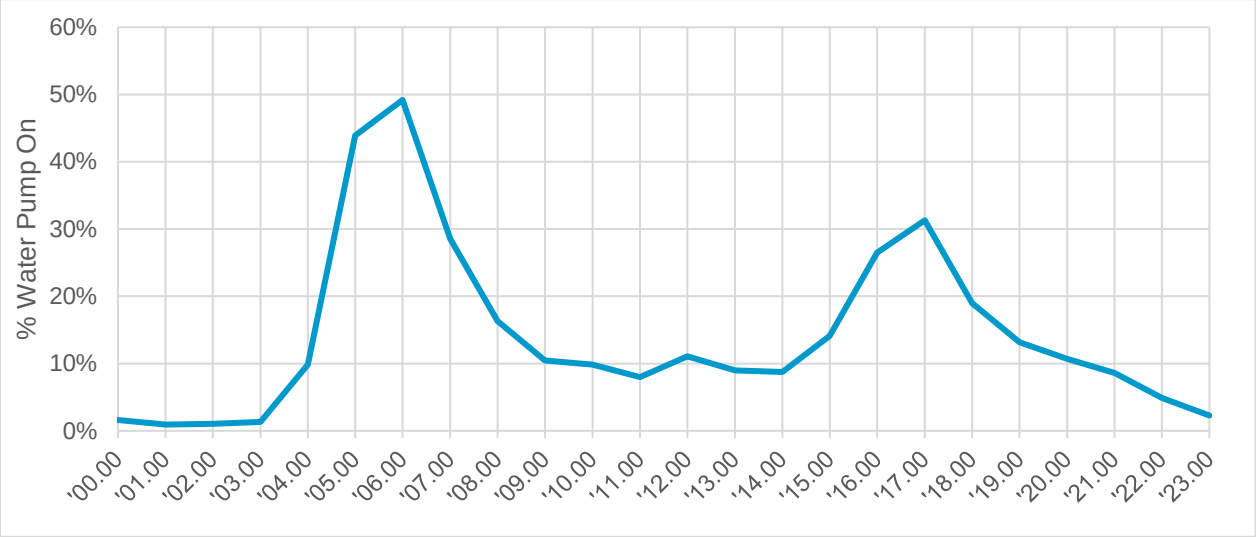


Figure 47: Share of water pump in use at the given hour of the day

4.2.11 Other Appliances

The survey also assessed 32 other electronic appliances. These appliances were expected to consume less energy due to lower rates of ownership, lower usage despite having relatively high wattage, or low wattage, leading to lower energy consumption despite high usage. Table 47 lists these additional appliances, with average wattage and use frequency.

Table 47. Other appliances penetration, ownership count, and use frequency sorted based on penetration

Appliance	Projection (household)	Average Number of Appliances Owned (unit)	Usage Frequency (days/month)	Average Wattage (W)	Average Hours of Use (hour/day)
Cell phone	50,918,989	1.9	29.4	10	4.7
Blender	17,808,392	1.0	12.6	215	1.5
DVD/VCD Player	9,129,845	1.0	9.2	176	2.0
Speaker	7,502,410	1.1	12.6	234	2.4
Mixer	6,169,270	1.0	3.6	185	1.5
Laptop	5,906,068	1.1	19.5	15	2.9
Radio	2,901,991	1.0	16.6	173	2.7
Tablet	2,309,135	1.1	26.1	15	4.0
Printer	1,125,187	1.0	12.6	15	1.6
Compo/mini compo	1,052,530	1.0	13.2	157	2.2
Emergency lamp	1,013,840	1.3	26.4	15	2.3
Personal computer	861,291	1.1	17.5	308	3.8
Wifi router	856,866	1.0	29.2	15	17.7
Desk lamp	695,848	1.1	26.4	81	3.2
Hair iron	692,588	1.0	7.2	230	1.6

Appliance	Projection (household)	Average Number of Appliances Owned (unit)	Usage Frequency (days/month)	Average Wattage (W)	Average Hours of Use (hour/day)
Juicer	654,109	1.0	8.5	218	2.7
Hair dryer	648,565	1.0	8.7	258	1.5
Electric water heater	611,951	1.1	28.8	680	1.9
Electric oven	433,643	1.0	7.5	295	2.8
Vacuum cleaner	400,861	1.0	8.6	379	1.8
Aquarium pump	334,283	1.1	30.0	15	18.1
Toaster	326,228	1.0	9.6	278	2.5
Microwave	301,249	1.0	13.3	620	2.9
Set Top Box	243,683	1.0	27.2	150	5.4
Decorative pump	213,079	1.0	28.9	232	5.3
Cooktop	198,448	1.0	19.2	700	3.5
Home phone	91,566	1.0	23.9	15	24.0
Kitchen exhaust	86,740	1.1	26.7	221	11.7
Electric bike	31,577	1.0	6.5	100	2.8
Dishwasher machine	23,867	1.0	3.5	125	13.5
Segway	6,859	1.0	30.0	125	2.0

The hourly trends are plotted in groups for communication and entertainment devices in Figure 48, additional lighting products and water pump units in Figure 49, and other types of household appliances, namely electric water heater and kitchen exhaust fan in Figure 50. Due to the relatively low energy share at the national level, hourly trends for remaining appliances were not analyzed.

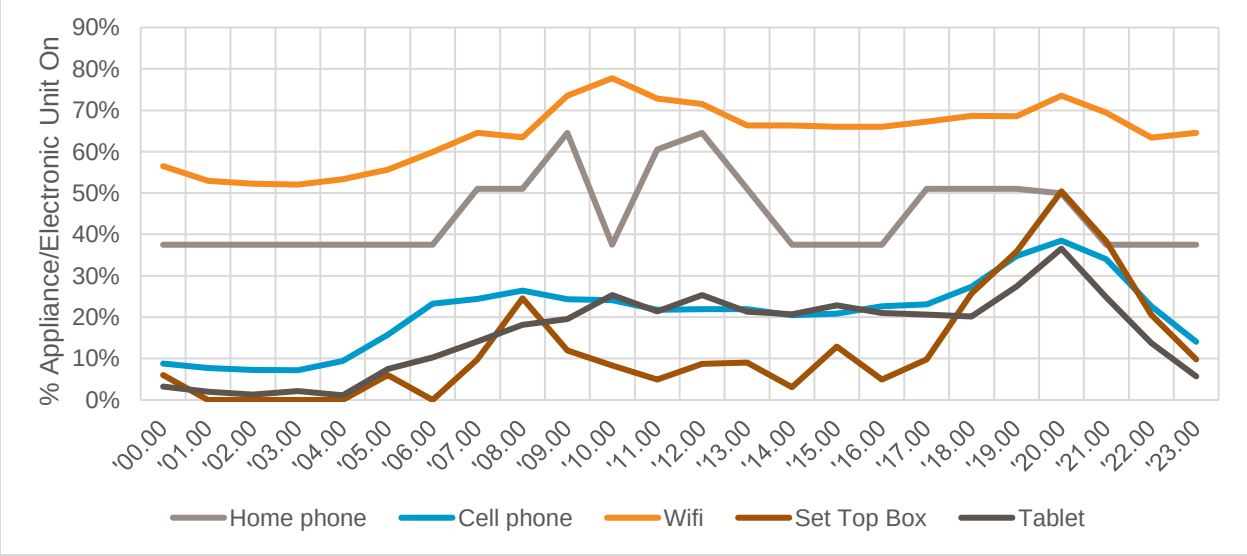


Figure 48. Share of communication and entertainment devices in use at the given hour of the day

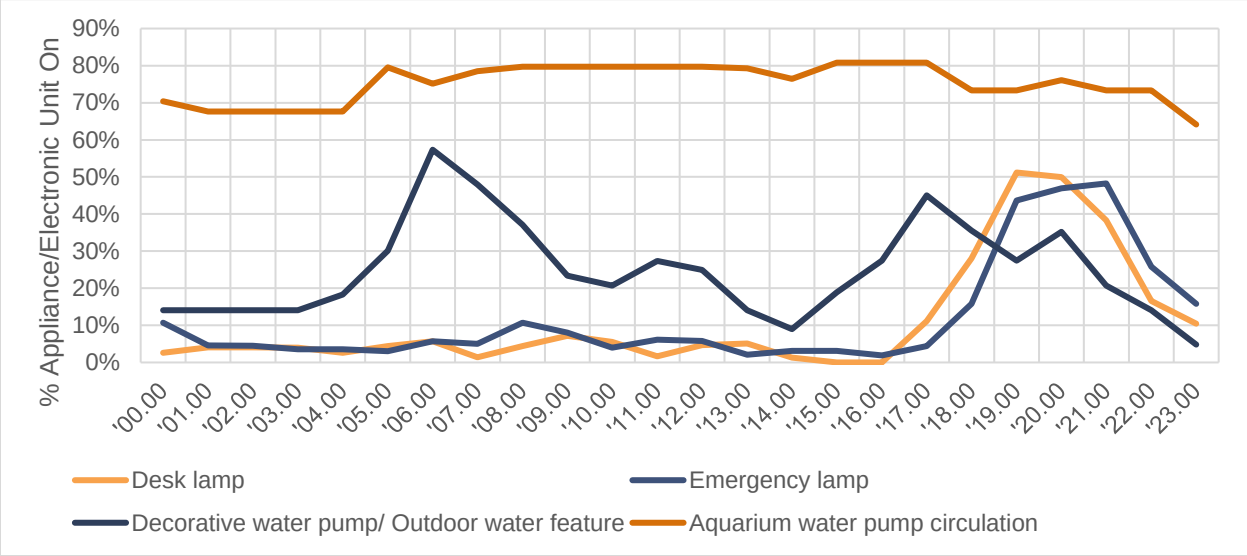


Figure 49. Share of other lighting products and water pumps in use at the given hour of the day

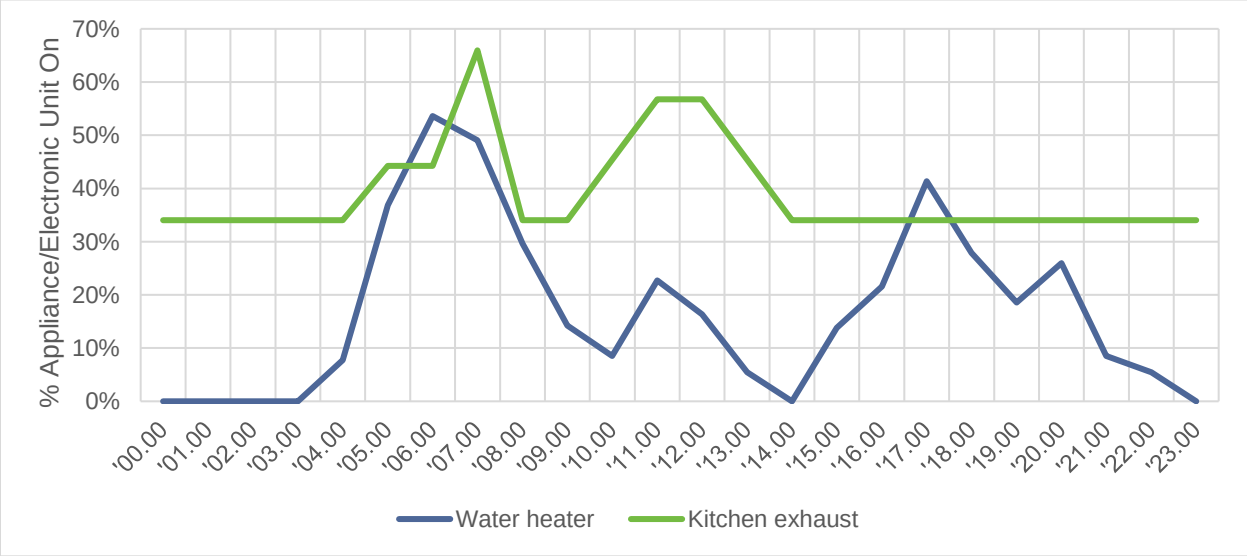


Figure 50. Number of other types of household appliances in use at the given hour of the day

5 Public Awareness of Energy Efficiency

5.1 Factors Considered During Appliance Purchase

The survey team evaluated six different factors considered during a new appliance purchase: the product's energy savings, brand, price, technology, type or capacity, and country of origin/local product. For five of the primary appliances—lighting, refrigerator, AC, electric fan and rice cooker—energy savings was identified as the most important factor when purchasing. The only exception was observed for TV, where energy savings was the second most important factor after brand.

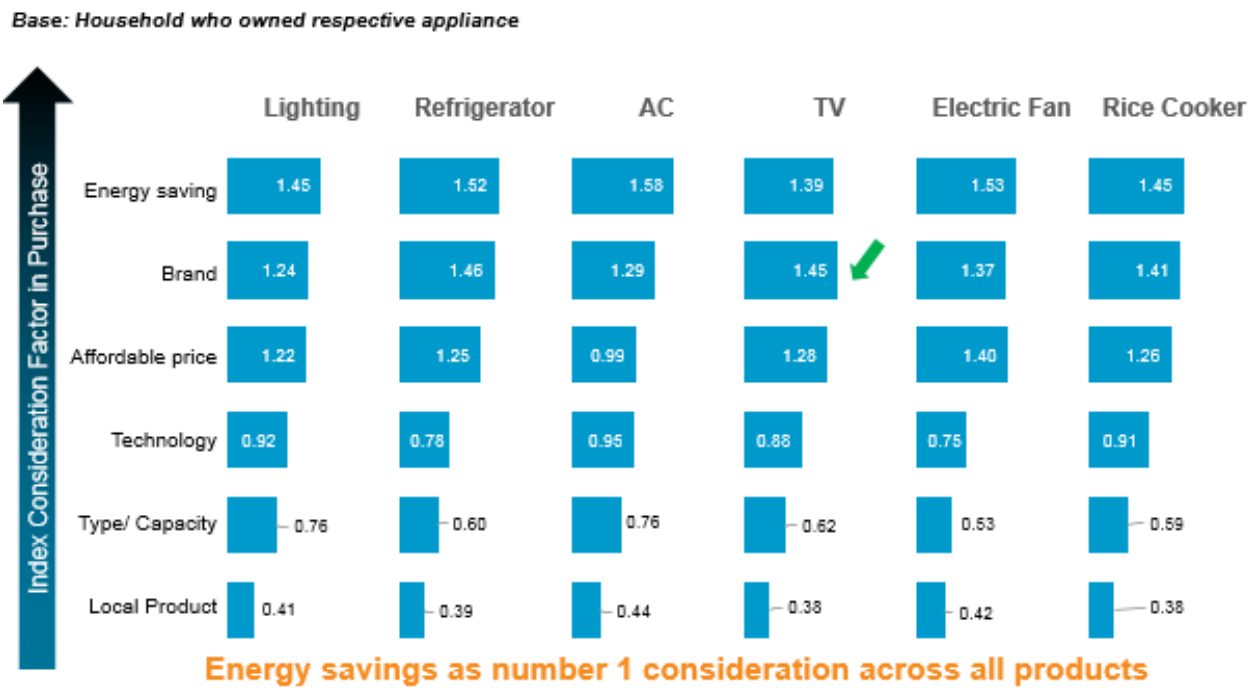


Figure 51: Ranking of factors considered during appliances purchase

These responses varied somewhat by region;

- In Sumatera, Kalimantan, and Sulawesi, energy savings was the number one factor when buying all of the primary appliances;
- In Java, Bali, Nusa Tenggara regions, energy savings and brand were the most important;
- In Papua, affordable price and brand were the most considered factors.

These findings are further illustrated in Table 48.

Table 48. Factors considered during appliance purchase for the major island groups

Purchase Factors Considered	National	Sumatera	Java	Bali & Nusa Tenggara	Kalimantan	Sulawesi	Maluku & Papua
Base Respondent (n)	**5,443**	**1122**	**3135**	**252**	**322**	**405**	**207**
Projection (household)	**65,235,368**	**13,396,690**	**39,425,688**	**3,276,344**	**3,729,477**	**4,267,387**	**1,139,978**
Lighting							
Affordable price	18%	18%	18%	16%	9%	21%	**36%**
Brand	22%	21%	23%	24%	19%	18%	19%
Technology	12%	15%	12%	8%	22%	6%	10%
Energy Saving	**27%**	**25%**	**26%**	**26%**	**33%**	**38%**	12%
Local Product	6%	8%	6%	5%	4%	3%	12%
Illumination Level	15%	13%	15%	21%	14%	15%	11%
Refrigerator							
Affordable price	23%	17%	18%	23%	16%	19%	34%
Brand	22%	26%	**30%**	**28%**	19%	23%	**35%**
Technology	11%	8%	9%	11%	15%	4%	8%
Energy Saving	**25%**	**30%**	**25%**	19%	**35%**	**41%**	6%
Local Product	7%	7%	5%	5%	3%	4%	7%
Capacity	13%	12%	13%	14%	12%	8%	10%
Air Conditioner							
Affordable price	12%	15%	13%	0%	10%	3%	**35%**
Brand	24%	18%	24%	27%	32%	32%	23%
Technology	12%	7%	15%	7%	18%	4%	22%
Energy Saving	**33%**	**30%**	**31%**	**39%**	**35%**	**52%**	0%
Local Product	5%	6%	5%	7%	0%	3%	15%
Power (PK)	14%	24%	12%	20%	5%	5%	5%
Television							
Affordable price	19%	16%	19%	23%	20%	19%	**28%**
Brand	28%	25%	**30%**	24%	22%	25%	26%
Technology	9%	9%	9%	8%	14%	5%	14%
Energy Saving	**24%**	**29%**	21%	**27%**	**32%**	**36%**	5%
Local Product	6%	8%	5%	5%	2%	2%	16%
Size	14%	12%	15%	13%	11%	13%	11%

Purchase Factors Considered	National	Sumatera	Java	Bali & Nusa Tenggara	Kalimantan	Sulawesi	Maluku & Papua
Base Respondent (n)	**5,443**	**1122**	**3135**	**252**	**322**	**405**	**207**
Projection (household)	**65,235,368**	**13,396,690**	**39,425,688**	**3,276,344**	**3,729,477**	**4,267,387**	**1,139,978**
Electric Fan							
Affordable price	22%	**24%**	20%	**27%**	26%	26%	**44%**
Brand	24%	22%	26%	22%	19%	17%	22%
Technology	8%	7%	8%	7%	14%	4%	7%
Energy Saving	**28%**	**30%**	**27%**	**27%**	**31%**	**43%**	5%
Local Product	6%	7%	6%	3%	3%	4%	18%
Blade Size	12%	11%	13%	14%	7%	6%	4%
Rice Cooker							
Affordable price	18%	18%	18%	20%	18%	15%	**45%**
Brand	26%	25%	**28%**	22%	19%	22%	23%
Technology	9%	9%	9%	6%	15%	2%	13%
Energy Saving	**26%**	**28%**	24%	**28%**	**32%**	**44%**	5%
Local Product	6%	7%	6%	8%	3%	4%	4%
Cooking Capacity	15%	13%	16%	16%	14%	12%	10%

In both urban and rural areas, refrigerator, AC, and rice cooker purchases were found to be made under differing considerations while the purchase consideration factors were considerably similar for lighting, TV, and fans. As a general observation, households residing in urban areas were shown to prioritize energy savings, while households residing in rural areas would likely opt for brand names.

Despite the high consideration for energy savings, not all consumers were aware of the wattage of their household appliances. Some respondents were not able recall the nominal power rating of their appliances. Outreach programs would play a substantial role in raising people's awareness of appliances energy efficiency and helping consumers make better purchase decisions.

Table 49. Consideration factors in appliances purchase for urban and rural households

Consideration Factor	National	Urban	Rural
Base Respondent (n)	**5,443**	**2979**	**2464**
Projection (household)	**65,235,368**	**30,306,017**	**34,929,351**
Lighting			
Affordable price	18%	16%	19%
Brand	22%	21%	23%
Technology	12%	12%	13%
Energy Saving	**27%**	**30%**	**23%**
Local Product	6%	5%	7%
Illumination Level	15%	15%	14%

Consideration Factor	National	Urban	Rural
Base Respondent (n)	**5,443**	**2979**	**2464**
Projection (household)	**65,235,368**	**30,306,017**	**34,929,351**
Refrigerator			
Affordable price	23%	16%	21%
Brand	22%	27%	**29%**
Technology	11%	10%	8%
Energy Saving	**25%**	**29%**	25%
Local Product	7%	5%	6%
Capacity	13%	13%	12%
Air Conditioner			
Affordable price	12%	12%	12%
Brand	24%	23%	**28%**
Technology	12%	13%	2%
Energy Saving	**33%**	**35%**	20%
Local Product	5%	4%	11%
Power (PK)	14%	12%	**28%**
Television			
Affordable price	19%	17%	21%
Brand	28%	**29%**	**27%**
Technology	9%	10%	9%
Energy Saving	**24%**	26%	23%
Local Product	6%	5%	6%
Size	14%	14%	14%
Electric Fan			
Affordable price	22%	20%	**25%**
Brand	24%	26%	22%
Technology	8%	7%	8%
Energy Saving	**28%**	**31%**	**25%**
Local Product	6%	5%	7%
Blade Size	12%	11%	13%
Rice Cooker			
Affordable price	18%	16%	21%
Brand	26%	27%	**25%**
Technology	9%	9%	9%
Energy Saving	**26%**	**29%**	23%
Local Product	6%	5%	6%
Cooking Capacity	15%	13%	17%

5.2 Energy Efficiency Logo Awareness

Comparative energy labeling has been in place in Indonesia since 2014 for CFLs[57] and labeling and Minimum Energy Performance Standards (MEPS) or *Standar Kinerja Energi Minimu*m (SKEM) has been in place since 2015 for ACs.[58] Despite the energy label's existence for the past 5 years, national awareness of the energy label is still very low, at only **6.5%** as quantified through this survey. The region with the highest energy efficiency logo awareness was Maluku and Papua, where only 2% of the national population reside, at 11% awareness rate, while the region with the lowest rate was Bali and Nusa Tenggara at 3%.

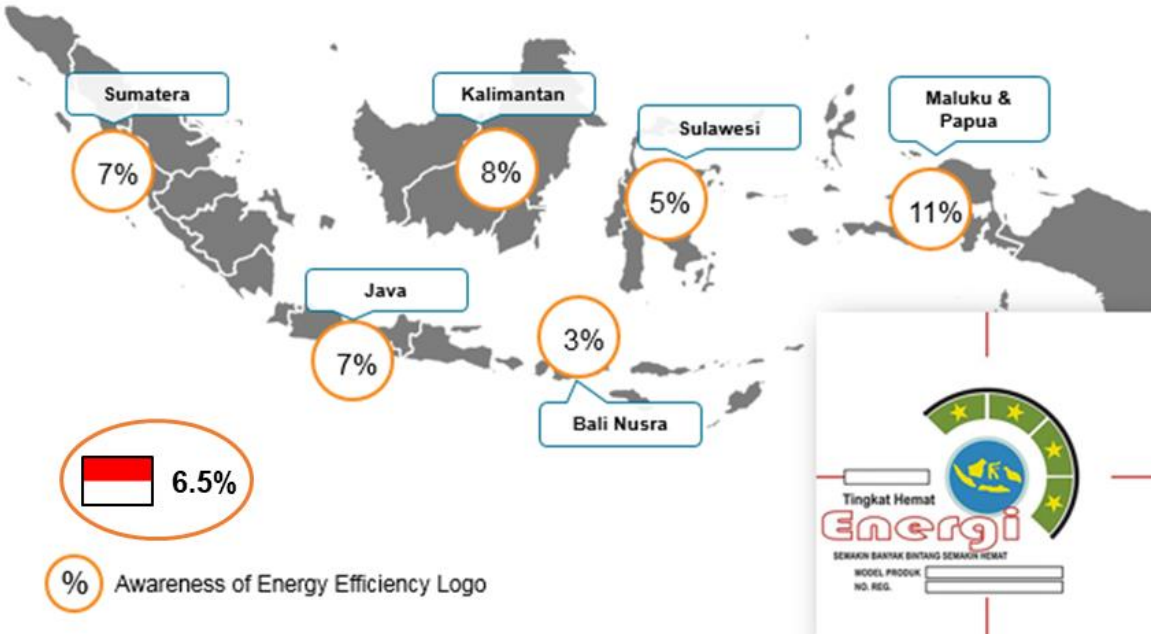


Figure 52: Awareness of energy efficiency logo in major island groups

Paradoxically, despite the low awareness, a high portion of survey respondents indicated that the energy saving label serves as a guideline for product efficiency, especially in Sumatra and Kalimantan. The nameplate power rating or the wattage of the product were mentioned by most respondents as the preferred guide in gauging the product's energy efficiency.

Table 50. Guideline to determine efficiency in the major island groups

Purchase Guide	Nationwide	Sumatra	Java	Bali & Nusa Tenggara	Kalimantan	Sulawesi	Maluku & Papua
Wattage	63%	67%	63%	47%	69%	58%	56%
Ask the salesperson directly	45%	41%	46%	49%	43%	50%	11%
Energy saving label	38%	44%	35%	26%	47%	39%	29%
Recommendations from friends / family	28%	27%	29%	36%	14%	32%	23%
Brand	1%	1%	0%	0%	2%	0%	0%

[57] Minister MEMR Regulation No. 18 Year 2014
[58] Minister MEMR Regulation No. 07 Year 2015, revised No. 57 Year 2017

Among the people who were aware of SKEM and comparative labels, the vast majority were able to interpret the energy label correctly. For instance, although only 7% people in Java were aware of the label, 94% of them had the correct understanding. In Maluku and Papua, the region with 11% of the surveyed households who are aware of the SKEM label, 92% understood the label. The level of the correct understanding is the lowest in Sulawesi at 80%.

Table 51. Understanding of the labeling logo in the major island groups

Energy Label Logo Understanding	Nationwide	Sumatra	Java	Bali & Nusa Tenggara	Kalimantan	Sulawesi	Maluku & Papua
The more stars, the more energy efficient	88%	88%	94%	86%	89%	80%	92%
The fewer stars, the more energy efficient	6%	6%	2%	7%	11%	8%	5%
The more stars, the cheaper	4%	4%	3%	4%	0%	11%	3%
The fewer stars, the cheaper	2%	2%	1%	3%	0%	0%	0%

6 Energy Consumption Analysis

6.1 Calculation Methods

As a final step, CLASP used the data obtained through the survey to generate energy consumption estimates for the residential sector. Insights gained from the analysis can be used to inform policymakers formulating efficiency regulations, to develop plans and programs to raise public awareness of energy efficiency, and to calculate impacts of energy efficiency standards.

The energy analysis for the **electrical appliances** involved three steps.

In the first step, appliances were grouped based on the data available through the survey:

1. Appliances Group 1, consisting of appliances for which input variables are available for each individual unit used in the surveyed household. These variables include individual wattage, hours in use, frequency of use in days per month, age of the appliance, and frequency of unplugging for continuously used products. There are 10 appliances that fall in this group, namely the primary appliances rice cooker, refrigerator, lighting, TV, fan, AC, water dispenser, washing machine, as well as iron, and vacuum cleaner. These most commonly used appliances were presumed to contribute significant energy shares, hence the survey had high data granularity for this group.
2. Appliances Group 2, consisting of appliances for which input variables are available as single reported values for all units used in the household. These variables include single average values for wattage, average hours in use, frequency of use in days per month, and the total number of appliances. There are 54 appliances in this group, for instance water pump, speaker, laptop, Wi-Fi, DVD/VCD player, and more. Most households were expected to have at most one of each of these appliances. The level of data granularity is lower for this group, as simplified calculation method was considered sufficient to estimate national energy consumption. To be noted, most of the appliances that fall in this group are used less frequently and owned by a lower proportion of households across the country.

Detailed information of the available input variables for each appliance in both Appliances Group 1 and Group 2 are provided in Appendix E.

In the second step, appliance-specific assessments were conducted to define Unit Energy Consumption (UEC) calculation methods. These calculation methods were defined at different complexity levels, according to the available primary input variables, the operating principles, and any available performance data from relevant standardized energy consumption test.

1. Performance-based calculation method

   Equation models were developed specifically for **rice cooker, refrigerator, and water pump** through regression analysis. The analysis was based on the performance data collected for CLASP's Rice Cooker and Refrigerator Market Studies, and an ongoing assessment report for water pump energy efficiency policy conducted by EBTKE and the Asian Development Bank (ADB). Details of this calculation are provided in Appendix F for rice cooker, Appendix G for refrigerator, and Appendix H for water pump.

2. Wattage-based calculation method

   This calculation method utilizes wattage, use frequency, and additional appliances-specific survey variables to estimate UEC values for **all appliances except for rice cooker, refrigerator, and water pump**. Additional factors were included in the calculation to reflect actual use and operating principle, namely *Hour Fraction Factor* and *UEC Adjustment Factor*, which were discussed in Section 2 on Survey Methodology, under Survey Limitations.

   As a reminder, the *Hour Fraction Factor* is an assumption adjusting the usage of some appliances that are typically used for less than one hour, while *UEC Adjustment Factor* is an assumption adjusting the wattage of products that are power cycled or operate at partial load. A full list of assigned Hour Fraction Factor and UEC Adjustment factor is provided in Appendix H. Variables utilized in both calculation methods are listed in Appendix E.

In the third step, estimates for uncertainty ranges were calculated based on average deviations quantified for wattage and use frequency. *Wattage Deviation* was calculated based on a subset of survey data where wattage was physically checked by the surveyor. *Use Frequency Deviation* was calculated based on the quantified differences between the claimed operating frequency and the recorded diary entries collected from 100 households.

Quantified Wattage Deviation values are available for 25 appliances out of the 64 surveyed appliances. While *Use frequency Deviation* calculated from the recorded diary are only available for 7 most commonly used appliances. A full list of each appliance's deviation values for wattage and use frequency is provided in Appendix I. Both deviations are incorporated into the energy consumption estimates to provide lower-end and upper-end estimates for each appliance.

As for the **non-electrical appliances**, the energy consumption was estimated from use frequency (claimed and calculated from billing information) and the type of the fuel source.

All data processing and computation was conducted in R.

6.2 Appliances Electricity Consumption Estimates

Based on the previously described calculation methods, CLASP estimated the national electricity consumption for 63 electrical appliances covered in this survey. For this, it should be noted that the referred term of energy used throughout this subsection is in form of electrical energy. Only 42 out of the 63 appliances included in the survey were found to be in-use in Indonesian households. Together, CLASP estimates that these electrical appliances consumed 65,853 GWh in residential homes.

The top 10 electrical appliances with the highest shares of energy consumption in 2019 were rice cookers, refrigerators, lighting, TVs, fans, AC, water dispensers, washing machines, irons, and water pumps. The shares of residential energy consumption for these top 10 energy consuming appliances and the remaining 32 appliances are illustrated in Figure 53. Hourly impacts are in Section 6.3, immediately below, while further analysis and detailed explanation of the approach and analysis are provided in Section 6.4.

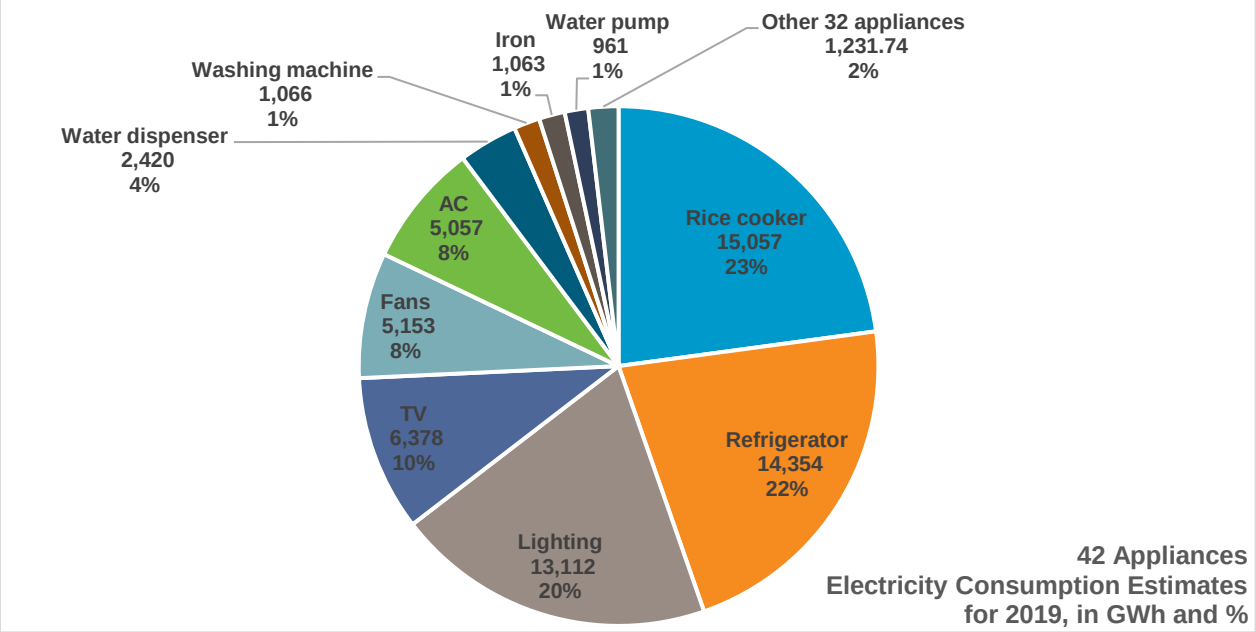


Figure 53: Shares of electricity consumption estimates generated for 42 electrical appliances

Tabulated values for the top 15 electrical appliances most commonly used are shown in Table 52 as follows. These 15 appliances were estimated to consume a total of 65,500 GWh in 2019 which amounts to nearly 64% of the reported total residential electricity consumption by PLN, reported at 102.916.7 GWh.

Table 52. Top 15 electricity-using appliances for residential use in 2019

Appliances	Stock (unit)	Est. Electricity Consumption (GWh)	Est. UEC (kWh/year)	Share of PLN 2019 Statistics
Rice cooker	45,586,664	15,056.74	330	14.6%
Refrigerator	45,545,264	14,354.48	315	13.9%
Lighting	351,833,537	13,111.94	37	12.7%
TV	65,413,797	6,377.88	98	6.2%
Fans	55,444,825	5,153.10	93	5.0%
AC	3,970,392	5,057.04	1274	4.9%
Water dispenser	13,257,061	2,420.35	183	2.4%
Washing machine	18,982,099	1,065.64	56	1.0%
Iron	45,847,996	1,062.63	23	1.03%
Water pump	22,651,598	961.44	42	0.93%
Cell phone	96,736,064	338.05	3	0.33%
Speaker	8,393,072	215.30	26	0.21%
Laptop	6,296,511	179.14	28	0.17%
Wifi router	856,866	81.15	95	0.08%
DVD/VCD Player	9,198,319	62.05	7	0.06%

Another list of the top 10 most-commonly owned appliances with the highest electricity consumption per 1% of penetration is provided in Table 53. Based on the quantified increase in the annual electricity consumption for 1% increase in penetration at the national level, it is clear that the short-listed appliances should be prioritized in the ongoing regulatory efforts made by EBTKE to enforce energy efficiency in Indonesia. A full list for the 42 appliances for both tables is provided in Appendix J.

With this insight, efforts can be focused on these major electrical appliances through energy efficiency policies and outreach programs to achieve energy savings and climate mitigation targets at the national level. In parallel to this, strategies and collective efforts can be established between key stakeholders, including policymakers, government bodies, manufacturers, and household consumers to support these policies. Successful implementation of energy efficiency policies will not only bring great impacts nationally, but also monetary savings for the household consumer.

Table 53. Top 10 appliances with the highest energy consumption per 1% penetration in 2019

Appliance	% Penetration	Est. Electricity Consumption per 1% Penetration (GWh/%)	Est. Equivalent Number of Units per 1% Penetration (unit)
AC	5%	958	752,108
Rice cooker	69%	218	659,941
Refrigerator	69%	209	664,235
Lighting	100%	131	3,518,335
Water dispenser	20%	119	654,335
Fans	64%	80	859,720
TV	93%	68	699,976
Washing machine	29%	37	656,106
Water pump	35%	28	654,250
Iron	70%	15	655,180

6.3 Hourly Electricity Demand Impact

By combining the calculated electricity consumption from the electrical appliances and reported hourly usage, CLASP was able to estimate the demand impact on the electric grid. The estimated demand for the 42 appliances is provided in Figure 54, while the individual impacts of the top ten appliances are provided in Appendix J. At the national level, the residential appliances were shown to require a base load of 6,000 MW, with a small peak of 8,000 MW in the morning, and a larger peak of over 11,000 MW in the evening.

The first peak was observed to span between 04:00 to 08:00, as residents prepare for the day. After 08:00, demand tends to fall to around 6,500 MWh until around 16:00. Even though rice cookers are in-use, this is offset by less use for lighting and AC. The second peak then occurs in the evening, extending from 17:00 to midnight. During this time, energy demand sharply increases, reaching around 11,600 MWh at 19:00. People spend their time in their homes after the working hours, using lighting, TVs, fans, and ACs.

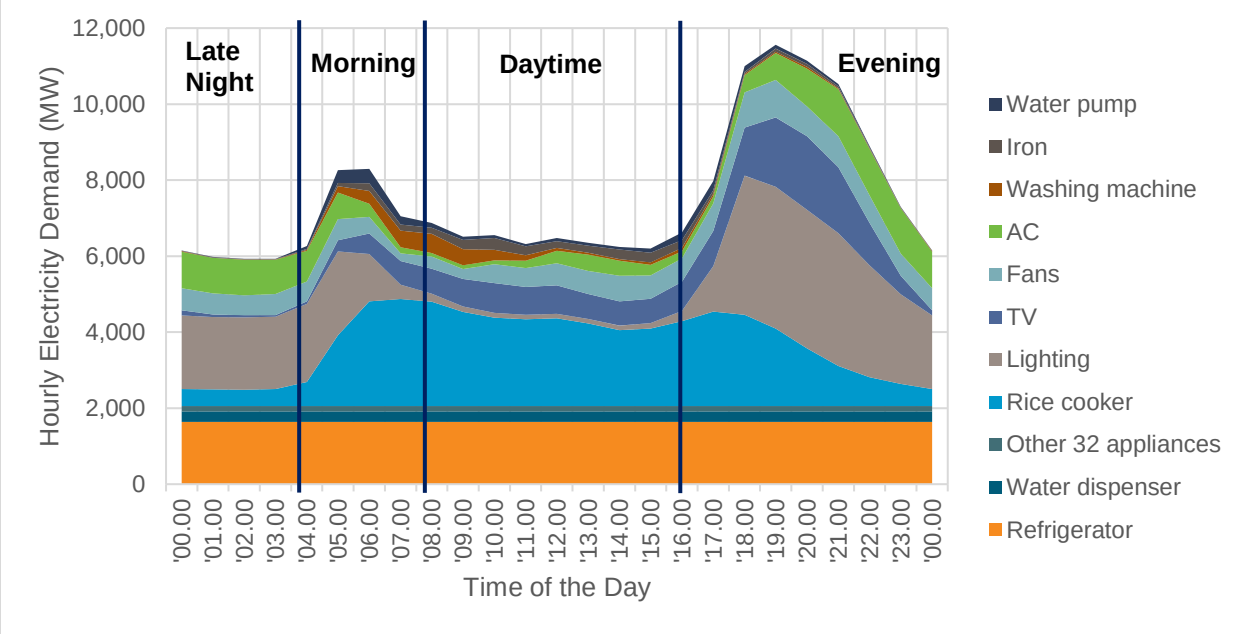


Figure 54: Hourly electricity consumption trends for the 42 electrical appliances

Table 54 shows the percentage share of the demand during each period (late night, morning, daytime, and evening) for each appliance. Out of the top 10 appliances, rice cooker, refrigerator, lighting, fans, TV, and AC were shown to be significant contributors.

Rice cooker, which is identified as the appliance with the highest electricity consumption in Indonesia, was shown to be used throughout the day and at night. While most rice cookers are used in the morning and daytime, from 05:00 to 16:00, a noticeable portion remain active throughout the evening and the night, drawing more power than the grouped 32 “other” appliances at all times.

Most refrigerators and water dispensers are plugged in continuously, drawing constant power throughout the day. Lighting is primarily switched on in the evening and late night, from 17:00 to 04:00. In the morning, a portion of these lights are switched off as the sun rises at around 06:00. Most households don’t keep their lights switched on during the daytime. TV energy consumption gradually increase throughout the day, reaching a peak in the evening.

As for the cooling appliances, fans and AC show somewhat similar electricity consumption pattern, with higher use in the evening and late night, from 17:00 to 04:00, and lower use in the morning and daytime, from 05:00 to 16:00. It should be noted that electric fans are used in 64% of all households, while ACs are

only found in 5% of the households at the national level. Interestingly, at the current distribution, national energy consumption of fans and ACs are almost equal.

Table 54. Distribution of electricity consumption shares in the different periods throughout the day

Time Duration	00:00-04:00	05:00-08:00	09:00-16:00	17:00-23:00
Appliance / Period	**Late Night**	**Morning**	**Daytime**	**Evening**
Rice cooker	8%	33%	35%	16%
Refrigerator	27%	21%	26%	17%
Lighting	32%	13%	2%	31%
TV	1%	7%	11%	14%
Fans	9%	5%	8%	8%
AC	15%	4%	4%	9%
Water dispenser	5%	4%	4%	3%
Washing machine	0%	5%	2%	0%
Iron	0%	2%	4%	1%
Water pump	0%	4%	1%	1%
Other 31 appliances	2%	2%	2%	1%

6.4 National Statistics Comparative Analysis

CLASP's best estimate of the 42 electrical appliances national electricity consumption was 65,853 GWh. To reconcile the survey's estimated residential consumption with available national statistics, PLN residential customer data in 2019 was used as the main reference. PLN shared a total residential electricity consumption of 102,917 GWh for 2019.

The estimated total obtained in this survey left 36% of PLN residential total energy use uncategorized. Illustrated breakdown of CLASP's best estimates for the top 10 appliances and the grouped 32 appliances is shown in Figure 55. A full list of the estimated values for each appliance is provided in Appendix J.

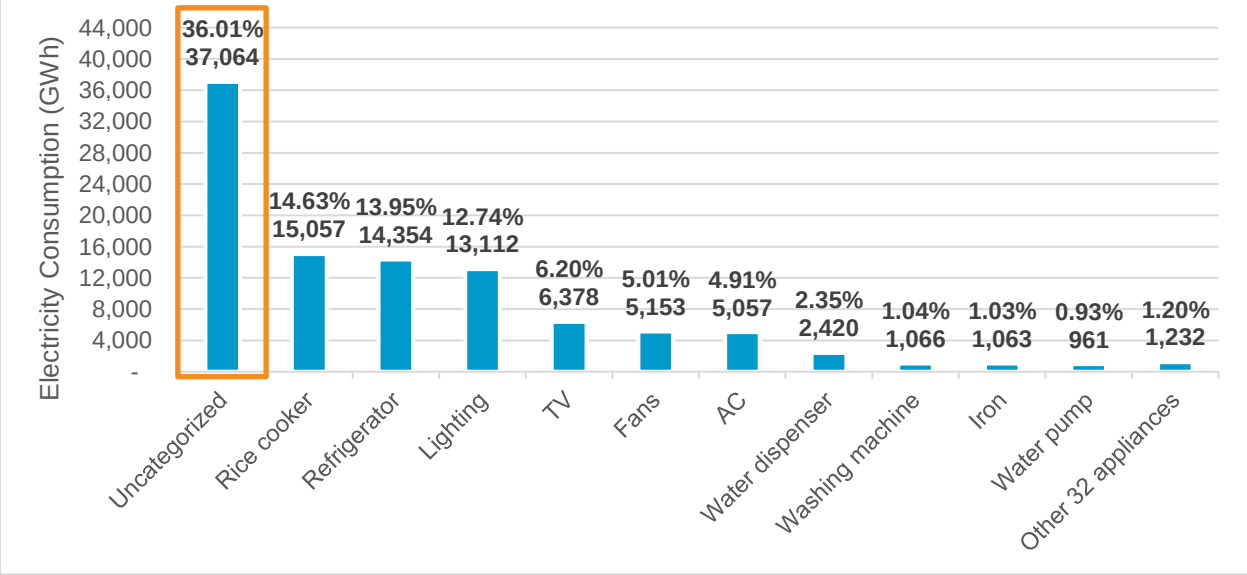


Figure 55: Best estimate of electricity consumption from 42 appliances in residential sector

There are potential explanations that may help account for the uncategorized energy consumption. First, the survey covered pure residential households, excluding households that conducted commercial activities, and dwelling units that were rented or leased to other households while maintaining a common electricity billing account. Stores or workshops were expected to have a wider variety of appliances (including types not included in this survey) and higher use frequency.

Second, there are certain uncertainties associated with each estimate that may originate from survey sampling distribution, survey variables, assumptions applied in the calculation methods, and realistic variations in appliances use. For instance, the *UEC Adjustment Factor* defined by CLASP was based on each appliance's typical operating principle and extent of use. At 50% of the defined factor and without the defined factor, the units would be assumed to operate closer to its maximum power rating at higher rate and constantly, respectively. The sensitivity can be seen in Figure 56. The *Hour Adjustment Factor* did not have as big an impact as it mostly affected low-frequency or low-wattage appliances.

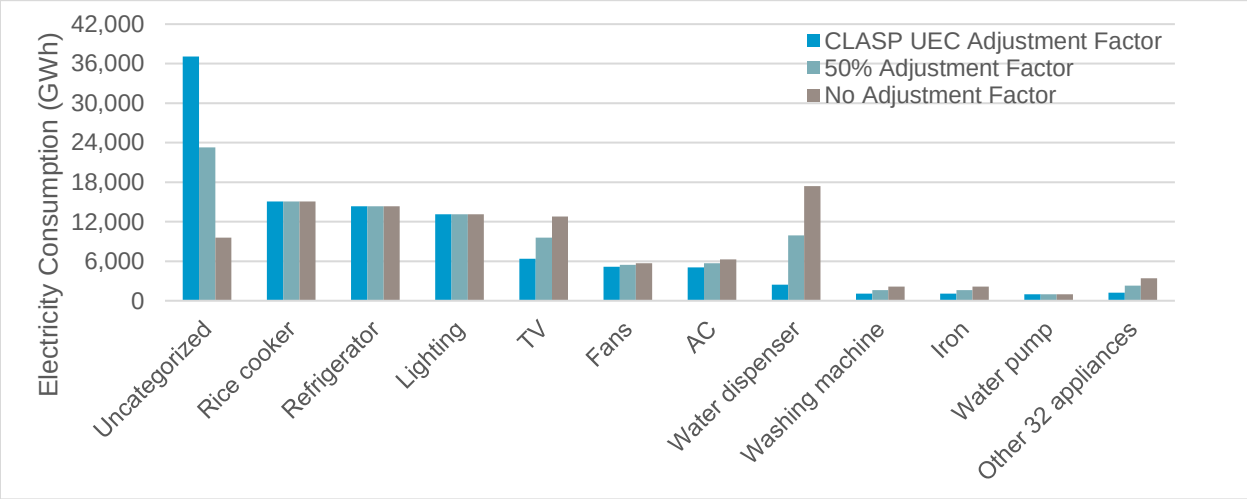


Figure 56: Sensitivity of appliance electricity consumption estimates on UEC Adjustment Factor

As previously explained in Section 6.1, deviations between claimed and observed wattage and claimed and diary-recorded use frequency were quantified and incorporated in the assessment. The results are presented as lower-end and upper end-estimates as provided in Figure 57. Detailed distribution shares can be evaluated in the subsequent Figure 58.

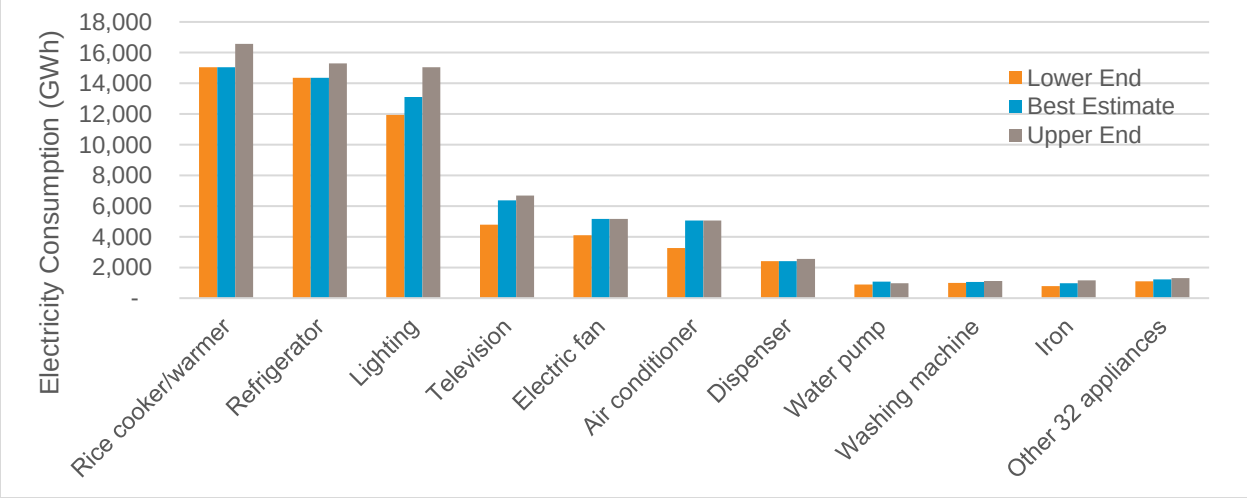


Figure 57: Estimations of residential electricity consumption including lower-end and upper-end ranges

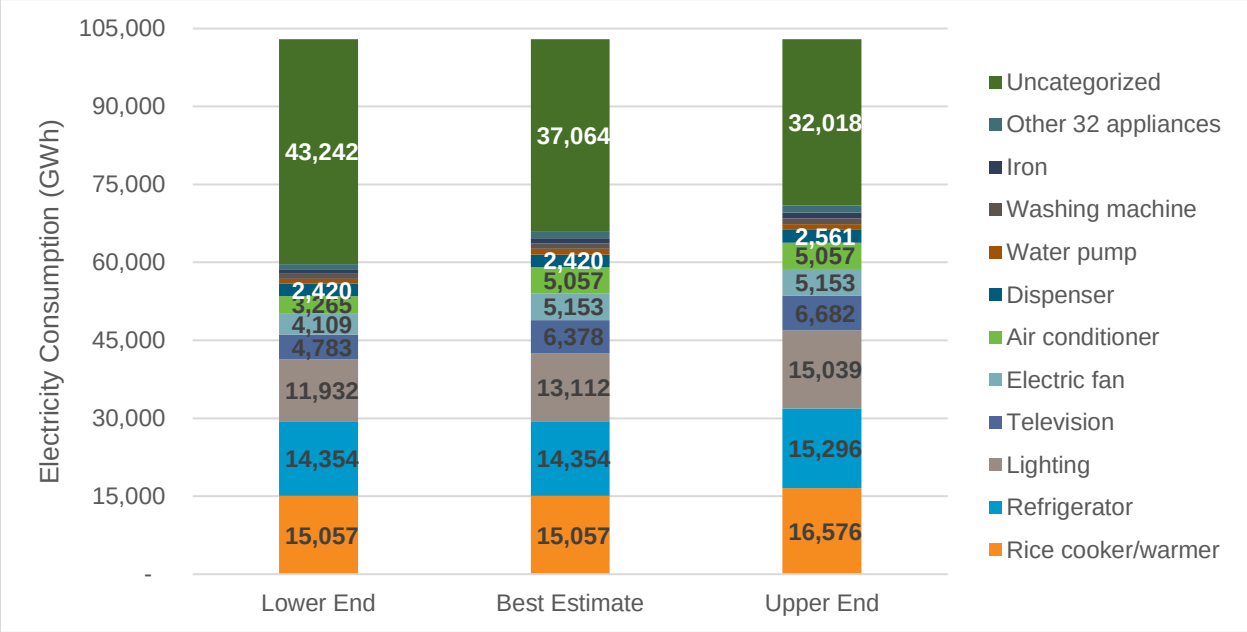


Figure 58: Distribution shares of the national electricity consumption estimates from the 42 electrical appliances, including lower-end and upper-end ranges

In the lower-end estimates for all appliances, a total of 43,242 GWh would be considered uncategorized, which is about 42% of the PLN total. As for the upper-end estimates, lower amount of electricity consumption would be uncategorized, at 32,018 GWh or 31% of the PLN total.

Based on the quantified deviations in wattage and use frequency, relatively high uncertainty ranges were found for the top 6 appliances, namely rice cooker, refrigerator, lighting, TV, fans, and AC. Ranges of upper-end uncertainty from the best estimate are **+10%** for rice cooker, **+7%** for refrigerator, **+15%** for lighting, and **+5%** for TV. Ranges for lower-end uncertainty from the best estimate are **-9%** for lighting, **-25%** for TV, **-20%** for fans, **-35%** for AC. Tabulated values are provided in Appendix J for the top 10 appliances.

6.4.1 Survey Estimate and PLN 2018 Provincial Residential Total

Over 60% of Indonesian households reside in Java, while 20% reside in Sumatra, 6% in Kalimantan, 7% in Sulawesi, 7% in Bali, Nusa Tenggara, Maluku, and Papua. The difference between the estimated residential energy usage of the 42 appliances estimated in this survey and the PLN residential total for Java, the most populated island, and islands outside Java was calculated. As shared by PLN, 64,963.27 GWh was consumed by the residential customers residing in Java and 37,953.43 GWh outside of Java in 2019. Figure 59 shows that the best estimate generated in this survey, still leaves 38% of electricity consumption uncategorized in Java and 33% outside of Java.

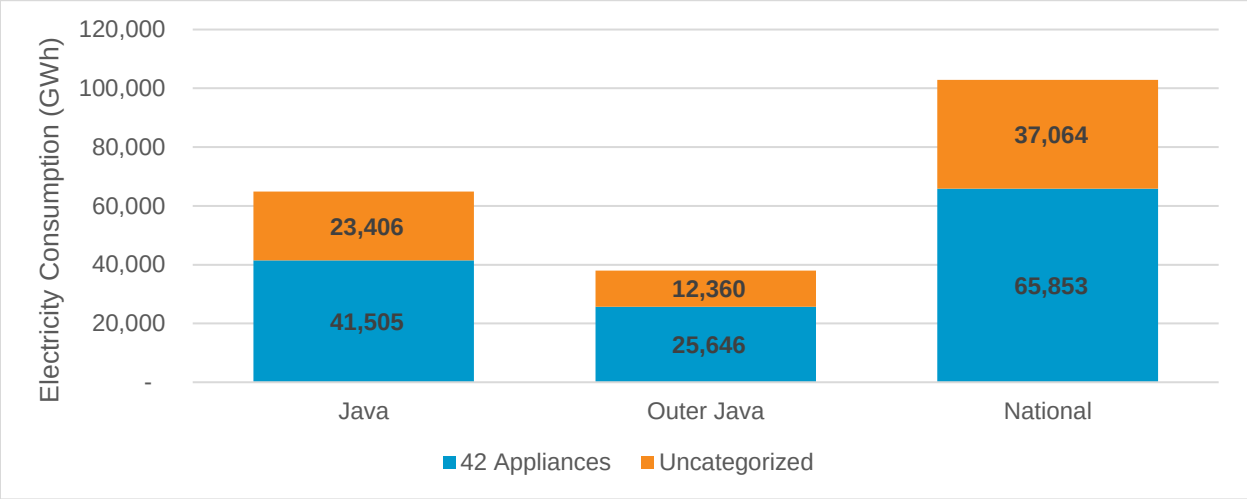


Figure 59: Best estimate electricity consumption for Java and outside of Java island groups

CLASP also generated appliance electricity usage estimates at the provincial level, to be compared with the provincial data published by PLN for the year of 2018.[59] This comparison was done to provide an overview on the distribution of the generated estimates across the country. PLN residential sector total electricity consumption in 2018 was reported at 97,832 GWh, around 5,000 GWh lower compared to the total in 2019. Based on this number, growth can be expected in certain provinces which implies that difference between the survey estimates and the PLN data plotted in Figure 60 would be greater in reference to electricity consumption in 2019.

[59] PLN Annual Statistics Report. https://web.pln.co.id/stakeholder/laporan-statistik

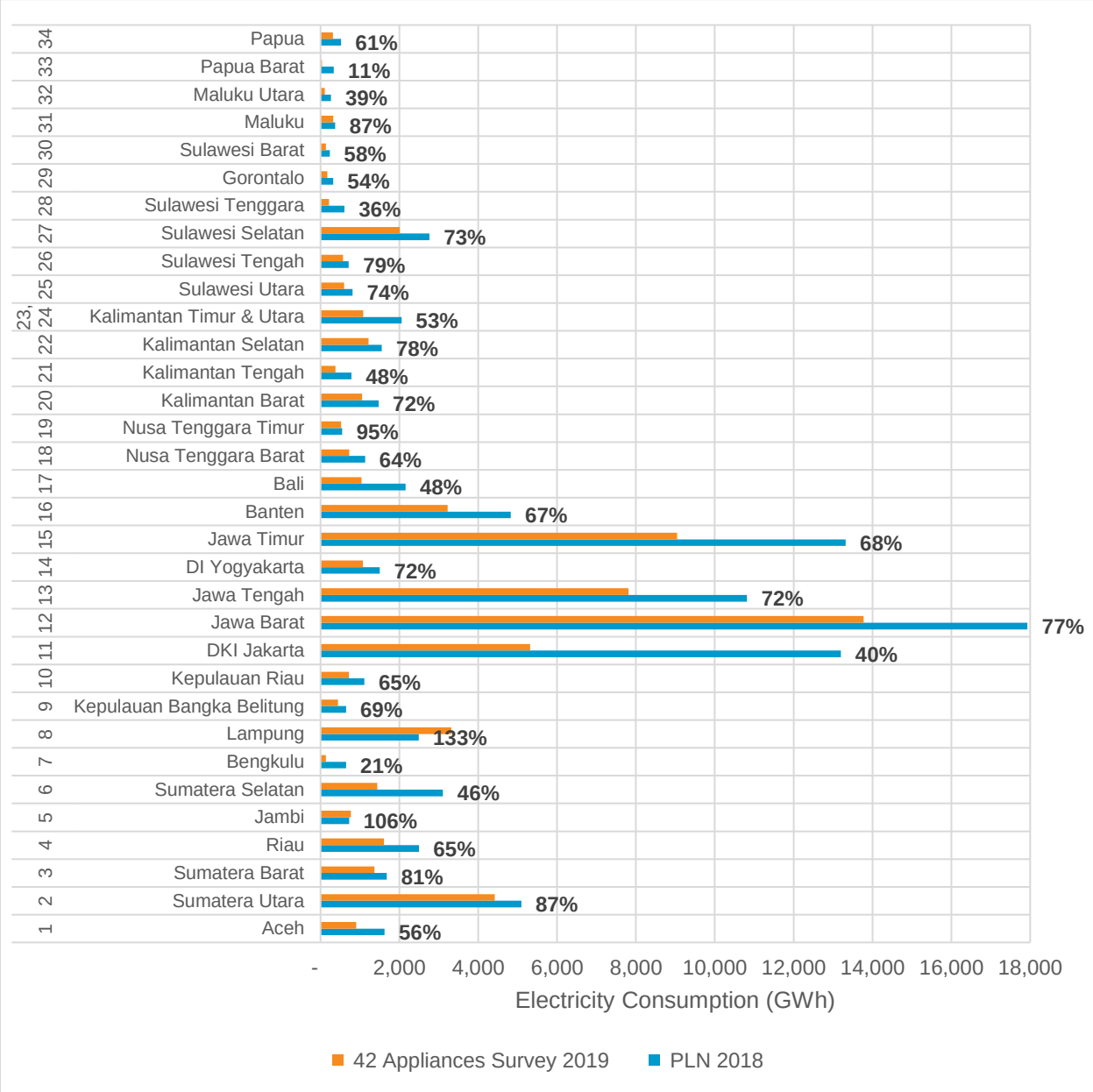


Figure 60: Survey estimated 42 appliances electricity consumption in 34 provinces in Indonesia, against PLN provincial total for the residential sector in 2018 (the accounted share in percentages)

At the national total, the survey estimates were able to account up to 67% of residential electricity use in 2018. The accounted shares from the survey's 42 appliances estimates were at 67% and higher for 15 provinces. The share ranged from 67% in Banten and up to 95% in Nusa Tenggara Timur. The shares in all provinces in Java fall within this range, except for Jakarta. In two provinces, namely Lampung and Jambi, higher appliances usage estimates were obtained, at 33% and 6% higher values respectively. The remaining 17 provinces had shares below 67%, ranging from 67% down to 11%. All are located outside Java, except for Jakarta. The accounted shares were the lowest in Jakarta at 40%, Maluku Utara at 39%, Sulawesi Tenggara at 36%, Bengkulu at 21%, and Papua Barat at 11%.

Estimates for each major island group were plotted in Figure 61. Estimates obtained through this survey was found to account for up to 77% of the reported PLN residential use in Sumatera, the highest accounted share among the other island groups. The shares for Sulawesi, Java, and Kalimantan were closer to the accounted share of 67% nationally. Lower accounted shares were obtained for the remaining islands in Eastern Indonesia, at 60% for Bali and Nusa Tenggara, and 52% for Maluku and Papua.

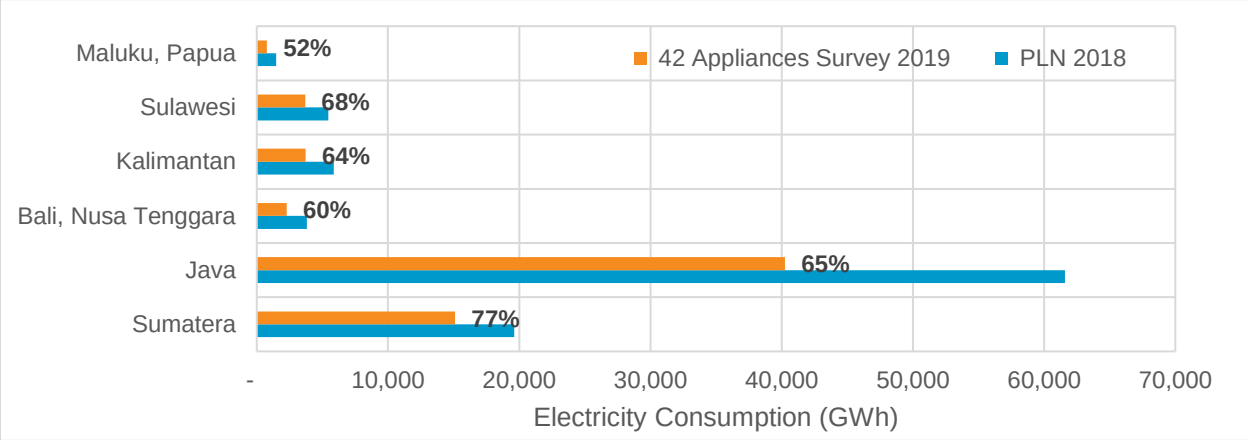


Figure 61: Survey estimated 42 appliances electricity consumption in six Indonesia major island groups, against PLN total for the residential sector in 2018 (the accounted share in percentages)

6.4.2 Energy Consumption by PLN Residential Tariff Class

CLASP further assessed residential energy consumption patterns based on PLN's electricity tariff groups. The number of customers in PLN's five R-1 residential tariff classes are shown in Figure 62, along with the monthly energy consumption.[60] The R-1 customers have lower power supply capacity than R-2 and R-3, and include customers who receive subsidies. Unsurprisingly, customers in higher capacity classes have higher electricity consumption. As was seen previously in Table 21, the survey found that higher classes had a higher penetration of appliances.

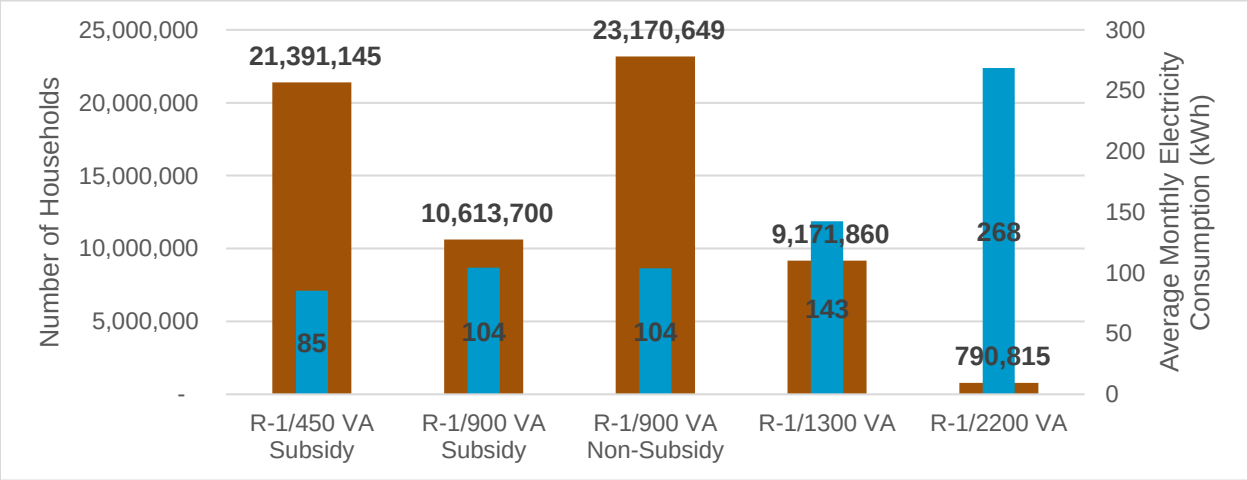


Figure 62: Customer count and monthly electricity consumption in PLN R-1 residential tariff groups

[60] Data from PLN annual residential consumption in 2019, assuming equal monthly usage for 12 months

The survey estimates of electricity consumption for major appliances used by the R-1 residential customers are compiled in Figure 63. The vast majority of electricity use in subsidized R-1/450 VA and R-1/900 VA customers is due to just five appliances: rice cooker, refrigerator, lighting, TV, and fan.

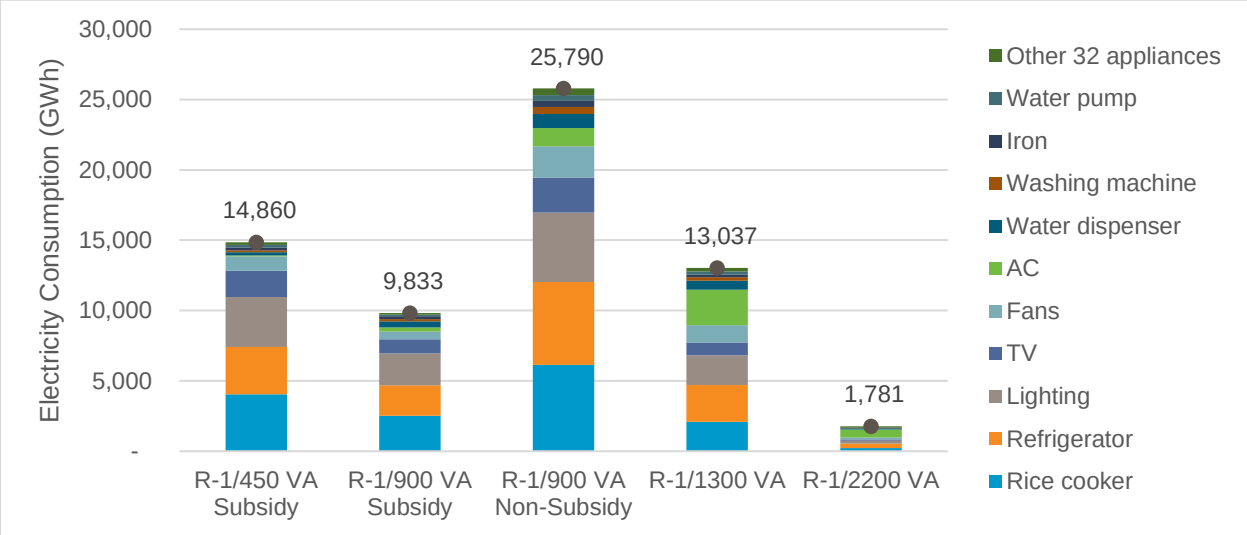


Figure 63: Electricity consumption estimates of 42 appliances in PLN R-1 residential tariff groups

Figure 64, below shows the estimated share of each R-1 tariff group's electricity consumption for the 42 appliances in the survey. The subsidized R-1/450 VA and R-1/900 VA customers have relatively similar overall consumption pattern other than presence of AC in R-1/900 VA. Among the 5 R-1 customers, AC electricity consumption share is higher for residential customers with higher power supply.

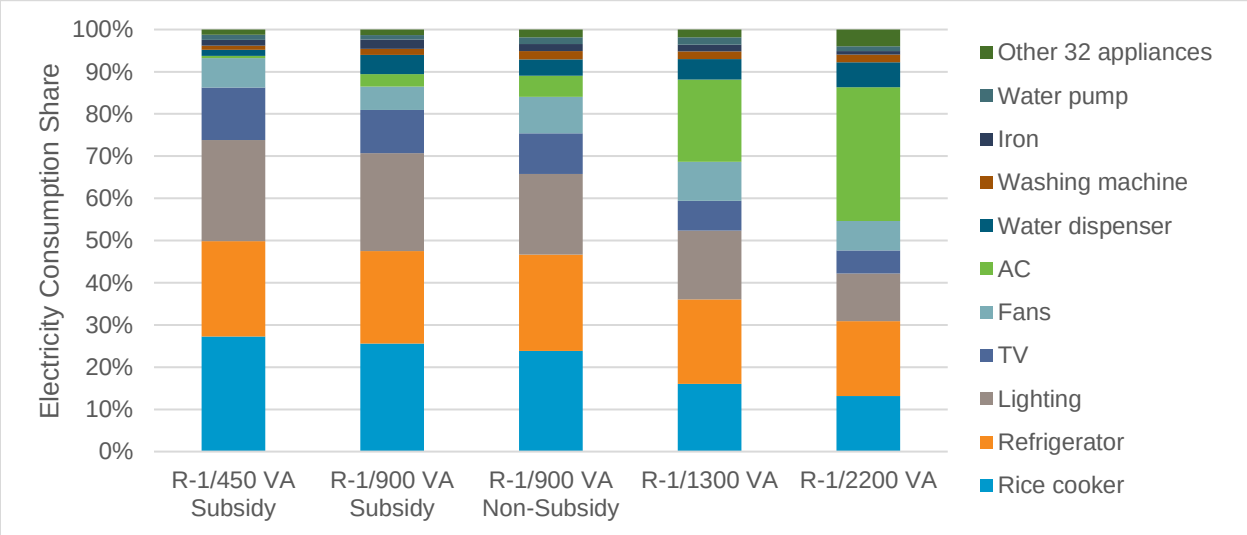


Figure 64: Distribution shares of 42 appliances electricity use in PLN R-1 residential tariff groups

There were differences between the survey's estimated total electricity use from the 42 appliances and the reported PLN data, as illustrated in Figure 65. In general, the survey estimate was lower, particularly for both subsidized customers and R-1/2200 VA customers. This may indicate higher extent of non-residential activities in dwelling units that fall within these tariff groups or higher than assumed UEC adjustment factor.

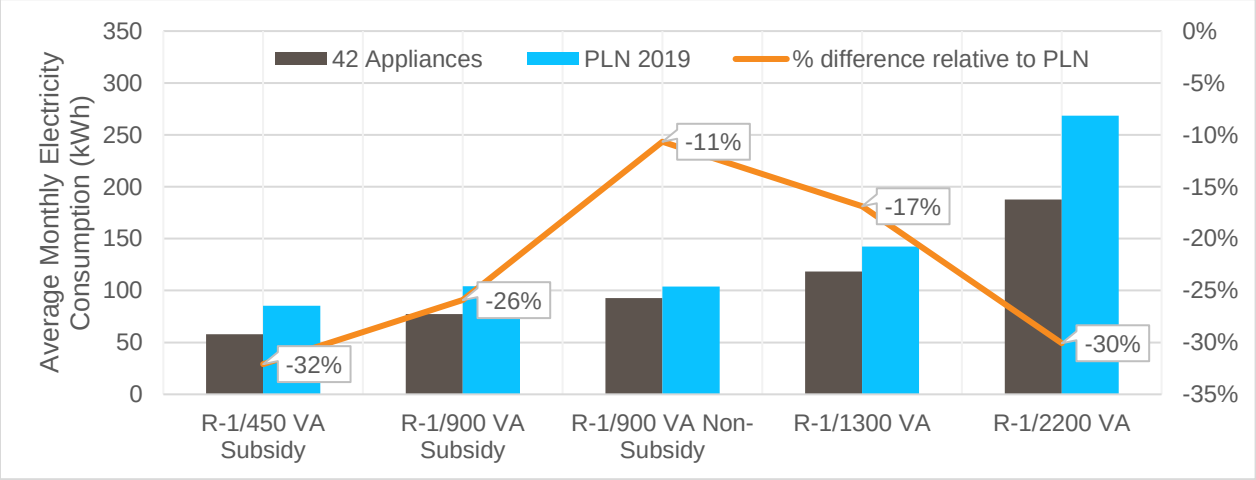


Figure 65: Monthly electricity consumption in PLN R-1 residential tariff groups as reported in 2019 and as estimated from 42 appliances usage in this survey

The last two PLN tariff classes, R-2 and R-3, account for 2% of PLN's residential customers. As explained in the methodology, random sampling led to only 11 households in the R-2 and R-3 tariff groups: seven in R-2 and four in R-3. Additional data from 28 households in the R-2 tariff class was obtained through purposive sampling.

The estimated appliance electricity consumption for these upper-class residential tariff groups appears in Figure 66. There is a significant increase in the estimated energy consumption for R-2 with the purposive samples included. The estimated AC electricity consumption in the R-2 dataset with booster is about 3 times that of the smaller randomly sampled R-2 dataset. Another difference between the two R-2 datasets is the total for the other 32 appliances. The electricity use in the larger dataset was 42 GWh, about 10-fold higher than the estimated 4 GWh in the smaller dataset. However, in either case, air conditioning is the main contributor of electricity consumption in both R-2 and R-3 households. It should be noted that only the randomly sampled 11 R-2 and R-3 households were included in the national energy consumption estimates.

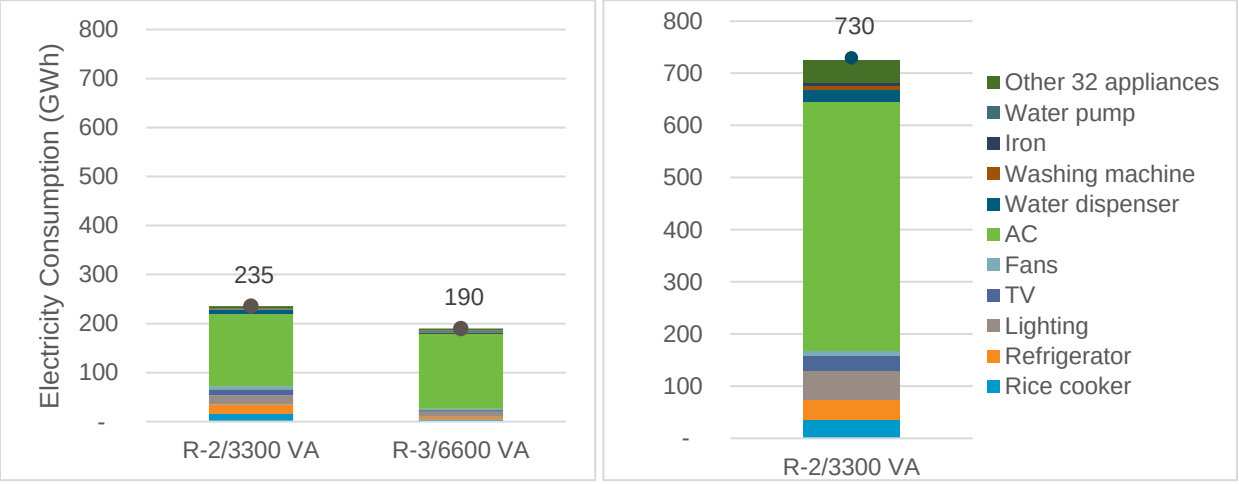


Figure 66: Electricity consumption estimates of 42 appliances in PLN R-2 and R-3 residential tariff groups (left, of the R-2 and R-3 randomly sampled households; right, of the 35 R-2 randomly and purposely sampled households)

Figure 67, below, shows the estimated share of R-2 and R-3 electricity consumption for the 42 appliances in the survey. As was the case for R-1, the AC electricity consumption share increased with power supply capacity, from 60 to 65% of the overall energy use in R-2, and up to 80% in R-3, implying consistent increase across all PLN tariff groups.

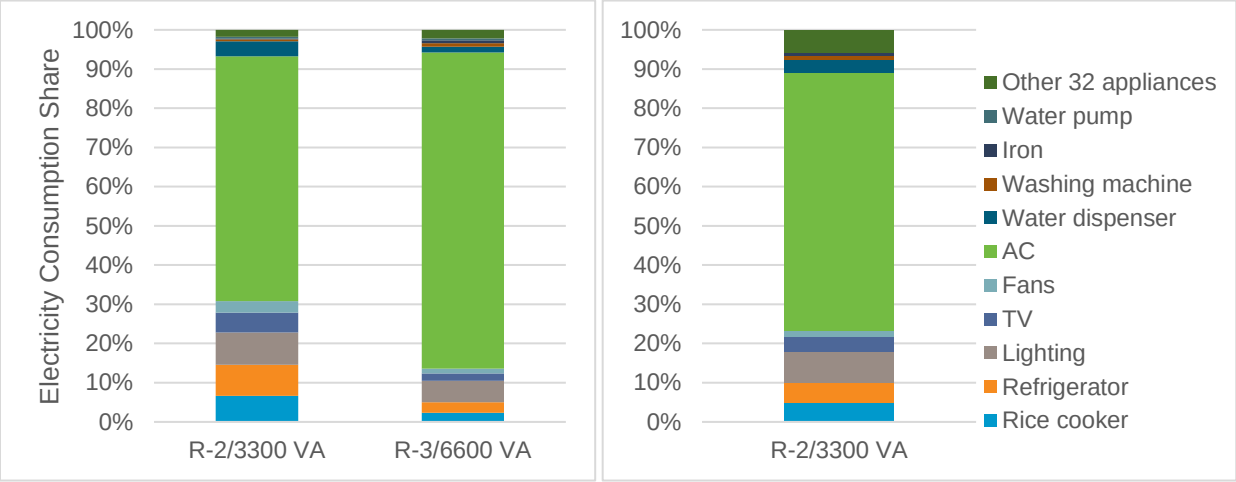


Figure 67: Distribution of 42 appliances electricity consumption in PLN R-2 and R-3 residential tariff groups (left, of the R-2 and R-3 randomly sampled households; right, of the 35 R-2 randomly and purposely sampled households)

Figure 68 shows the PLN data for R-2 and R-3 customers (left), and the comparison with this survey's 42 appliances electricity use estimation (right). Survey estimated values were lower in both R-2 and R-3. Based on these percentages shown in Figure 65 and Figure 68, the survey was only able to account appliances electricity consumption, in the range of 80 to 90% of the total electricity bill in the non-subsidized R-1/900 VA and R-1/1300 VA customers, about 70% in both subsidized and R-1/2200 VA customers, and the lowest below 50% in R-2 and R-3.

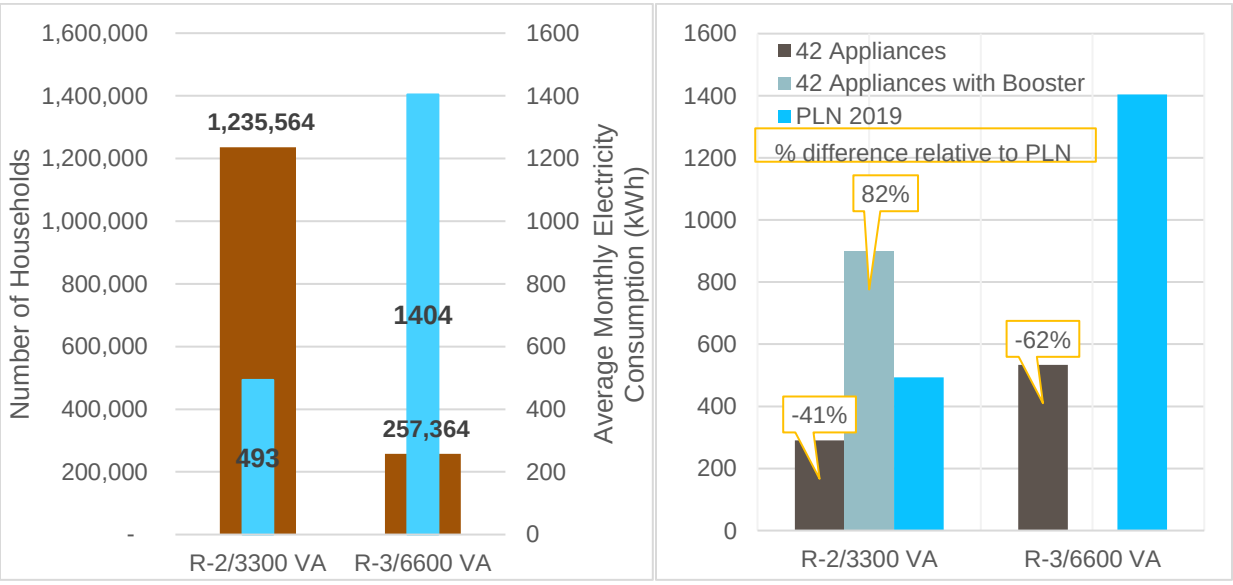


Figure 68: Customer count and monthly electricity consumption in PLN R-2 and R-3 residential tariff groups (left); estimated monthly consumption from 42 appliances usage in this survey (right)

Further evaluation on the sensitivity of the national energy consumption estimate on the *UEC Adjustment Factor* is summarized in Figure 69. The difference between the survey estimates and PLN data became lower without CLASP-defined *UEC Adjustment Factor.* As previously mentioned in Section 6.4.1, the factor was defined to reflect realistic energy consumption from the nameplate power rating. This also shows that even though all appliances were assumed to constantly operate at the maximum nameplate wattage, the national estimate remains 12% below the PLN data.

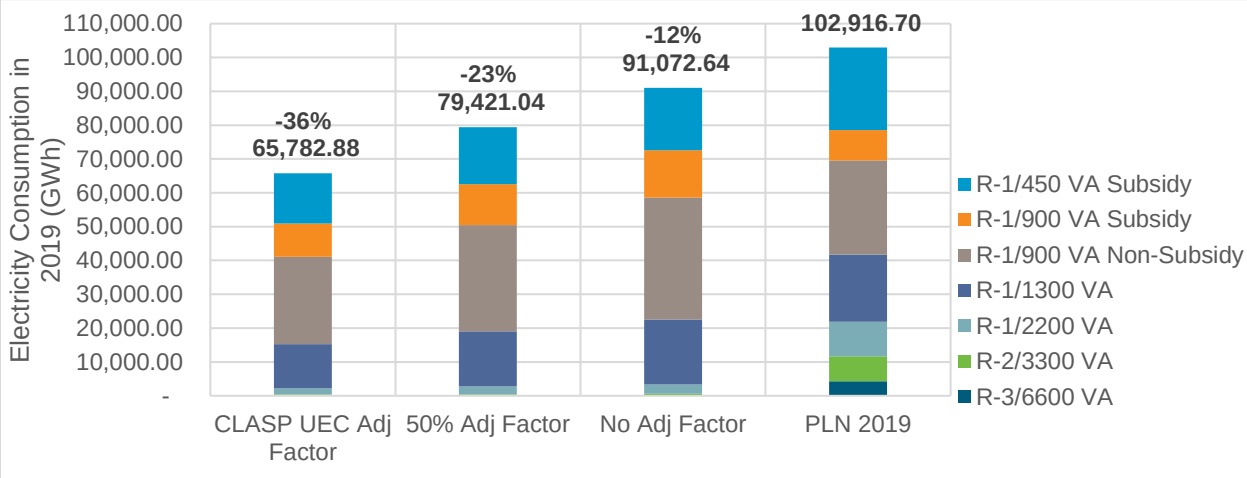


Figure 69: Sensitivity of national electricity consumption estimates based on PLN residential tariff groups

In addition to this, it should also be noted that the survey was aimed to assess pure residential energy consumption, hence excluding residential dwelling units that were also used for commercial activities. The randomly sampled 5,443 households was projected to the national household population of 65,235,368, which was 6.3% lower than PLN's residential consumer count at 69,619,322 in 2019, shown in Figure 70.

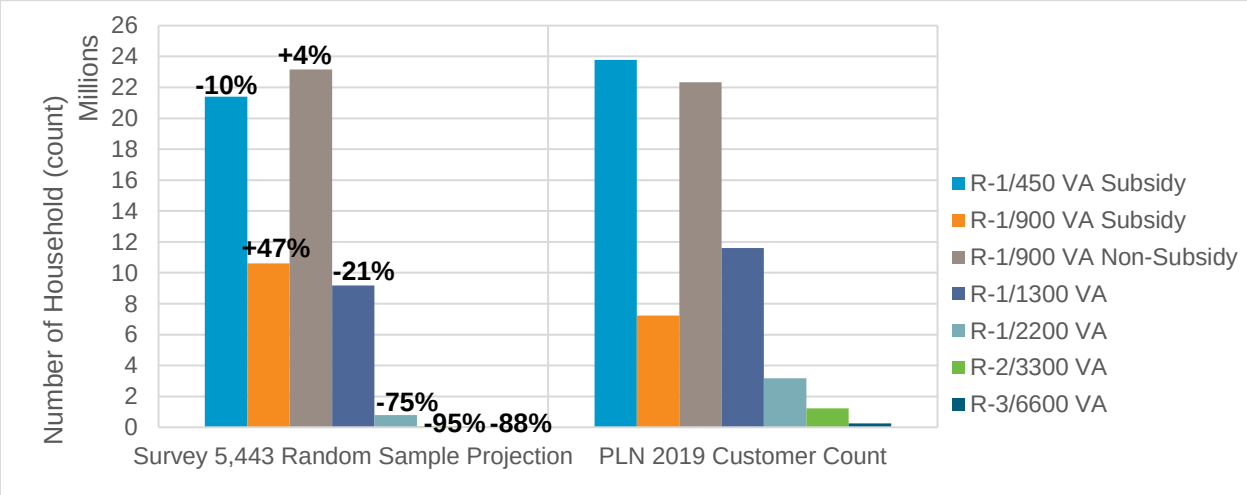


Figure 70: Distribution of survey respondent projection and PLN customer count, with percent differences.

Significantly lower projection of pure residential dwelling units was identified for the upper PLN residential tariff groups, namely R-1/2200 VA, R-2, and R-3 customers. From Figure 69 and Figure 70, it can be safely assumed that a large portion of energy use accounted for R-1/2200 VA, R-2, and R-3 PLN customers was outside the surveyed appliance use, and likely non-residential.

On the other hand, nearly 47% higher projection was obtained for the subsidized R-1/900 VA customer, which shows a certain extent of sampling bias for this specific PLN customer at the national level of projection. Despite this bias, the percent difference of the monthly consumption from the survey's estimate is still 26% lower in comparison to the PLN data.

Among the uncertainty factors that contribute to the uncategorized energy consumption of 37,064 GWh highlighted in Figure 55, CLASP concluded that non-residential activities were included in PLN residential sector statistics, noticeably in R-1/2200 VA, R-2, and R-3 residential dwelling units. The survey was only able to quantify 10% of the PLN reported electricity use for these upper-class residential energy consumers, that together held 7% share of the PLN residential customer count and 21% share of the PLN national residential electricity consumption in 2019. Furthermore, significant variations within these tariff groups were observed in the collected booster data in R-2 customers, indicating the need for targeted investigation.

6.5 Non-Electrical Energy Usage

Natural gas was the second largest source of household energy after electricity, at 62,022,000 barrels of oil equivalents (BOE) in 2018, followed by biomass at 23,020,000 BOE, kerosene at 3,043,000 BOE, and biogas at 167,000 BOE.[61] This survey found that 8 out of 10 households used a gas stove. Despite this fact, nearly 10% still use a biomass or kerosene stove, with biomass stove ownership slightly higher than that of kerosene stoves. Kerosene lamp was surprisingly still used in households with access to electricity, at 2% penetration. Water heater powered with gas was considerably uncommon, owned by nearly one-third of the number of households that own electric heater (0.9% penetration). Table 55 summarizes the national penetration and the use frequency of the surveyed non-electrical appliances.

Table 55. Average ownership and usage of non-electrical appliances

Non-Electrical Appliances	Penetration %	Average Usage (days/month)
Gas stove using LPG	77%	29
Gas stove using pipeline gas	2%	29
Biomass stove	6%	26
Kerosene stove	4%	23
Kerosene lamp	2%	2
Water heater using LPG	0.3%	24

The types of fuel used in a household is linked with household economic status. A summary of the penetration for the different fuel sources is provided in Table 56. Liquid Petroleum Gas (LPG) distributed in cylinders was found to be used by more than 80% middle socio-economic households with monthly primary expenditure from Rp 1,750,000 to Rp 6,000,000. "City Gas", which is distributed through centralized natural gas distribution pipeline, on the other hand, was only accessible to households with higher monthly expenditures, above Rp 6,000,000. Kerosene and biomass stoves were found primarily in households with lower monthly expenditures, below Rp 1,750,000.

[61] Handbook of Energy and Economic Statistic of Indonesia 2018 https://www.esdm.go.id/assets/media/content/content-handbook-of-energy-and-economic-statistics-of-indonesia-2018-final-edition.pdf

Table 56. Penetration of non-electrical fuel sources by primary monthly expenditure

	Total	<= Rp 900k	> Rp 900k - Rp 1,250k	> Rp 1,250k - Rp 1,750k	> Rp 1,750k - Rp 2,500k	> Rp 2,500k - Rp 4,000k	> Rp 4,000k - Rp 6,000k	> Rp 6,000k
% Household Population	**100%**	**8%**	**7%**	**18%**	**29%**	**28%**	**6%**	**2%**
LPG Cylinder	77%	58%	62%	75%	81%	84%	83%	59%
City Gas	2%	0%	1%	1%	1%	2%	5%	30%
Kerosene	5%	9%	9%	8%	4%	3%	2%	2%
Biomass	6%	20%	16%	10%	4%	2%	0%	0%

To compare the consumption level, the quantity of use from each fuel was converted into the unit of Barrel of Oil Equivalent (BOE). The national gas consumption of both LPG and City Gas combined was shown to be the highest in the surveyed households, at 70%, followed by biomass at 15% and kerosene at 3%.

The surveyed non-electrical energy consumption amounts to 46.6 million BOE, which only account for 53% of the reported national residential use of 88 million BOE of non-electrical energy use in 2018. The survey quantified 61%, 54%, and 31% of the reported national residential consumption for gas (LPG and City Gas combined), kerosene, and biomass respectively. The unaccounted differences between the survey estimates and the statistics released by MEMR were speculated to be due to use in home-based food industry and other informal industries that utilize gas-powered equipment.

Table 57. Non-electrical energy consumption estimates summary

	LPG	City Gas	Kerosene	Biomass
Base Respondent (n)	**4,110**	**125**	**359**	**293**
Projection (household)	**50,444,880**	**1,339,347**	**3,450,511**	**3,936,817**
Share of Households Using This Fuel	77%	2%	5%	6%
Survey Estimated Annual Consumption	4,311,833 tons	195,413,641 m^3	275,082,000 L	3,067,774 tons[62]
Equivalent Surveyed Energy Consumption (Thousand BOE)	36,757	1,150	1,630	7,072
National Residential Energy Consumption in 2018[63] (Thousand BOE)	61,819	203[64]	3,043	23,020
Accounted Share through The Survey	59%	566%[65]	54%	31%

[62] Biomass energy calculation derived from the time of usage. Amount of firewood use rate was estimated from an average use of 0.8 kg firewood used within 33.3 minutes in a traditional open fire cook stove, to cook 0.5 kg dry rice. Muhammad, Sabiu Bala & Muhammad Usman, Kaisan. (2014). Performance Evaluation of a Save 80 Wood Stove using Controlled Cooking Test Method. Journal of Energy Environment and Carbon Credits. Volume 4. 25-30

[63] Handbook of Energy and Economic Statistic of Indonesia 2018 https://www.esdm.go.id/assets/media/content/content-handbook-of-energy-and-economic-statistics-of-indonesia-2018-final-edition.pdf

[64] Cited source from PT Perusahaan Gas Negara (PGN), likely not including other existing installations by other centralized gas providers. Actual amount of use was presumed to be higher.

[65] Further explanation under the “City Gas” subsection.

A summary for the estimated energy consumption for the surveyed non-electrical appliances is provided in Table 58. The equivalent amount of energy use in the unit of electrical energy was calculated for each appliance as well, to be compared with the electrical appliances that have the same function.

Table 58. Summary of energy consumption estimates for non-electrical and electrical appliances used for cooking, lighting, and water heating

Function	Appliance	% Penetration	Surveyed Annual Energy Consumption (listed units)		Multiplier Conversion Factor to BOE[66]	Equivalent Annual Energy Consumption (BOE)	Equivalent Electrical Energy Consumption (GWh)	National Usage Share (%)
Cooking	Gas stove using LPG	77%	4,302,728	ton	8.5246	36,679,035	59,835	80%
	Gas stove using City Gas	2%	195,413,641	m3	0.0058830[67]	1,149,618	1,875	3%
	Biomass stove	6%	3,067,774	ton	2.3054[68]	7,072,381	11,537	15%
	Kerosene stove	4%	178,803	kL	0.0059274	1,059,838	1,729	2%
	Electric cooktop	0.3%	35	GWh	613.0	21,455	35	0.05%
Lighting	Kerosene lamp	2%	96,279	GWh	0.0059274	570,682	931	13%
	Electric lighting	100%	6,378	GWh	613.0	3,909,714	6,378	87%
Water heating	Water heater using LPG	0.3%	9,105	ton	8.5246	77,616	127	79%
	Electric water heater	0.9%	33	GWh	613.0	20,229	33	21%

[66] MEMR. Handbook of Energy and Economic Statistic of Indonesia 2018. Conversion Factor. https://www.esdm.go.id/assets/media/content/content-handbook-of-energy-and-economic-statistics-of-indonesia-2018-final-edition.pdf.
[67] BP. Approximate conversion factors – Statistical Review of World Energy. https://www.bp.com/content/dam/bp/business-sites/en/global/corporate/pdfs/energy-economics/statistical-review/bp-stats-review-2019-approximate-conversion-factors.pdf
[68] Averaged conversion factor from 99.7% firewood and 0.3% charcoal

Cooking stove is an essential appliance in Indonesian households. The majority of the surveyed households use gas cooking stove with LPG as the fuel source, at 77% penetration rate. At the national level, LPG gas stoves were projected to be used in 50,444,880 households at an annual consumption of 36.7 million BOE in 2019, which was 59% of the reported annual LPG residential consumption in 2018 at nearly 62 million BOE.

In comparison to other fuel sources used for cookstoves, LPG held 80% share of the equivalent energy amount quantified in this survey, followed by biomass at 15%, natural gas at 3%, kerosene at 2%, and electricity at 0.05%. This shows that Indonesia has a large extent of reliance on LPG usage for residential cooking, hence energy efficiency policies and programs targeting LPG cookstove can be expected to bring significant impacts.

In regions where kerosene was found to be still in use, particularly in several provinces in Eastern Indonesia, kerosene was used to light their kerosene lamps. Nearly 3.5 million electrified households were projected to still use kerosene for lighting, likely due to costs, local preference, or grid stability issues. In equivalent energy amount, kerosene used for lighting was estimated to be at nearly 13% at the national level.

The survey also identified LPG use for water heater, the less common appliance used in only about 0.3% of the households. Both electric and gas-powered water heaters were only used by a very small portion of the population, at about 1%; however, in terms of equivalent energy, the share was considerably more dominant, at almost 80%.

The benefits for shifting distribution of usage share in residential cooking should be further assessed, in parallel with emissions mitigation efforts in GHG and household air pollution reduction. The use of kerosene lamps in electrified households should be discouraged, and further reduced through deployment of affordable and efficient lighting products. The success of LED-deployment program called UJALA in India can be used as an inspiration for similar future programs in Indonesia, as well as building upon MEMR's efforts in providing energy efficient solar-powered LED bulbs in 2,500 villages with limited electricity access.[69,70]

6.5.1 Gas

As identified through this survey, nearly 80% of all households used gas to fuel their non-electrical appliances. There are two form of gaseous fuels available in distribution, namely LPG, containing 50% propane and 50% butane,[71] and natural gas, containing 80-95% methane, 5-15% ethane, <5% propane and butane.[72]

Nearly 97% utilize LPG supplied in cylinders, and only 3% have access to centralized natural gas systems, referred as "City Gas". Only two of all the surveyed households indicated dual use of LPG and City Gas, projected at 15,012 households nationally. Both LPG and City Gas were used primarily for cooking, with only seven LPG respondents using gas for water heating, as seen in Table 59.

[69] EESL & IEA. "India UJALA Story – Energy Efficient Prosperity". 2017. https://www.eeslindia.org/content/dam/doitassets/eesl/pdf/programmes/UJALA/UJALA_Case_Studies_1.pdf

[70] MEMR. "3 Tahun Kinerja Sektor ESDM: Lampu Surya Hemat Energi, Melistriki Desa Belum Berlistrik - Kementerian ESDM Republik Indonesia." Kementerian ESDM Republik Indonesia. Last modified October 26, 2017. https://ebtke.esdm.go.id/post/2017/10/26/1790/3.tahun.kinerja.sektor.esdm.lampu.surya.hemat.energi.melistriki.desa.belum.berlistrik.

[71] MEMR Directorate General Oil and Gas. "Komposisi LPG Tidak Berubah." Migas.esdm.go.id. Accessed May 29, 2020. https://migas.esdm.go.id/post/read/Komposisi-LPG-Tidak-Berubah.

[72] MEMR Directorate General Oil and Gas. "Pembangunan Jaringan Gas Bumi untuk Rumah Tangga". https://migas.esdm.go.id/uploads/buku-jasrgas-isi.pdf

Table 59. Gas type and usage purpose (based on 4,233 respondents reporting access to natural gas, representing 51,777,336 households—2 respondents indicated dual use of LPG and City Gas, at 15,012 projected households)

Type	Usage	Base (n)	Projection (HH)	National Consumption (listed units)	National Consumption (BOE)	Usage Share
LPG	Cooking stove	4110	50,444,880	4,302,728 ton	36,679,038	96.8%
	Gas water heater	19	228,234	9,105 ton	77,613	0.2%
City Gas	Cooking stove	125	1,339,347	195,413,641 m^3	1,149,618	3.0%
	Gas water heater	-	-		-	-
Projected national consumption of natural gas (BOE)					**37,906,270**	**100%**

LPG

The survey identified that the most widely used LPG in Indonesia is the 3 kg capacity cylinders, used for both cooking stoves and gas-powered water heater units. The majority of gas cookstoves (97%) were utilizing 3 kg LPG, while only 3% use larger capacity LPG of 5.5 kg and 12 kg. Two-thirds of gas-fired water heaters were also found to be mostly powered by the 3 kg cylinders, and one-third by the 12 kg.

Table 60. Distribution of LPG penetration and average usage for cooking stove (based on 4,110 respondents, projected to 50,444,880 households) and water heater (based on 19 respondents, projected to 228,234 households)

National Penetration of LPG Cook Stove		**77%**	**National Penetration of LPG Water Heater**		**0.3%**
Capacity	**Share**	**Avg Cylinder / Month**	**Capacity**	**Share**	**Avg Cylinder / Month**
12 kg	2.2%	0.7	12 kg	30%	0.5
5.5 kg (Pink)	0.6%	1.5	5.5 kg (Pink)	-	-
5.5 kg (Blue)[73]	0.4%	2.0	5.5 kg (Blue)	-	-
3 kg	96.8%	2.4	3 kg	70%	3.8
300 g canister	0.02%	2.0	300 g canister	-	-
Monthly Consumption		**358,000 ton**			**760 ton**

The national average tube gas consumption was calculated based on the average time for replacement per month for each tube size, which was then multiplied by the total number of households that reported usage for the listed 5 types of tube gas. An annual total LPG consumption obtained through this survey is 4.3 million tons in 2019 for pure residential use. Based on the listed distribution, 4.17 million tons of subsidized 3 kg LPG were consumed in 2019, in nearly 48.9 million households.

The 3 kg LPG has been and is currently subsidized by the government, to support the nationwide conversion from kerosene to LPG that began in 2007 and to provide affordable access to cleaner and efficient fuel source, especially for people residing in remote areas with limited distribution access in Eastern Indonesia. However, there has been a high rate of misuse by those considered financially able to

[73] Distributon of blue cylinder in 5.5 kg is limited in Java by PGN. Blue Gaz. Perusahaan Gas Negara. http://www.bluegaz.co.id/5/tabung-gas-t911---khusus-pulau-jawa.html

purchase unsubsidized larger capacity LPGs and restaurants, mainly due to the current open distribution access and the absence of purchase restrictions in the distribution system.[74]

City Gas

Currently, more than 50% of the domestic gas energy demand is fulfilled through imports. To meet this growing demand, Indonesia plans to apply several support programs, including a plan to build additional gas distribution network for 4.7 million households residing in cities by 2025.[75] The map of the planned national natural gas transmission and distribution network for 2012 to 2025 is provided in Figure 71.[76] The existing and planned transmission pipelines are primarily located in Java, Sumatra, Kalimantan, and Sulawesi. Over the period of 2009 to 2019, MEMR has coordinated installations of pipeline gas connections in 400,269 households.[77]

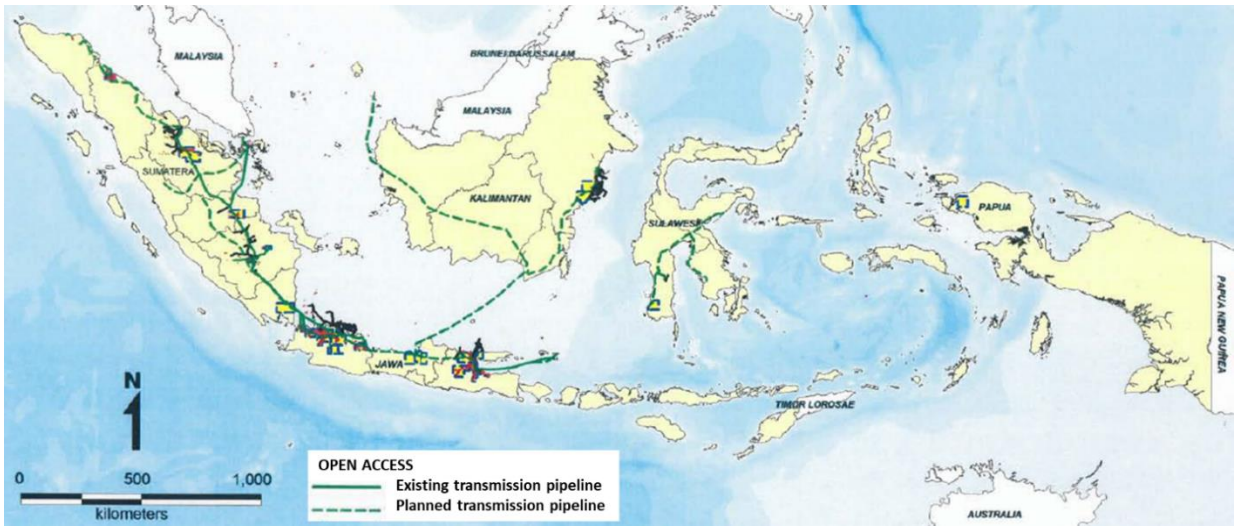


Figure 71: Indonesia's national natural gas pipeline transmission and distribution network master plan (2012-2025)

Since 2013, the state-owned corporation for energy and petrochemicals, PT Pertamina, assigned PT Pertagas Niaga (PTGN) to conduct and manage City Gas around industrial area in Prabumulih in South Sumatra, Sengkang in South Sulawesi, and Jambi in South Sumatra. PTGN also has programs to build City Gas facilities for households in upper socioeconomic class, hotels, restaurants, office buildings, and shopping centers. PTGN has currently established City Gas in 9 provinces.[78] The most recently published number of household connections developed PTGN was 201,464.[79]

In addition to PTGN, PT Perusahaan Gas Negara (PGN) Tbk, a publicly listed subsidiary of PT Pertamina also provides City Gas for North Sumatra (Medan), Kepulauan Riau (Batam), Riau (Pekanbaru), Lampung, Banten (Tangerang, Cilegon), Jakarta, West Java (Bogor, Bekasi, Karawang, Cirebon), Jawa Tengah

[74] MEMR. LPG 3 Kg Right on Target: 50% of the Poor Have Been Registered. https://www.esdm.go.id/id/berita-unit/direktorat-jenderal-minyak-dan-gas-bumi/lpg-3-kg-tepat-sasaran-50-masyarakat-miskin-telah-terdata
[75] RUEN https://www.esdm.go.id/assets/media/content/content-rencana-umum-energi-nasional-ruen.pdf
[76] Directorate General Oil and Gas MEMR. MEMR's Ministerial Decree No. 2700/K/11/MEM/2012. https://migas.esdm.go.id/uploads/regulasi/profil_peraturan_309.pdf
[77] Tunda Proyek Jaringan gas, ESDM Alihkan Dana Rp 3,5 T untuk COVID-19. (2020, April 27). Berita Terkini Hari Ini Ekonomi dan Bisnis Indonesia - Katadata.co.id. https://katadata.co.id/berita/2020/04/27/tunda-proyek-jaringan-gas-esdm-alihkan-dana-rp-35-t-untuk-covid-19
[78] Pertagas Niaga pertagasniaga.pertamina.com/city_gas
[79] Pertagas Pastikan Keamanan Pasokan Jargas Selama Ramadan. (2020, April 22). Bisnis.com. https://ekonomi.bisnis.com/read/20200422/44/1231291/pertagas-pastikan-keamanan-pasokan-jargas-selama-ramadan

(Semarang), and Jawa Timur (Surabaya-Gresik, Sidoarjo-Mojokerto, and Pasuruan Probolinggo).[80] PTGN reported that over 390,000 household connections are maintained by the company in mid-2020.[81]

In this survey, provinces with the highest penetration of city gas are Banten, Kalimantan Utara, and Kepulauan Riau, at 25%, 10%, and 9% respectively.

Table 61. City gas penetration for province with city gas

Province	Base (n)	Projection (household)	Penetration
Total National	**5,443**	**65,235,568**	**2.1%**
Sumatera Selatan	158	1,952,746	2.3%
Lampung	158	2,097,146	0.5%
Kepulauan Riau	53	523,989	9.4%
DKI Jakarta	216	2,672,331	4.2%
Jawa Barat	987	12,671,012	1.8%
Jawa Tengah	688	9,207,403	0.1%
Jawa Timur	925	10,843,053	1.1%
Banten	235	2,921,426	25.3%
Kalimantan Utara	50	140,919	10.2%
Sulawesi Utara	58	612,818	2.7%

The energy consumption from City Gas was obtained from the monthly gas bill submitted by the surveyed households and the tariff rate obtained from BPH Migas for City Gas in IDR per m^3.[82] Tariff rate at Rp 3,141/m^3 was assumed, yielding an average monthly consumption at 25.8 m^3 per household.

From the 125 surveyed households with access to City Gas that is projected to 1,339,347 household at the national level, a total monthly consumption of 16.3 million m^3 of natural gas was consumed. The survey estimated an annual consumption at 195 million m^3 for City Gas, which is about 8% of the LPG consumption quantified in this survey.

The total City Gas consumption estimated through the survey was nearly 6 times the reported total consumption in 2018 by PGN. This difference was likely to originate from the unaccounted consumption from PTGN and other pipeline gas providers. As the national total pipeline gas consumption from all suppliers was not obtained, the extent of this survey's projection was unfortunately not quantified.

6.5.2 Kerosene

Kerosene to LPG nationwide conversion is projected to be completed in 2022.[83] In this survey, kerosene was still used by 5% of the households at the national level. Provinces with the highest use were Maluku, Papua, Papua Barat, and NTT with over 75% kerosene penetration.

Table 62. Penetration per province of kerosene usage for cooking stoves

Province	Base (n)	Projection (household)	Penetration
Total National	**5,443**	**65,235,568**	**5.3%**
Aceh	91	1,198,063	1.1%

[80] PGN https://pgn.co.id/tentang-kami
[81] PGN: April, Pembangunan Jargas Rumah Tangga Mencapai 39 Persen. (2020, May 7). Berita Terkini Hari Ini Ekonomi dan Bisnis Indonesia - Katadata.co.id. https://katadata.co.id/berita/2020/05/07/pgn-april-pembangunan-jargas-rumah-tangga-mencapai-39-persen
[82] Penetapan Harga Gas Bumi Wilayah Jakarta https://www.bphmigas.go.id/penetapan-harga-gas-bumi-wilayah-jakarta/
[83] Indonesia Energy Outlook 2019 https://www.esdm.go.id/assets/media/content/content-indonesia-energy-outlook-2019-english-version.pdf

Province	Base (n)	Projection (household)	Penetration
Total National	**5,443**	**65,235,568**	**5.3%**
Sumatera Utara	267	3,253,945	6.7%
Sumatera Barat	95	1,207,827	13.2%
Riau	124	1,506,585	3.2%
Kepulauan Bangka Belitung	51	357,215	1.7%
Kepulauan Riau	53	523,989	18.9%
DKI Jakarta	216	2,672,331	0.5%
Jawa Barat	987	12,671,012	0.4%
Jawa Tengah	688	9,207,403	0.5%
Jawa Timur	925	10,843,053	9.7%
Nusa Tenggara Barat	104	1,366,595	4.9%
Nusa Tenggara Timur	68	812,537	**76.6%**
Kalimantan Tengah	50	627,675	1.6%
Kalimantan Selatan	87	1,073,863	7.7%
Kalimantan Timur	63	859,805	1.6%
Kalimantan Utara	50	140,919	2.6%
Sulawesi Utara	58	612,818	1.3%
Sulawesi Tengah	50	646,154	14.4%
Sulawesi Selatan	141	1,943,092	0.9%
Sulawesi Tenggara	52	530,464	3.1%
Gorontalo	54	260,705	1.4%
Maluku	51	313,074	**88.7%**
Papua Barat	54	180,357	**95.5%**
Papua	52	422,242	**86.5%**

Kerosene is used for cooking (65%) and lighting purposes (35%) in the surveyed households. Based on the reported monthly use in nearly 3.5 million households, the total consumption was 275 million L in 2019.

Table 63. Distribution of kerosene use purposes (based on 359 surveyed respondents, representing 3,450,511 households)

Type	Kerosene Usage
Kerosene Stove	65%
Kerosene Lamp	35%
Kerosene Monthly Consumption per Household	**6.64 L/month**

6.5.3 Biomass

The survey found 6.0% of households using biomass stoves nationally. Highest penetration was in NTT with 79.5%, followed by Sulawesi Barat at 40.2% and Sumatera Barat at 33.3%.

Table 64. Incidence of biomass stove

Province	Base (n)	Projection (household)	Penetration
Total National	**5,443**	**65,235,568**	**6.0%**
Sumatera Utara	267	3,253,945	0.3%
Sumatera Barat	95	1,207,827	33.3%

Province	Base (n)	Projection (household)	Penetration
Total National	**5,443**	**65,235,568**	**6.0%**
Riau	124	1,506,585	1.0%
Lampung	158	2,097,146	1.4%
Kepulauan Bangka Belitung	51	357,215	2.4%
DKI Jakarta	216	2,672,331	0.5%
Jawa Barat	987	12,671,012	5.3%
Jawa Tengah	688	9,207,403	3.4%
DI Yogyakarta	84	1,110,336	1.0%
Jawa Timur	925	10,843,053	12.0%
Nusa Tenggara Barat	104	1,366,595	17.3%
Nusa Tenggara Timur	68	812,537	79.5%
Kalimantan Selatan	87	1,073,863	2.5%
Kalimantan Utara	50	140,919	6.4%
Sulawesi Tengah	50	646,154	2.9%
Sulawesi Selatan	141	1,943,092	5.2%
Sulawesi Tenggara	52	530,464	3.1%
Sulawesi Barat	50	274,146	40.2%

The average usage for biomass stove was 1.86 hours per day, ranging from 1 and up to 6 hours. Firewood was the most common biomass fuel source used in the surveyed households, at 88% share, followed by coconut shell at 10% share.

Table 65. Distribution of biomass types usage (based on 293 surveyed respondents, representing 3,936,817 households)

Source of Biomass Stove	Biomass Usage Share
Wood	88.4%
Coconut shell	10.1%
Husk	1.2%
Charcoal	0.3%

Zero Kero Program that primarily focused on the conversion of kerosene use to LPG, was unfortunately not targeting biomass users. While the government has achieved substantial kerosene subsidy reduction, there is a pressing need to evaluate the sustainability of the LPG use in daily cooking and address household air pollution issue and health impacts of the existing kerosene and biomass usage. Due to growing energy needs and rising fuel prices, collected firewood and crop residue remain an affordable option particularly for rural households, and likely the fuel source relied upon in low-income families.[84]

[84] Semarak News 2019 https://semarak.news/ekonomi/tidak-sekadar-penerangan-dan-elpiji-kualitas-akses-energi-di-indonesia-perlu-ditingkatkan-untuk-meraih-manfaat-pembangunan-manusia/

7 Conclusions and Recommendations

CLASP's *Indonesia Residential End-Use National Survey* provides an extensive view into the country's appliance distribution, ownership, and usage. The survey results were used as the primary inputs to generate estimates on energy consumption, to inform policymakers and stakeholders on Indonesia's untapped energy efficiency potential.

Conducted in collaboration with EBTKE, this survey identifies household appliances that should be prioritized for energy conservation and provides a robust reference dataset that can be used in formulating future policies. Through stringent MEPS and effective comparative labeling, Indonesia can significantly reduce energy consumption, achieving climate mitigation targets, while at the same time saving money for over 65 million Indonesian households through reduced electricity bills.

The survey covered all of Indonesia, with surveyors interviewing 5,443 randomly sampled households within a four-month period, from September to December 2019. The survey was conducted in both urban and rural areas in 34 provinces and covered a total of 42 appliances, including both high and low wattage products (e.g., AC and rice cookers as well as lighting and cell phones).

Among the surveyed appliances, CLASP identified 10 with the highest electricity consumption at the national level—listed in descending order: rice cooker, refrigerator, lighting, TV, fan, AC, water dispenser, washing machine, iron, and water pump. The top 6 appliances namely rice cooker, refrigerator, lighting, TV, fan, and AC were estimated to strongly contribute to electricity demand peaks due to their frequent use in the evening.

Refrigerators and water dispensers tend to be plugged in continuously, drawing constant power throughout the day. Rice cookers are used throughout the day and into the evening. Lighting is used for 7.5 hours daily, primarily in the evening and late at night. TV use gradually increases throughout the day, peaking in the evening.

Fans and ACs, the two major cooling appliances in Indonesia, are used similarly, with higher use in the evening and late at night. At 64% national penetration rate, fans are the most widely used cooling appliance. ACs were found in only 5% of households, but their high wattage resulted in almost the same national energy consumption as fans.

LPG cookstove was identified as the most important non-electrical appliance in Indonesian households. A share of 80% of the survey-estimated national equivalent energy use for all cookstoves was accounted for LPG, followed by biomass at 15%, natural gas at 3%, kerosene at 2%, and electricity at 0.05%. While the vast majority of electrified households use grid-powered lighting, kerosene lamps were still found in 2% of all households, projected at 3.5 million households.

The survey identified energy savings as the top consideration in new appliances purchases. Most consumers currently rely on the nameplate power rating to estimate energy consumption, or simply ask the salesperson. Despite having enforced mandatory MEPS and labeling policy for ACs since 2017 and CFLs since 2014,[85] public awareness of EBTKE's programs was found to still be very low. In Java, the most densely populated island in Indonesia, 7% of the surveyed households recognized the SKEM label; nationally, the proportion was 6.5%.

The findings from this survey clearly indicate that targeted energy efficiency policies and outreach programs can bring significant impacts in the country. Building upon the existing AC and CFL programs, EBTKE should focus on covering the identified top energy-consuming appliances, reducing energy consumption and CO_2 emissions through MEPS and providing needed efficiency information to consumers through labels. With a modest 15% improvement in the efficiency of the top 10 electrical appliances, standards and labeling could reduce up to 10,000 GWh per year, or about 10% of annual residential energy use.

[85] MEMR. Official posts for CFL regulation in 2014, and AC in 2018. https://ebtke.esdm.go.id/post/2014/11/13/712/peraturan.label.hemat.energi.lampu.swabalast,https://ebtke.esdm.go.id/post/2018/08/20/1997/pemerintah.terapkan.skem.dan.pencantuman.label.hemat.energi.untuk.peranti.pengkondisi.udara.

Appendix A. Timeline

	2019								2020		
	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar
Activity											
PREPARATION											
Kickoff Meeting											
Inception Report											
Questionnaire Development											
Questionnaire Programming											
Pilot Interview											
Briefing & Preparation											
DATA COLLECTION											
National Exclude Maluku Papua											
National Total											
DATA PROCESSING & ANALYSIS											
National Exclude Maluku Papua											
National Total											

Appendix B. Sampling based on BPS SUPAS

Referencing BPS Survei Penduduk Antar Sensus / Supas 2015 (Inter-Census Population Survey)

No	Province	Census Household with Electricity			City/Regency	Number of Sample (Achievement)		
		Urban	Rural	TOTAL		Urban	Rural	Total
1	Aceh	363,516	834,547	1,198,063	Kota Banda Aceh	31		**91**
					Kab. Aceh Utara		60	
2	Sumatera Utara	1,726,895	1,527,053	3,253,948	Kota Medan	83		**267**
					Kota Binjai	62		
					Kab.Deli Serdang		64	
					Kab. Langkat		58	
3	Sumatera Barat	538,864	668,962	1,207,826	Kota Padang	40		**95**
					Kab. Agam		55	
4	Riau	615,331	891,254	1,506,585	Kota Pekanbaru	46		**124**
					Kab. Kampar		78	
5	Jambi	262,012	567,067	829,079	Kota Jambi	20		**60**
					Kab. Muaro Jambi		40	
6	Sumatera Selatan	689,286	1,263,460	1,952,746	Kota Palembang	63		**158**
					Kab. Ogan Komering Ulu		54	
					Kab.Banyu Asin		41	
7	Bengkulu	151,452	318,591	470,043	Kota Bengkulu	21		**65**
					Kab. Bengkulu Utara		44	
8	Lampung	571,661	1,525,485	2,097,146	Kota Bandar Lampung	44		**158**
					Kab. Lampung Tengah		64	
					Kab. Lampung Timur		50	
9	Kepulauan Bangka Belitung	187,587	169,628	357,215	Kota Pangkal Pinang	31		**51**
					Kab. Bangka		20	
10	Kepulauan Riau	447,212	76,777	523,989	Kota Batam	42		**53**
					Kab. Karimun		11	
11	DKI Jakarta	2,672,327	0	2,672,327	Jakarta Timur	59		**216**
					Jakarta Selatan	42		

No	Province	Census Household with Electricity			City/Regency	Number of Sample (Achievement)		
		Urban	Rural	TOTAL		Urban	Rural	Total
					Jakarta Barat	41		
					Jakarta Utara	35		
					Jakarta Pusat	39		
12	Jawa Barat	8,981,491	3,689,573	12,671,064	Kota Bandung	165		987
					Kota Bogor	104		
					Kota Bekasi	108		
					Kota Depok	121		
					Kota Cirebon	107		
					Kota Sukabumi	120		
					Kab. Garut		101	
					Kab. Majalengka		101	
					Kab. Tasikmalaya		60	
13	Jawa Tengah	4,404,084	4,803,338	9,207,422	Kota Semarang	82		688
					Kota Surakarta	80		
					Kota Pekalongan	81		
					Kota Tegal	88		
					Kab. Rembang		73	
					Kab. Banyumas		74	
					Kab. Kebumen		73	
					Kab. Brebes		74	
					Kab. Grobogan		63	
14	DI Yogyakarta	797,871	312,465	1,110,336	Kota Yogyakarta	64		84
					Kab. Sleman		20	
15	Jawa Timur	5,435,070	5,407,912	10,842,982	Kota Surabaya	97		925
					Kota Malang	93		
					Kota Probolinggo	94		
					Kota Madiun	92		
					Kota Kediri	72		
					Kab. Banyuwangi		96	
					Kab. Pacitan		96	

No	Province	Census Household with Electricity			City/Regency	Number of Sample (Achievement)		
		Urban	Rural	TOTAL		Urban	Rural	Total
					Kab. Tuban		109	
					Kab. Ngawi		99	
					Kab. Situbondo		77	
16	Banten	2,040,650	880,769	2,921,419	Kota Serang	85		235
					Kota Tangerang	81		
					Kab. Lebak		69	
17	Bali	725,143	372,073	1,097,216	Kota Denpasar	50		80
					Kab. Buleleng		30	
18	Nusa Tenggara Barat	618,281	748,315	1,366,596	Kota Mataram	42		104
					Kab. LombokTimur		62	
19	Nusa Tenggara Timur	237,224	575,312	812,536	Kota Kupang	25		68
					Kab. Kupang		43	
20	Kalimantan Barat	360,300	666,914	1,027,214	Kota Pontianak	32		72
					Kab. Mempawah		40	
21	Kalimantan Tengah	240,519	387,156	627,675	Kota Palangkaraya	20		50
					Kab. Kotawaringin Timur		30	
22	Kalimantan Selatan	486,751	587,112	1,073,863	Kota Banjarmasin	43		87
					Kab. Banjarmasin		44	
23	Kalimantan Timur	574,431	285,375	859,806	Kota Samarinda	41		63
					Kab. Kutai Kartanegara		22	
24	Kalimantan Utara	70,189	70,730	140,919	Kota Tarakan	30		50
					Kab. Bulungan		20	
25	Sulawesi Utara	300,240	312,578	612,818	Kota Manado	25		58
					Kab. Minahasa		33	
26	Sulawesi Tengah	186,370	459,784	646,154	Kota Palu	20		50
					Kab. Parigi Moutong		30	
27	Sulawesi Selatan	779,450	1,163,639	1,943,089	Kota Makassar	61		141
					Kab. Maros		80	

No	Province	Census Household with Electricity			City/Regency	Number of Sample (Achievement)		
		Urban	Rural	TOTAL		Urban	Rural	Total
28	Sulawesi Tenggara	181,431	349,033	530,464	Kota Kendari	21		52
					Kab. Kolaka		31	
29	Gorontalo	105,319	155,386	260,705	Kota Gorontalo	21		54
					Kab. Bone Bolango		33	
30	Sulawesi Barat	57,467	216,679	274,146	Kab. Mamuju	10		50
					Kab. Majene		40	
31	Maluku	144,278	168,796	313,074	Kota Ambon	21		50
					Kab. Maluku Tengah		30	
32	Maluku Utara	75,280	149,024	224,304	Kota Ternate	33		50
					Kab. Halmahera Selatan		17	
33	Papua Barat	78,429	101,928	180,357	Kota Sorong	0		54
					Kab. Manokwari		54	
34	Papua	195,932	226,310	422,242	Kota Jayapura	51		52
					Kab. Jayapura		1	
	TOTAL	**35,302,343**	**29,933,025**	**65,235,368**		**2,979**	**2,464**	**5,443**

Appendix C. Questionnaire

ID Responden

Project Name :	Edison
Project Number:	1902544001
Questionnaire:	Screening & Main Questionnaire
Version:	Final
Date:	March 16, 2021
Exec in charge:	BW/MW/AP

Nama responden: *Respondent name:* No KTP: *ID Card Number:*	
Alamat lengkap : *Address:* RT: RW: KEL: KEC: *Family Group:* *Communities:* *Neighborhood:* *Sub Disctrict:*	
KODE POS: KOTA : *ZIP CODE:* *CITY :*	
No telpon rumah : *Phone number:*	No Hp: *Mobile:*
	Alamat email : *Email Address:*
Nama interviewer : *Interviewer name:*	Inverviewer ID : *Interviewer ID:*
Tgl/bln/th Interview : *Date Interview:*	Jam mulai : *Time Start:*
Lama waktu Interview : *Length of Interview:*	Jam selesai : *Time End:*

PERKENALAN *INTRODUCTION*

Selamat pagi / siang / sore / malam. Nama saya adalah ……. (*SEBUTKAN NAMA ANDA*) dari Ipsos, sebuah perusahaan riset pasar yang independen. Kami mewakili **Kementrian Energi dan Sumber Daya Mineral (ESDM)** sedang melakukan survey untuk mengetahui ***penggunaan listrik dan peralatan elektronik rumah tangga sehari-hari***. Kami akan berterima kasih sekali jika Anda dapat meluangkan waktu Anda sekitar 45 menit untuk membantu kami dalam penelitian ini. Kami jamin bahwa penelitian ini adalah murni untuk kepentingan penelitian. Saya tidak mencoba untuk menjual apapun kepada Anda dan informasi yang Anda berikan akan digunakan hanya untuk keperluan penelitian saja.

*"Good morning / afternoon / evening. My name is _____ (MENTION YOUR NAME) from Ipsos, carrying out a study on behalf **Ministry of Energy and Mineral Resource,** to find out your daily usage of household appliance. We would be grateful if you could spare your time about 45 minutes to assist us in our research. May I reassure you that this is a genuine piece of research. I am not trying to sell you anything and the information will be used for research purposes only".*

AREA RECORD

RECORD PROVINCE

S1 **INTERVIEWER:** CATAT PROVISI **(SA)** *RECORD PROVINCE **(SA)***

		CEK KUOTA (TOTAL 5000) *QUOTA CHECK (TOTAL 5000)*
Aceh	1	90
Sumatera Utara	2	240
Sumatera Barat	3	90
Riau	4	110
Jambi	5	60
Sumatera Selatan	6	140
Bengkulu	7	50
Lampung	8	150
Kepulauan Bangka Belitung	9	50
Kepulauan Riau	10	50
DKI Jakarta	11	190
Jawa Barat	12	910
Jawa Tengah	13	660
DI Yogyakarta	14	80
Jawa Timur	15	780
Banten	16	210
Bali	17	80
Nusa Tenggara Barat	18	100
Nusa Tenggara Timur	19	60
Kalimantan Barat	20	70
Kalimantan Tengah	21	50
Kalimantan Selatan	22	80
Kalimantan Timur	23	60
Kalimantan Utara	24	50
Sulawesi Utara	25	50
Sulawesi Tengah	26	50
Sulawesi Selatan	27	140
Sulawesi Tenggara	28	50
Gorontalo	29	50
Sulawesi Barat	30	50
Maluku	31	50
Maluku Utara	32	50
Papua Barat	33	50
Papua	34	50

RECORD DISTRICT

S2 **INTERVIEWER:** CATAT KABUPATEN **(SA)** *RECORD DISTRICT **(SA)***

DP : TUNJUKKAN KABUPATEN SESUAI PROVINSI DI S1 *SHOW DISTRICT ACCORDING PROVINCE IN S1*

		PROVINSI	URBAN (1) PERI-URBAN (2)	CEK KUOTA
Kota Banda Aceh	1	Aceh (1)	1	30
Kab. Aceh Utara	2		2	60
Kota Medan	3	Sumatera Utara (2)	1	70
Kota Binjai	4		1	60
Kab. Deli Serdang	5		2	60
Kab. Langkat	6		2	50
Kota Padang	7	Sumatera Barat (3)	1	40
Kab. Agam	8		2	50
Kota Pekanbaru	9	Riau (4)	1	40
Kab. Kampar	10		2	70
Kota Jambi	11	Jambi (5)	1	20
Kab. Muaro Jambi	12		2	40
Kota Palembang	13	Sumatera Selatan (6)	1	50
Kab. Ogan Komering Ulu	14		2	50
Kab. Banyu Asin	15		2	40
Kota Bengkulu	16	Bengkulu (7)	1	20
Kab. Bengkulu Utara	17		2	30
Kota Bandar Lampung	18	Lampung (8)	1	40
Kab. Lampung Tengah	19		2	60
Kab. Lampung Timur	20		3	50
Kota Pangkal Pinang	21	Kep. Bangka Belitung (9)	1	30
Kab. Bangka	22		2	20
Kota Batam	23	Kep. Riau (10)	1	40
Kab. Karimun	24		2	10
Jakarta Timur	25	DKI Jakarta (11)	1	50
Jakarta Selatan	26		1	40
Jakarta Barat	27		1	40
Jakarta Utara	28		1	30
Jakarta Pusat	29		1	30
Kota Bandung	30	Jawa Barat (12)	1	150
Kota Bogor	31		1	100
Kota Bekasi	32		1	100
Kota Depok	33		1	100
Kota Cirebon	34		1	100
Kota Sukabumi	35		1	100
Kab. Garut	36		2	100

Kab. Majalengka	37		2	100
Kab. Tasikmalaya	38		2	60
Kota Semarang	39	Jawa Tengah (13)	1	80
Kota Surakarta	40		1	80
Kota Pekalongan	41		1	80
Kota Tegal	42		1	80
Kab. Rembang	43		2	70
Kab. Banyumas	44		2	70
Kab. Kebumen	45		2	70
Kab. Brebes	46		2	70
Kab. Grobogan	47		2	60
Kota Yogyakarta	48	DKI Yogyakarta (14)	1	60
Kab. Sleman	49		2	20
Kota Surabaya	50	Jawa Timur (15)	1	80
Kota Malang	51		1	80
Kota Probolinggo	52		1	80
Kota Madiun	53		1	80
Kota Kediri	54		1	70
Kab. Banyuwangi	55		2	80
Kab. Pacitan	56		2	80
Kab. Tuban	57		2	80
Kab. Ngawi	58		2	80
Kab. Situbondo	59		2	70
Kota Serang	60	Banten (16)	1	70
Kota Tangerang	61		1	80
Kab. Lebak	62		2	60
Kota Denpasar	63	Bali (17)	1	50
Kab. Buleleng	64		2	30
Kota Mataram	65	NTB (18)	1	40
Kab. Lombok Timur	66		2	60
Kota Kupang	67	NTT (19)	1	20
Kab. Kupang	68		2	40
Kota Pontianak	69	Kalimantan Barat (20)	1	30
Kab. Mempawah	70		2	40
Kota Palangkaraya	71	Kalimantan Tengah (21)	1	20
Kab. Kotawaringin Timur	72		2	30
Kota Banjarmasin	73	Kalimantan Selatan (22)	1	40
Kab. Banjarmasin	74		2	40
Kota Samarinda	75	Kalimantan Utara (23)	1	40
Kab. Kutai Kartanegara	76		2	20

Kota Tarakan	77	Kalimantan Tengah (24)	1	30
Kab. Bulungan	78		2	20
Kota Manado	79	Sulawesi Utara (25)	1	20
Kab. Minahasa	80		2	30
Kota Palu	81	Sulawesi Tengah (26)	1	20
Kab. Parigi Moutong	82		2	30
Kota Makassar	83	Sulawesi Selatan (27)	1	60
Kab. Maros	84		2	80
Kota Kendari	85	Sulawesi Tenggara (28)	1	20
Kab. Kolaka	86		2	30
Kota Gorontalo	87	Gorontalo (29)	1	20
Kab. Bone Bolango	88		2	30
Kab. Mamuju	89	Sulawesi Barat (30)	1	10
Kab. Majene	90		2	40
Kota Ambon	91	Maluku (31)	1	20
Kab. Maluku Tengah	92		2	30
Kota Ternate	93	Maluku Utara (32)	1	20
Kab. Halmahera Selatan	94		2	30
Kota Sorong	95	Papua Barat (33)	1	20
Kab. Manokwari	96		2	30
Kota Jayapura	97	Papua (34)	1	20
Kab. Jayapura	98		2	30

RECORD AREA

S3 **DP : OTOMATIS TERKODE SESUAI TABEL KABUPATEN DI S2** *AUTOCODE ACCORDING TABLE DISTRICT IN S2*

Urban	1
Peri-Urban	2

PANEL AREA

S3b **INTERVIEWER CATAT AREA SESUAI PANEL/ PSU** *RECORD AREA ACCORDING TO THE PANEL/ PSU*
DP: TUNJUKKAN KODE 3 HANYA JIKA TERKODE 25 – 29 ATAU 50 DI S2 *SHOW CODE 3 ONLY IF CODED 25 – 29 OR 50 IN S2*

Random PSU Umum *General Random PSU*	1
Random PSU Rumah Mewah/ Cluster (Purposive dalam PSU) *Random PSU for gated community (Purposive within PSU)*	2
Apartemen *Apartment*	3

SCREENING

INTERVIEWER KATAKAN : Bapak/Ibu/ kakak, sekarang saya akan mulai bertanya mengenai hal-hal yang berhubungan dengan penggunaan listrik dan alat-alat yang membutuhkan energi di rumah. Alat rumah tangga yang saya maksud di sini contohnya seperti lampu, TV, kulkas, kipas angin, AC, rice cooker, kompor gas, blender, oven, alat pemanas, mesin cuci, setrika, dan lain-lain. Selain alat-alat rumah tangga, kami juga akan bertanya mengenai alat-alat elektronik pribadi seperti komputer, laptop, handphone, speaker, printer, dll.
Ketika menjawab pertanyaan, mohon mengacu ke contoh alat-alat yang saya sebutkan tadi.
INTERVIEWER READ OUT : Mr/ Mrs/ Ms, now I'm going to ask about electricity and fuel usage and household appliance such as lighting, television, refrigerator, electric fan, AC, rice cooker, blender, oven, heater, washing machine, iron, and others. Besides household appliance, we will also ask about personal electric appliance such as computer, laptop, mobile phone, speaker, printer, etc.
When answering the question, please refer to the appliance that I have mentioned before

AWARENESS OF APPLIANCE USAGE

TUNJUKKAN TABLET *SHOW TABLET*

S4 Seberapa besar pengetahuan Anda terhadap PENGGUNAAN barang-barang elektronik untuk rumah tangga Anda? **(SA)**.
*How much your awareness about USAGE of electrical appliances in your household? **(SA)***

Saya tidak tahu sama sekali tentang penggunaan barang-barang elektronik di rumah tangga *I don't know at all about usage of HH electric appliance*	1	STOP *STOP*
Saya hanya tahu sedikit tentang penggunaan barang-barang elektronik di rumah tangga *I know few things about usage of HH electric appliance*	2	
Saya tahu banyak tentang penggunaan barang-barang elektronik di rumah tangga *I know many things about usage of HH electric appliance*	3	LANJUTKAN *CONTINUE*
Saya tahu semua tentang penggunaan barang-barang elektronik di rumah tangga *I know all about usage of HH electric appliance*	4	

AWARENESS OF ELECTRICITY BILL

TUNJUKKAN TABLET *SHOW TABLET*

S5 Apakah Anda tahu berapa tagihan listrik rumah tangga setiap bulannya? **(SA)**.
*Do you aware how much your monthly electricity bill in your household? **(SA)***

Ya *Yes*	1	LANJUTKAN *CONTINUE*
Tidak *No*	2	STOP *STOP*

CONFLICTING HOUSEHOLD SITUATION

INTERVIEWER BACAKAN SATU PER SATU INTERVIEWER READ OUT ONE BY ONE

S6 Apakah kondisi penggunakan listrik di rumah tangga Anda sesuai dengan situasi berikut ini? **(SA)** *Is the electricity usage situation in your household suitable with following situation? **(SA)***

Penggunaan listrik di rumah tangga saya digunakan juga untuk usaha (contoh : bengkel, salon, laundry, minimarket, jual jus, warung/ restoran, dll) *Eletricity usage in household also used for business (ie. Workshop, salon, laundry, minimarket, juice center, restaurant, etc)*	1	**STOP**

Penggunaan listrik di rumah tangga saya digunakan bersama tetangga/ beberapa rumah *Household electricity is used with other household/ neighbour (more than 1 house for 1 account)*	2	
Disewakan untuk tempat kos (dimana listrik masih jadi 1 dengan tagihan listrik rumah tangga) *The house is rented, where the tenant and house owner use same source of electricity*	3	
Tidak satupun di atas *None of above*	99	**CONTINUE** **LANJUTKAN**

AGE

S7 Berapa usia Anda pada saat ulang tahun yang terakhir? **(SA)** How old are you based on your last birthday? **(SA)**

INTERVIEWER: CATAT USIA YANG SEBENARNYA DAN LINGKARI KELOMPOK USIA YANG SESUAI *RECORD RESPONDENT'S ACTUAL AGE AND CIRCLE THE APPROPRIATE AGE GROUP*

		Tahun y.o.

Di bawah 18 tahun *Less than 18 y.o.*	1	STOP
18 - 20 tahun *y.o.*	3	*LANJUTKAN CONTINUE*
21 - 30 tahun *y.o.*	4	
31 - 40 tahun *y.o.*	5	
41 - 50 tahun *y.o.*	6	
51 - 60 tahun *y.o.*	7	
Di atas 60 tahun *More than 60 y.o.*	8	STOP

INTERVIEWER: TANYAKAN DAN CATAT TANGGAL LAHIR RESPONDEN *ASK AND RECORD RESPONDENT'S DATE OF BIRTH*

Tanggal *Date*		Bulan *Month*		Tahun *Year*			

GENDER

S8 **INTERVIEWER:** *CATAT JENIS KELAMIN RESPONDEN* ***(SA)***
RECORD GENDER ***(SA)***

Laki-laki *Male*	1
Perempuan *Female*	2
Tidak menjawab *Don't want to specify*	3

SOURCE OF ELECTRICIY POWER

S9 Dari mana sumber daya listrik yang ada di rumah Anda? ***(MA)***
What is the source of electricity in your household? ***(MA)***

PLN *PLN*	1
Panel surya yang saya miliki *Solar panel*	2
Generator yang saya miliki *Generator*	3
Lainnya, sebutkan_____ *Other, specify*_____	4

MAIN QUESTIONNAIRE

SECTION A : LISTING SECTION

INTERVIEWER KATAKAN : Sekarang, kita akan berbicara mengenai semua peralatan yang membutuhkan energi di rumah tangga Anda

INTERVIEWER READ OUT : Now, we're going to talk about all appliance in your household

HOME APPLIANCE LISTING

A1a Dari daftar barang-barang yang membutuhkan energi berikut ini, mana saja yang dimiliki oleh rumah tangga Anda? ***(MA)***

CATATAN: *Jika diijinkan, interviewer sebaiknya berkeliling rumah sambil mencatat semua peralatan.*

Of these following appliance that require energy, which appliance owned by your household? ***(MA)***

NOTE: If allowed, interviewer go around the house to record all electric appliance

NUMBER OF ELECTRIC APPLIANCE

A1b Dari masing-masing peralatan yang tadi sudah disebutkan, berapa yang dimiliki oleh rumah ini? Silahkan mengingat ingat kembali sambil membayangkan seluruh sudut dari rumah ini. ***(OE)***

CATATAN: *Jika diijinkan, interviewer sebaiknya berkeliling rumah sambil mencatat semua peralatan.*

From each appliance you've mentioned before, how many number of appliance in the household? Please remember all the number by figuring it from all corner of this house. ***(MA)***

NOTE: If allowed, interviewer go around the house to record all electric appliance

FREQUENCY OF USAGE

TUNJUKKAN TABLET KE RESPONDEN

A1c Mana saja peralatan yang digunakan……?**(MA)**

INSTRUKSI: UNTUK ALAT ELEKTRONIK YANG MENGGUNAKAN BATERAI (CHARGE) SEPERTI TELEPON GENGGAM, LAPTOP, SPEAKER DLL, TIDAK MENGACU PADA FREKUENSI PAKAI, TAPI FREKUENSI ISI ULANG/ CHARGING.

a. Setiap hari/ hampir setiap hari
b. ***3 – 4 kali/ minggu***
c. ***1 – 2 kali per minggu***
d. ***1 – 3 kali per bulan***
e. ***Kurang dari 1 kali sebulan***

Which appliance that used …..? ***(MA)***

a. *daily/ almost daily*
b. *3 – 4 times/ week*
c. *1 – 2 times/ week*
d. *1 – 3 times/ month*
e. *Less than once in a month*

CATATAN UNTUK INTERVIEWER: UNTUK LAPTOP/ HP/ TABLET/ ALAT YANG MENGGUNAKAN BATERAI, TANYAKAN JAM NGECHARGE NYA.

		A1a	A1b Jumlah QNTY	A1c Frekuensi *Frequency*			
				Hampir/ setiap hari (daily) *Daily*	3-4 kali/ minggu *3 – 4 times/ week*	1 – 2 kali/ minggu *1 - 2 times/ week*	1 – 3 kali/ bulan *1-3 times/ month*
KATEGORI UTAMA	***PRIMARY CATEGORY***						
Lampu	*Lighting*	1		1	1	1	1
Kulkas	*Refrigerator*	2		2	2	2	2
AC (Pendingin ruangan)	*air conditioner*	3		3	3	3	3
TV	*Television*	4		4	4	4	4
Kipas angin (termasuk exhaust, dan segala jenis kipas angin)	*Electric fan*	5		5	5	5	5
Penanak/ penghangat nasi (Rice Cooker)	*Rice cooker/warmer*	6		6	6	6	6
KATEGORI UTAMA KEDUA	***SECONDARY CATEGORY***						
Setrika	*Iron*	7		7	7	7	7
Penyedot debu/ Vacuum cleaner	*Vacuum cleaner*	8		8	8	8	8
Mesin cuci	*Washing machine*	9		9	9	9	9
Dispenser	*Dispenser*	10		10	10	10	10
Pemanas air (menggunakan listrik) / water heater	*Water heater*	11		11	11	11	11
PERALATAN MASAK & RUMAH TANGGA	***COOKING/ HOUSEHOLD APPLIANCE***						
Pompa air	*Water pump*	12		12	12	12	12
Microwave	*Microwave*	13		13	13	13	13
Oven Listrik	*Electric oven*	14		14	14	14	14
Kompor listrik	*Cooktop*	15		15	15	15	15
Blender	*Blender*	16		16	16	16	16
Mesin pembuat jus/ Juicer	*Juicer*	17		17	17	17	17
Panggangan roti/ Toaster	*Toaster*	18		18	18	18	18
Mixer	*Mixer*	19		19	19	19	19
Exhaust dapur	*Kitchen exhaust*	20		20	20	20	20
ALAT PEMBERSIH	***CLEANING APPLIANCE***						
Mesin pencuci piring	*Diswasher machine*	21		21	21	21	21
PERALATAN KANTOR/ SEKOLAH	***OFFICE/ SCHOOL APPLIANCE***						

Lampu meja	*Desk lamp*	22		22	22	22	22
Komputer PC	*Personal computer (PC)*	23		23	23	23	23
Laptop	*Laptop*	24		24	24	24	24
Printer	*Printer*	25		25	25	25	25
HIBURAN	***ENTERTAINMENT***						
Set top box/ TV Tuner	*Set Top Box*	26		26	26	26	26
Speaker	*Speaker*	27		27	27	27	27
DVD/ VCD player	*DVD/ VCD Player*	28		28	28	28	28
Radio	*Radio*	29		29	29	29	29
Compo/ Mini compo	*Compo/ mini compo (audio system)*	30		30	30	30	30
Wifi	*Wifi*	31		31	31	31	31
ALAT KOMUNIKASI	***COMMUNICATION APPLIANCE***						
Tablet	*Tablet*	32		32	32	32	32
Telepon genggam (charger handphone)	*Cell phone*	33		33	33	33	33
Telepon kabel/ rumah	*Phone (Home)*	34		34	34	34	34
ALAT KECANTIKAN	***BEAUTY APPLIANCE***						
Catokan	*Hair iron*	35		35	35	35	35
Pengering rambut	*Hair dryer*	36		36	36	36	36
PERALATAN LAINNYA	***OTHER APPLIANCE***						
Pompa air dekoratif (Air mancur/ air terjun/ dll(	*Decorative water pump/ Outdoor water feature*	37		37	37	37	37
Pompa air untuk sirkulasi aquarium	*Aquarium water pump circulation*	38		38	38	38	38
Sepeda listrik	*Electric bike*	39		39	39	39	39
Segway	*Segway*	40		40	40	40	40
Lampu emergency	*Emergency lamp*	41		41	41	41	41
PERALATAN NON LISTRIK	***NON ELECTRI APPLIANCE***						
Kompor gas	*Gas stove*	42		42	42	42	42
Kompor minyak tanah	*Kerosene stove*	43		43	43	43	43
Tungku tradisional	*Biomass stove*	44		44	44	44	44
Pemanas air (menggunakan gas/elpiji)	*Water heater using gas/elpiji*	45		45	45	45	45
Lampu teplok/ ublik	*Kerosene lamp*	46		46	46	46	46
Lainnya, _____	*Other, specify_____*	47		47	47	47	47
Lainnya, _____	*Other, specify_____*	48		48	48	48	48
Lainnya, _____	*Other, specify_____*	49		49	49	49	49
Lainnya, _____	*Other, specify_____*	50		50	50	50	50
Lainnya, _____	*Other, specify_____*	51		51	51	51	51
Lainnya, _____	*Other, specify_____*	52		52	52	52	52

LIGHTING SECTION

DP : TANYA SECTION A2 JIKA TERJAWAB KODE 1 DI A1a
DP : ASK SECTION A2 IF CODED 1 IN A1a
Sekarang saya akan bertanya mengenai lampu/ penerangan yang ada di rumah Anda. Dari semua lampu/ penerangan yang dimiliki oleh rumah ini tolong beri keterangan sesuai kriteria-kriteria berikut ini.
Now, we're going to ask about lighting in your househol. Of all lighting in this house, please identify regarding following criteria. ***(A)***
DP: TOLONG TANYAKAN SATU PER SATU LAMPU YANG DIMILIKI DARI A2A – A2E, JIKA SUDAH TERISI SAMPAI A2E BARU LANJUT KE LAMPU BERIKUTNYA

A2a Berapa Watt masing-masing lampu tersebut? **(OE)**
How many wattage of each lighting ***(OE)***
INTERVIEWER: JIKA RESPONDEN SETELAH MENGECHECK MASIH TIDAK TAHU, TULIS "TIDAK TAHU"

1 – 5 Watt	**1**
5 – 10 Watt	2
11 – 15 Watt	3
16 – 20 Watt	4
21 – 25 Watt	5
26 – 30 Watt	6
31 – 30 Watt	7
31 – 40 Watt	8
41 – 50 Watt	9
51 – 75 Watt	10
76 – 100 Watt	11
100 – 150 Watt	12
151 – 200 Watt	13
'> 200 Watt	14
Tidak tahu Don't know	15

DP: MUNCULKAN JIKA RESPONDEN MENJAWAB DILUAR KODE 15 DI A2A
A2a.2 Interviewer: tolong catat manakah yang sesuai dari pernyataan berikut **(SA)**
Interviewer: please note which is appropriate in the following statement (SA)

Jawaban ini merupakan klaim responden This answer is the respondent's claim	**1**
Jawaban ini berdasarkan hasil check/ melihat langsung ke alat elektronik This answer is based on the results of checking / looking directly into electronic devices	2

TUNJUKKAN TABLET *SHOW TABLET*
A2b Pada jam berapa saja biasanya lampu ini tersebut menyala pada saat HARI KERJA (weekdays – senin – jumlat/ sabtu)? **(MA)**
*At what time does the lighting usually lit during weekdays? (**MA**)*

TUNJUKKAN TABLET *SHOW TABLET*

A2c Pada jam berapa saja biasanya lampu ini tersebut menyala pada saat HARI LIBUR (weekend – sabtu/ minggu)? **(MA)**
*At what time doeas the lighting usually lit during weekend/ holiday? (**MA**)*

	A2b WEEKDAYS	**A2c** WEEKEND
00.00	1	1
01.00	2	2
02.00	3	3
03.00	4	4
04.00	5	5
05.00	6	6
06.00	7	7
07.00	8	8
08.00	9	9
09.00	10	10
10.00	11	11
11.00	12	12
12.00	13	13
13.00	14	14
14.00	15	15
15.00	16	16
16.00	17	17
17.00	18	18
18.00	19	19
19.00	20	20
20.00	21	21
21.00	22	22
22.00	23	23
23.00	24	24

TUNJUKKAN TABLET *SHOW TABLET*

A2e Apa tipe masing-masing lampu di rumah Anda? (SA per lampu)
What is the type of each lighting in your household (SA per lighting)

Pijar/ bolham *Incandescent*	**1**
Neon/ CFL *CFL*	2
LED *LED*	3
Halogen *Halogen*	4
Hybrid Halogen CFL *Hybrid Halogen CFL*	5
Tidak TAHU Don't know	6

DP: FLOW DIBUAT KESAMPING PER ALAT ELEKTRONIK
DP : TUNJUKKAN BARI SESUAI JUMLAH LAMPU TERJAWAB DI A1b.1 (Sampai 40 baris)

SHOW ROW ACCORDING NUMEBR OF LIGHTING ANSWERED IN A1b.1 (up to 40 row)

	A2a Wattage (Watt)	**A2b** Usage – Weekdays (hrs)	**A2c** Usage – Weekends (hrs)	**A2e** Type					
	(1-15))	**(MA)**	**MA)**	**(SA)**					
Lampu 1 *Lighting 1*	( )	( )	( )	1	2	3	4	5	6
Lampu 2 *Lighting 2*	( )	( )	( )	1	2	3	4	5	6
Lampu 3 *Lighting 3*	( )	( )	( )	1	2	3	4	5	6
Lampu 4 *Lighting 4*	( )	( )	( )	1	2	3	4	5	6
Lampu 5 *Lighting 5*	( )	( )	( )	1	2	3	4	5	6
Lampu 6 *Lighting 6*	( )	( )	( )	1	2	3	4	5	6
Lampu 7 *Lighting 7*	( )	( )	( )	1	2	3	4	5	6
Lampu 8 *Lighting 8*	( )	( )	( )	1	2	3	4	5	6
Lampu 9 *Lighting 9*	( )	( )	( )	1	2	3	4	5	6
Lampu 10 *Lighting 10*	( )	( )	( )	1	2	3	4	5	6
Lampu 11 dst… *Lighting 11 & so on..*	( )	( )	( )	1	2	3	4	5	6

REFRIGERATOR SECTION

DP : TANYA SECTION A3 JIKA TERJAWAB KODE 2 DI A1a
DP : ASK SECTION A3 IF CODED 2 IN A1a
Sekarang saya akan bertanya mengenai KULKAS (Lemari Pendingin) yang ada di rumah Anda.
Now, we're going to ask about REFRIGERATOR in your household.

DP: TOLONG TANYAKAN SATU PER SATU KULKAS YANG DIMILIKI DARI A3A – A3D, JIKA SUDAH TERISI SAMPAI A3D BARU LANJUT KE KULKAS BERIKUTNYA

A3a Berapa Watt masing-masing KULKAS tersebut? **(OE)**
*How many wattage of each REFRIGERATOR **(OE)***

<50 Watt	**1**
50 - 75 Watt	2
76 - 100 Watt	3
100 - 125 Watt	4
126 - 150 Watt	5
151 - 200 Watt	6
>200 Watt	7
Tidak tahu *Don't know*	8

DP: MUNCULKAN JIKA RESPONDEN MENJAWAB DILUAR KODE 8 DI A3A
A3a.2 Interviewer: tolong catat manakah yang sesuai dari pernyataan berikut **(SA)**
Interviewer: please note which is appropriate in the following statement (SA)

Jawaban ini merupakan klaim responden This answer is the respondent's claim	**1**

Jawaban ini berdasarkan hasil check/ melihat langsung ke alat elektronik This answer is based on the results of checking / looking directly into electronic devices	2

TUNJUKKAN TABLET *SHOW TABLET*

A3b **Seberapa sering Anda mencabut kulkas Anda? (SA)**
*How often do you un-pug your refrigerator? (**MA**)*

Tidak pernah/ Hampir tidak pernah *Never almost never*	**1**
Sekali sampai dua kali dalam setahun *Once to twice a year*	2
3-4 kali dalam setahun *3-4 times a year*	3
5-6 kali dalam setahun *5 - 6 times a year*	4
Lebih dari 6 kali dalam setahun *> 6 times a year*	6

TUNJUKKAN TABLET *SHOW TABLET*

A3c Apa tipe masing-masing KULKAS di rumah Anda? **(SA)**
*What is the type of each REFRITERATOR in your household **(SA)***

Kulkas 1 pintu *1 door refrigerator*	**1**
Kulkas 2 pintu (atas bawah) – Freeezer di atas *2 doors refrigerator – top freezer*	2
Kulkas 2 pintu (atas bawah) – Freeezer di bawah *2 doors refrigerator – bottom freezer*	3
Kulkas 2 pintu (kiri kanan) *Side by side refrigerator*	4
Kulkas mini *Mini refrigerator*	5
Kulkas freezer *Freezer storage*	6

A3d Berapa kapasitas KULKAS ini? **(SA)**
*How many capacity of the REFRIGERATOR? (**SA**)*

≤ 50 Liter *Litres*	**1**
51 – 100 liter *Litres*	2
101 – 150 liter *Litres*	3
151 – 200 liter *Litres*	4
201 – 250 liter *Litres*	5
251 – 300 liter *Litres*	6
301 – 400 liter *Litres*	7
401 – 500 liter *Litres*	8
501 – 600 liter *Litres*	9
>600 liter *Litres*	10
Tidak tahu *Don't know*	11

DP: MUNCULKAN JIKA RESPONDEN MENJAWAB DILUAR KODE 8 DI A3A

A3d.2 Interviewer: tolong catat manakaha yang sesuai dari pernyataan berikut **(SA)**
Interviewer: please note which is appropriate in the following statement (SA)

Jawaban ini merupakan klaim responden This answer is the respondent's claim	**1**
Jawaban ini berdasarkan hasil check/ melihat langsung ke alat elektronik This answer is based on the results of checking / looking directly into electronic devices	2

TUNJUKKAN TABLET HANYA JIKA RESPONDEN TIDAK BISA MENJAWAB SECARA SPONTAN
SHOW TABLET ONLY IF RESPONDENT UNABLE TO SPONTANEOUSLY ASNWER

A3e Apa merek KULKAS tersebut? (SA)
INTERVIEWER : Pilih sesuai kode merek
*What is the brand of the REFRIGERATOR? **(SA)***

A3F Berapa tahun usia kulkas ini sejak Anda membelinya? (OE)
How old is this fridge, since you bought this? (OE)
INTERVIEWER: TULIS 99 JIKA RESPONDEN TIDAK TAHU (99) *WRITE 99 IF RESPONDENT NOT AWARE*
DP: Tolong buat range 0-50 tahun, bisa dibikin decimal 2 angka dibelakang koma

DP : TUNJUKKAN BARIS SESUAI JUMLAH KULKAS TERJAWAB DI A1b.2 (Sampai 5 baris)
SHOW ROW ACCORDING NUMEBR OF REFRIGERATORS ANSWERED IN A1b.2 (up to 5 row)

DP: FLOW DIBUAT KESAMPING PER ALAT ELEKTRONIK

	A3a Wattage (Watt)								**A3b** Un-plug Frequency						**A3C** Type						**A3d** Capacity	**A3e** Brand	**A3f** Age
	(SA)								**(MA)**						**(SA)**						**(SA)**	**(SA)**	**(OE)**
Kulkas 1 *Refrigerator1*	1	2	3	4	5	6	7	8	1	2	3	4	5	6	1	2	3	4	5	6	[ ]		
Kulkas 2 *Refrigerator 2*	1	2	3	4	5	6	7	8	1	2	3	4	5	6	1	2	3	4	5	6	[ ]		
Kulkas 3 *Refrigerator 3*	1	2	3	4	5	6	7	8	1	2	3	4	5	6	1	2	3	4	5	6	[ ]		
Kulkas 4 *Refrigerator 4*	1	2	3	4	5	6	7	8	1	2	3	4	5	6	1	2	3	4	5	6	[ ]		
Kulkas 5 *Refrigerator 5*	1	2	3	4	5	6	7	8	1	2	3	4	5	6	1	2	3	4	5	6	[ ]		

AIR CONDITIONER SECTION

DP : TANYA SECTION A4 JIKA TERJAWAB KODE 3 DI A1a
DP : ASK SECTION A4 IF CODED 3 IN A1a
Sekarang saya akan bertanya mengenai AC/ PENDINGIN RUANGAN yang ada di rumah Anda.
Now, we're going to ask about AIR CONDITIONER (AC) in your househol.
DP: TOLONG TANYAKAN SATU PER SATU AC YANG DIMILIKI DARI A4A – A4F, JIKA SUDAH TERISI SAMPAI A4F BARU LANJUT KE AC BERIKUTNYA

A4a Berapa Daya Watt masing-masing AC/ PENDINGIN RUANGAN tersebut? **(OE)**
*How many wattage of each AIR CONDITIONER (AC) **(OE)***

½ PK (± 400 Watt)	**1**
¾ PK (± 600 Watt)	2
1 PK (± 800 Watt)	3
1.5 PK (± 1100 Watt)	4
2 PK (± 1900 Watt)	5

2.5 PK (± 2200 Watt)	6
Tidak tahu *Don't know*	7

DP: MUNCULKAN JIKA RESPONDEN MENJAWAB DILUAR KODE 7 DI A4A

A4a.2 Interviewer: tolong catat manakaha yang sesuai dari pernyataan berikut **(SA)**
Interviewer: please note which is appropriate in the following statement (SA)

Jawaban ini merupakan klaim responden This answer is the respondent's claim	**1**
Jawaban ini berdasarkan hasil check/ melihat langsung ke alat elektronik This answer is based on the results of checking / looking directly into electronic devices	2

A4b Apakah tipe efisiensi dari AC/ PENDINGIN RUANGAN INI? **(SA)**
*What is the efficiency type of the AIR CONDITIONER (AC)? **(SA)***

Standard	**1**
Low Watt/ Watt Rendah	2
Inverter	3
Hybrid	4
Tidak tahu *Don't know*	5

DP: MUNCULKAN JIKA RESPONDEN MENJAWAB DILUAR KODE 5 DI A4b

A4b.2 Interviewer: tolong catat manakah yang sesuai dari pernyataan berikut **(SA)**
Interviewer: please note which is appropriate in the following statement (SA)

Jawaban ini merupakan klaim responden This answer is the respondent's claim	**1**
Jawaban ini berdasarkan hasil check/ melihat langsung ke alat elektronik This answer is based on the results of checking / looking directly into electronic devices	2

TUNJUKKAN TABLET *SHOW TABLET*

A4c Apa tipe masing-masing AC/ PENDINGIN RUANGAN di rumah Anda? **(SA)**
*What is the type of each AIR CONDITIONER (AC) in your household **(SA)***

AC Split (indoor & outdoor AC terpisah) *Split*	**1**
AC Window (indoor & outdoor AC dalam 1 unit) *Window*	2
AC Standing/ berdiri (dalam ukuran besar) *Standing*	3
AC Portable (biasanya berdiri, dalam ukuran lebih kecil, bisa dipindah dengan mudah) *Portable (Smaller than Standing AC, portable)*	4
Tipe lainnya *Other type*	5

A4c.2 Interviewer: tolong catat manakah yang sesuai dari pernyataan berikut **(SA)**
Interviewer: please note which is appropriate in the following statement (SA)

Jawaban ini merupakan klaim responden This answer is the respondent's claim	**1**
Jawaban ini berdasarkan hasil check/ melihat langsung ke alat elektronik This answer is based on the results of checking / looking directly into electronic devices	2

TUNJUKKAN TABLET *SHOW TABLET*

A4d Pada jam berapa saja biasanya AC ini menyala pada saat HARI KERJA (weekdays – senin – jumlat/ sabtu)? **(MA)**
*At what time does the AC usually lit during weekdays? (**MA**)*

TUNJUKKAN TABLET *SHOW TABLET*

A4e Pada jam berapa saja biasanya AC ini menyala pada saat HARI LIBUR (weekend – sabtu/ minggu)? **(MA)**
*At what time doeas the AC usually lit during weekend/ holiday? (**MA**)*

	A4d WEEKDAYS	**A4e** WEEKEND
00.00	1	1
01.00	2	2
02.00	3	3
03.00	4	4
04.00	5	5
05.00	6	6
06.00	7	7
07.00	8	8
08.00	9	9
09.00	10	10
10.00	11	11
11.00	12	12
12.00	13	13
13.00	14	14
14.00	15	15
15.00	16	16
16.00	17	17
17.00	18	18
18.00	19	19
19.00	20	20
20.00	21	21
21.00	22	22
22.00	23	23
23.00	24	24

TUNJUKKAN TABLET *SHOW TABLET*

A4g Pada suhu berapa rata-rata Anda mengatur suhu untuk AC ini saat digunakan? **(OE) (Dalam satuan Celsius)**
At what temperature on average do you set the temperature for this air conditioner when in use? (OE)

DP: PASTIKAN JAWABAN RESPONDEN ADA DI RANGE 15 – 35 DERAJAT CELSIUS)

TUNJUKKAN TABLET HANYA JIKA RESPONDEN TIDAK BISA MENJAWAB SECARA SPONTAN
SHOW TABLET ONLY IF RESPONDENT UNABLE TO SPONTANEOUSLY ASNWER

A4h Apa merek AC tersebut? (SA)
INTERVIEWER : Pilih sesuai kode merek

*What is the brand of the AC? (**SA**)*

A4i Berapa tahun usia AC ini sejak Anda membelinya? (OE)
How old is this AC? (OE)
INTERVIEWER: TULIS 99 JIKA RESPONDEN TIDAK TAHU (99) *WRITE 99 IF RESPONDENT NOT AWARE*

DP: Tolong buat range 0-50 tahun, bisa dibikin decimal 2 angka dibelakang koma

DP : TUNJUKKAN BARIS SESUAI JUMLAH AC TERJAWAB DI A1b.3 (Sampai 10 baris)
SHOW ROW ACCORDING NUMBER OF ACANSWERED IN A1b.3 (up to 10 row)

	A4a Wattage (Watt)							**A4b** Efficiency Type					**A4c** Type					**A4d** Weekdays Usage hours	**A4e** Weekend Usage hours	**A4f** Usage time					**A4G** Temperature (Celsius)	**A4H** Brand	**A4I** Age
	(SA)							**(SA)**					**(SA)**					**(SA) 1-24**	**(SA) 1-24**	**(MA)**					**(OE) 15 - 35**	**(SA)**	**(OE)**
AC 1	1	2	3	4	5	6	7	1	2	3	4	5	1	2	3	4	5			1	2	3	4	5			
AC 2	1	2	3	4	5	6	7	1	2	3	4	5	1	2	3	4	5			1	2	3	4	5			
AC 3	1	2	3	4	5	6	7	1	2	3	4	5	1	2	3	4	5			1	2	3	4	5			
AC 4	1	2	3	4	5	6	7	1	2	3	4	5	1	2	3	4	5			1	2	3	4	5			
AC 5	1	2	3	4	5	6	7	1	2	3	4	5	1	2	3	4	5			1	2	3	4	5			
AC 6	1	2	3	4	5	6	7	1	2	3	4	5	1	2	3	4	5			1	2	3	4	5			
AC 7	1	2	3	4	5	6	7	1	2	3	4	5	1	2	3	4	5			1	2	3	4	5			
AC 8	1	2	3	4	5	6	7	1	2	3	4	5	1	2	3	4	5			1	2	3	4	5			
AC 9	1	2	3	4	5	6	7	1	2	3	4	5	1	2	3	4	5			1	2	3	4	5			
AC 10	1	2	3	4	5	6	7	1	2	3	4	5	1	2	3	4	5			1	2	3	4	5			

TELEVISION SECTION

DP : TANYA SECTION A5 JIKA TERJAWAB KODE 4 DI A1a
DP : ASK SECTION A5 IF CODED 4 IN A1a
Sekarang saya akan bertanya mengenai Televisi yang ada di rumah Anda.
Now, we're going to ask about TELEVISION in your household.

DP: TOLONG TANYAKAN SATU PER SATU TV YANG DIMILIKI DARI A5A – A5G, JIKA SUDAH TERISI SAMPAI A5G BARU LANJUT KE TV BERIKUTNYA

A5a Berapa Daya Watt masing-masing TELEVISI yang dimiliki rumah ini? **(SA)**
*How many wattage of each TELEVISION in this household (AC) **(SA)***

< 30 Watt	**1**
30 - 50 Watt	2
50 - 75 Watt	3
76 - 100 Watt	4

101 - 125 Watt	5
126 - 150 Watt	6
> 151 Watt	7
Tidak tahu *Don't know*	8

DP: MUNCULKAN JIKA RESPONDEN MENJAWAB DILUAR KODE 8 DI A2A

A5a.2 Interviewer: tolong catat manakaha yang sesuai dari pernyataan berikut **(SA)**
Interviewer: please note which is appropriate in the following statement (SA)

Jawaban ini merupakan klaim responden This answer is the respondent's claim	**1**
Jawaban ini berdasarkan hasil check/ melihat langsung ke alat elektronik This answer is based on the results of checking / looking directly into electronic devices	2

A5b Berapa ukuran Televisi tersebut? **(SA)**
*What is the size of the TELEVISION? **(SA)***

< 20 inch	1
20 - 29 inch	2
30 - 39 inch	3
40 - 49 inch	4
50 - 59 inch	5
> 60 inch	6
Tidak tahu *Don't know*	7

DP: MUNCULKAN JIKA RESPONDEN MENJAWAB DILUAR KODE 7 DI A4A

A5b.2 Interviewer: tolong catat manakah yang sesuai dari pernyataan berikut **(SA)**
Interviewer: please note which is appropriate in the following statement (SA)

Jawaban ini merupakan klaim responden This answer is the respondent's claim	**1**
Jawaban ini berdasarkan hasil check/ melihat langsung ke alat elektronik This answer is based on the results of checking / looking directly into electronic devices	2

TUNJUKKAN TABLET *SHOW TABLET*

A5c Apa **tipe** dari Televisi tersebut? **(SA)**
*What is the type the Television **(SA)***

Tabung	**1**
Plasma TV	2
LCE/ LED TV	3
OLED TV	4
Tidak tahu *Don't know*	6

A5c.2 Interviewer: tolong catat manakah yang sesuai dari pernyataan berikut **(SA)**
Interviewer: please note which is appropriate in the following statement (SA)

Jawaban ini merupakan klaim responden This answer is the respondent's claim	**1**
Jawaban ini berdasarkan hasil check/ melihat langsung ke alat elektronik This answer is based on the results of checking / looking directly into electronic devices	2

TUNJUKKAN TABLET *SHOW TABLET*

A5d Apa resolusi dari Televisi tersebut? **(SA)**
*What is the type the Television **(SA)***

SD	**1**
HD (High Definition)	2
Full HD	3
4K UHD (Ultra High Definition)	4
Tidak tahu *Don't know*	5

A5d.2 Interviewer: tolong catat manakah yang sesuai dari pernyataan berikut **(SA)**
Interviewer: please note which is appropriate in the following statement (SA)

Jawaban ini merupakan klaim responden This answer is the respondent's claim	**1**
Jawaban ini berdasarkan hasil check/ melihat langsung ke alat elektronik This answer is based on the results of checking / looking directly into electronic devices	2

TUNJUKKAN TABLET *SHOW TABLET*

A5e Pada jam berapa saja biasanya TELEVISI ini menyala pada saat HARI KERJA (weekdays – senin – jumlat/ sabtu)? **(MA)**
*At what time does the TELEVISION usually lit during weekdays? (**MA**)*

TUNJUKKAN TABLET *SHOW TABLET*

A5f Pada jam berapa saja biasanya TELEVISI ini menyala pada saat HARI LIBUR (weekend – sabtu/ minggu)? **(MA)**
*At what time doeas the TELEVISION usually lit during weekend/ holiday? (**MA**)*

	A5e WEEKDAYS	**A5f** WEEKEND
00.00	1	1
01.00	2	2
02.00	3	3
03.00	4	4
04.00	5	5
05.00	6	6
06.00	7	7
07.00	8	8
08.00	9	9
09.00	10	10
10.00	11	11
11.00	12	12
12.00	13	13
13.00	14	14
14.00	15	15
15.00	16	16
16.00	17	17
17.00	18	18

18.00	19	19
19.00	20	20
20.00	21	21
21.00	22	22
22.00	23	23
23.00	24	24

TUNJUKKAN TABLET HANYA JIKA RESPONDEN TIDAK BISA MENJAWAB SECARA SPONTAN
SHOW TABLET ONLY IF RESPONDENT UNABLE TO SPONTANEOUSLY ASNWER

A5h Apa merek TV tersebut? (SA)
INTERVIEWER : Pilih sesuai kode merek
*What is the brand of the TV? (**SA**)*

A5i Berapa tahun usia TV ini sejak Anda membelinya? (OE)
How old is this TV since you bought this? (OE)
INTERVIEWER: TULIS 99 JIKA RESPONDEN TIDAK TAHU (99) *WRITE 99 IF RESPONDENT NOT AWARE*
DP: Tolong buat range 0-50 tahun, bisa dibikin decimal 2 angka dibelakang koma

DP : TUNJUKKAN BARIS SESUAI JUMLAH AC TERJAWAB DI A1b.4 (Sampai 5 baris)
SHOW ROW ACCORDING NUMBER OF ACANSWERED IN A1b.4 (up to 5 row)

	A5a	**A5b**	**A5c**	**A5d**	**A5e**	**A5f**	**A5h** Brand	**A5i** Age
	Wattage (1-8)	Size (1-6)	Type (1-6)	Resolution (1-5)	Weekday Usage (1-24)	Weekend Usage (1-24)	**(SA)**	**(OE)**
TV 1								
TV 2								
TV 3								
TV 4								
TV 5								

ELECTRIC FAN

DP : TANYA SECTION A6 JIKA TERJAWAB KODE 5 DI A1a
DP : ASK SECTION A6 IF CODED 5 IN A1a
Sekarang saya akan bertanya mengenai KIPAS ANGIN yang ada di rumah Anda.
Now, we're going to ask about ELECTRIC FAN in your household.
DP: TOLONG TANYAKAN SATU PER SATU KIPAS ANGIN YANG DIMILIKI DARI A6A – A6E, JIKA SUDAH TERISI SAMPAI A6E BARU LANJUT KE KIPAS ANGIN BERIKUTNYA

A6a Berapa Daya Watt masing-masing KIPAS ANGIN tersebut? **(SA)**
*How many wattage of each ELECTRIC FAN? **(SA)***

<30 Watt	1
30 - 39 Watt	2
40 - 49 Watt	3
50 - 59 Watt	4

60 - 79 Watt	5
80 - 100 Watt	6
>100 Watt	7
Tidak tahu *Don't know*	8

DP: MUNCULKAN JIKA RESPONDEN MENJAWAB DILUAR KODE 8 DI A6A

A6a.2 Interviewer: tolong catat manakah yang sesuai dari pernyataan berikut **(SA)**
Interviewer: please note which is appropriate in the following statement (SA)

Jawaban ini merupakan klaim responden This answer is the respondent's claim	**1**
Jawaban ini berdasarkan hasil check/ melihat langsung ke alat elektronik This answer is based on the results of checking / looking directly into electronic devices	2

TUNJUKKAN TABLET *SHOW TABLET*

A6b Apakah tipe KIPAS ANGIN tersebut? **(SA)**
*What is the ELECTRIC FAN ? (**SA**)*

Kipas angin lantai	*Floor fan*	**1**
Kipas angin berdiri	*Standing fan*	2
Kipas angin di langit-langit	*Ceiling fan*	3
Kipas dinding	*Wall fan*	4
Kipas multifungsi (bisa di lantai, meja, berdiri, atau di dinding)	*Multifunction fan*	5
Kipas portable (bisa dibawa ke mana-mana)	*Portable fan*	6
Kipas tanpa baling-baling	*Bladeless fan*	7
Kipas exhaust (penyedot udara ruangan)	*Exhaust fan*	8
Kipas air cooler (dengan tekologi uap air)	*Air (Evaporative) cooler*	9

A6c Pada jam berapa saja biasanya KIPAS ANGIN ini menyala pada saat HARI KERJA (weekdays – senin – jumlat/ sabtu)? **(MA)**
*At what time does the ELECTRIC FAN usually lit during weekdays? (**MA**)*

A6d Pada jam berapa saja biasanya KIPAS ANGIN ini menyala pada saat HARI LIBUR (weekend – sabtu/ minggu)? **(MA)**
*At what time doeas the ELECTRIC FAN usually lit during weekend/ holiday? (**MA**)*

	A6c WEEKDAYS	**A6d** WEEKEND
00.00	1	1
01.00	2	2
02.00	3	3
03.00	4	4
04.00	5	5
05.00	6	6
06.00	7	7
07.00	8	8

08.00	9	9
09.00	10	10
10.00	11	11
11.00	12	12
12.00	13	13
13.00	14	14
14.00	15	15
15.00	16	16
16.00	17	17
17.00	18	18
18.00	19	19
19.00	20	20
20.00	21	21
21.00	22	22
22.00	23	23
23.00	24	24

TUNJUKKAN TABLET HANYA JIKA RESPONDEN TIDAK BISA MENJAWAB SECARA SPONTAN

SHOW TABLET ONLY IF RESPONDENT UNABLE TO SPONTANEOUSLY ASNWER

A6f Apa merek KIPAS ANGIN tersebut? (SA)
INTERVIEWER : Pilih sesuai kode merek
*What is the brand of the ELECTRIC FAN? (**SA**)*

A6g Berapa tahun usia KIPAS ANGIN ini sejak Anda membelinya? (OE)
How old is this ELECTRIC FAN since you bought this? (OE)
INTERVIEWER: TULIS 99 JIKA RESPONDEN TIDAK TAHU (99) *WRITE 99 IF RESPONDENT NOT AWARE*
DP: Tolong buat range 0-50 tahun, bisa dibikin decimal 2 angka dibelakang koma

DP : TUNJUKKAN BARIS SESUAI JUMLAH KIPAS ANGIN TERJAWAB DI A1b.5 (Sampai 5 baris)

SHOW ROW ACCORDING NUMBER OF ELECTRIC FAN ANSWERED IN A1b.5 (up to 5 row)

	A6a								**A6b**	**A6c**	**A6d**	**A6f**	**A6g**
	Wattage (1-7)								Type (1 – 9)	Weekday Usage (1-24)	Weekend Usage (1-24)	Brand **(SA)**	Age **(OE)**
Kipas angin 1 *Electric fan 1*	1	2	3	4	5	6	7	8					
Kipas angin 2 *Electric fan 2*	1	2	3	4	5	6	7	8					
Kipas angin 3 *Electric fan 3*	1	2	3	4	5	6	7	8					
Kipas angin 4 *Electric fan 4*	1	2	3	4	5	6	7	8					
Kipas angin 5 *Electric fan 5*	1	2	3	4	5	6	7	8					
Kipas angin 6 *Electric fan 6*	1	2	3	4	5	6	7	8					
Kipas angin 7 *Electric fan 7*	1	2	3	4	5	6	7	8					
Kipas angin 8 *Electric fan 8*	1	2	3	4	5	6	7	8					
Kipas angin 9 *Electric fan 9*	1	2	3	4	5	6	7	8					
Kipas angin 10 *Electric fan 10*	1	2	3	4	5	6	7	8					

RICE COOKER SECTION

DP : TANYA SECTION A7 JIKA TERJAWAB KODE 6 DI A1a

DP : ASK SECTION A7 IF CODED 6 IN A1a

Sekarang saya akan bertanya mengenai RICE COOKER/ WARMER (Pemasak/ penghangat nasi) yang ada di rumah Anda.

Now, we're going to ask about RICE COOKER/ WARMER in your household.

DP: TOLONG TANYAKAN SATU PER SATU RICE COOKER YANG DIMILIKI DARI A7A – A7H, JIKA SUDAH TERISI SAMPAI A7H BARU LANJUT KE RICE COOKER BERIKUTNYA

A7a Berapa Daya Watt masing-masing RICE COOKER/ WARMER (Pemasak/ penghangat nasi) tersebut? **(OE)**
How many wattage of each RICE COOKER/ WARMER (AC) ***(OE)***

<300 Watt	**1**
300 - 350 Watt	2
351 - 400 Watt	3
400 - 500 Watt	4
> 501 Watt	5
Tidak tahu *Don't know*	6

DP: MUNCULKAN JIKA RESPONDEN MENJAWAB DILUAR KODE 6 DI A7A

A7a.2 Interviewer: tolong catat manakah yang sesuai dari pernyataan berikut **(SA)**
Interviewer: please note which is appropriate in the following statement (SA)

Jawaban ini merupakan klaim responden This answer is the respondent's claim	**1**
Jawaban ini berdasarkan hasil check/ melihat langsung ke alat elektronik This answer is based on the results of checking / looking directly into electronic devices	2

TUNJUKKAN TABLET *SHOW TABLET*

A7b Apakah tipe RICE COOKER/ WARMER tersebut? **(SA)**
*What is the type of the RICE COOKER/ WARMER? (**SA**)*

Rice cooker saja (Hanya menanak nasi)	*Rice cooker only*	**1**
Rice cooker & warmer (Memasak dan menghangatkan nasi)	*Rice cooker & Rice Warmer*	2
Smart rice cooker (Dapat memasak nasi, membuat bubur, mengukus, slow cook/ memasak lambat, mengatur waktu dll)	*Smart Rice Cooker*	3

DP: JANGAN TANYAKAN JIKA TERKODE 1 DI A7B

A7d Pada jam berapa saja RICE COOKER tersebut digunakan **HANYA UNTUK MENGHANGATKAN**? **(SA)**
*At what time doeas the RICE COOKER used ONLY for warming? (**SA**)*

TUNJUKKAN TABLET *SHOW TABLET*

A7e Pada jam berapa saja RICE COOKER tersebut digunakan untuk **MEMASAK NASI SAJA** (bukan menghangatkan) ? **(MA)**
*At what time does the RICE COOKER used to cook rice (not for warm)? (**MA**)*

	A7d	**A7e**

	MENGHANGATKAN	MEMASAK NASI
00.00	1	1
01.00	2	2
02.00	3	3
03.00	4	4
04.00	5	5
05.00	6	6
06.00	7	7
07.00	8	8
08.00	9	9
09.00	10	10
10.00	11	11
11.00	12	12
12.00	13	13
13.00	14	14
14.00	15	15
15.00	16	16
16.00	17	17
17.00	18	18
18.00	19	19
19.00	20	20
20.00	21	21
21.00	22	22
22.00	23	23
23.00	24	24

TUNJUKKAN TABLET *SHOW TABLET*

A7f Apakah jenis nasi yang paling sering dimasak ? (SA)

*What kind of rice that usually cooked? (**SA**)*

Nasi putih pulen	*Soft white rice*	**1**
Nasi putih pera/ kering	*Hard white rice*	2
Nasi merah	*Brown rice*	3
Campuran nasi merah dan nasi putih	*Combination of brown & white rice*	4
Nasi jagung	*Corn rice*	5
Campuran nasi merah dan nasi jagung	*Combination of corn & white rice*	6
Lainnya, sebutkan_____	*Other, specify_____*	7

TUNJUKKAN TABLET *SHOW TABLET*

A7g Berapa perbandingan air yang Anda gunakan ? (SA)

*What is the ratio of water that you use? (**SA**)*

Nasi : Air (1:1)	*Rice : Water (1:1)*	**1**
Nasi : Air (1:2)	*Rice : Water (1:2)*	2

Nasi : Air (1:3)	*Rice : Water (1:3)*	3
Nasi : Air (2:3)	*Rice : Water (2:3)*	4
Tidak bisa mengukur	*Can't measure*	5

TUNJUKKAN TABLET *SHOW TABLET*

A7h Berapa kapasitas Rice Cooker/ Warmer tersebut? **(SA)**
*How many the Rice Cooker/ Warmer capacity? (**SA**)*

< 1 Liter *Litre*	1
1 – 1.5 Liter *Litre*	2
1.6 – 2 Liter *Litre*	3
2.1 – 3 Liter *Litre*	4
3.1 – 4 Liter *Litre*	5
4.1 – 5 Liter *Litre*	6
'> 5 Liter *Litre*	7

TUNJUKKAN TABLET HANYA JIKA RESPONDEN TIDAK BISA MENJAWAB SECARA SPONTAN
SHOW TABLET ONLY IF RESPONDENT UNABLE TO SPONTANEOUSLY ASNWER

A7i Apa merek rice cooker tersebut? (SA)
INTERVIEWER : Pilih sesuai kode merek
*What is the brand of the RICE COOKER? (**SA**)*

A7j Berapa tahun usia RICE COOKER ini sejak Anda membelinya? (OE)
How old is this RICE COOKER since you bought this? (OE)
INTERVIEWER: TULIS 99 JIKA RESPONDEN TIDAK TAHU (99) *WRITE 99 IF RESPONDENT NOT AWARE*
DP: Tolong buat range 0-50 tahun, bisa dibikin decimal 2 angka dibelakang koma

DP : TUNJUKKAN BARI SESUAI JUMLAH LAMPU TERJAWAB DI A1b.6 (Sampai 5 baris)
SHOW ROW ACCORDING NUMEBR OF LIGHTING ANSWERED IN A1b.6 (up to 5 row)

	A7a	**A7b**	**A7d**	**A7e**	**A7f**	**A7g**	**A7h**	**A7i**	**A7j**
	7j (1-6)	Type (1-3)	Warming time (1-24)	Cooking Time (1-24)	Rice (1-6)	Ratio (1-5)	Capacity (1-7)	Brand **(SA)**	Age **(OE)**
Rice Cooker 1									
Rice Cooker 2									
Rice Cooker 3									
Rice Cooker 3									
Rice Cooker 3									

ELECTRIC IRON SECTION

DP : TANYA SECTION A8 JIKA TERJAWAB KODE 7 DI A1a
DP : ASK SECTION A8 IF CODED 7 IN A1a

DP: TOLONG TANYAKAN SATU PER SATU SETRIKA YANG DIMILIKI DARI A8A – A8D, JIKA SUDAH TERISI SAMPAI A8D BARU LANJUT KE SETRIKA BERIKUTNYA

A8a Berapa Daya Watt masing-masing setrika di rumah ini? **(SA)**
*How many the wattage of each ELECTRIC IRON in this houshold **(SA)***

< 300 Watt	1
300 – 350 Watt	2
351 – 400 Watt	3
401 – 500 Watt	4
501 – 700 Watt	5
701 – 800 Watt	6
801 – 1000 Watt	7
1001 – 1500 Watt	8
1501 – 2000 Watt	9
'> 2000 Watt	10
Tidak tahu *Don't know*	11

DP: MUNCULKAN JIKA RESPONDEN MENJAWAB DILUAR KODE 11 DI A8A
A8a.2 Interviewer: tolong catat manakaha yang sesuai dari pernyataan berikut **(SA)**
Interviewer: please note which is appropriate in the following statement (SA)

Jawaban ini merupakan klaim responden This answer is the respondent's claim	**1**
Jawaban ini berdasarkan hasil check/ melihat langsung ke alat elektronik This answer is based on the results of checking / looking directly into electronic devices	2

TUNJUKKAN TABLET *SHOW TABLET*
A8b Apakah tipe SETRIKA tersebut? **(SA)**
*What is the type of the ELECTRIC IRON? **(SA)***

Setrika biasa/ plat	*Regular electric iron*	1
Setrika uap	*Vapor*	2
Setrika plat & uap	*Plat & Vapor*	3

A8c Berapa jam setrika tersebut digunakan di hari ketika ia dipakai? **(OE)**
*How many hours the electric iron used during the day of usage? **(OE)***

TUNJUKKAN TABLET *SHOW TABLET*
A8d **Ketika digunakan, pada jam berapa biasanya SETRIKA tersebut digunakan? (MA)**
*At what time does the ELECTRIC IRON is used? **(MA)***

00.00	1
01.00	2
02.00	3
03.00	4
04.00	5
05.00	6

06.00	7
07.00	8
08.00	9
09.00	10
10.00	11
11.00	12
12.00	13
13.00	14
14.00	15
15.00	16
16.00	17
17.00	18
18.00	19
19.00	20
20.00	21
21.00	22
22.00	23
23.00	24

DP : TUNJUKKAN BARI SESUAI JUMLAH LAMPU TERJAWAB DI A1b.7 (Sampai 5 baris)
SHOW ROW ACCORDING NUMEBR OF LIGHTING ANSWERED IN A1b.7 (up to 5 row)

	A8a	**A8b**	**A8c**	**A8d**
	Wattage (1-11)	Type (1-3)	Usage hours (OE)	Time (1-24)
Setrika 1 *Iron 1*				
Setrika 2 *Iron 2*				
Setrika 3 *Iron 3*				
Setrika 4 *Iron 4*				
Setrika 5 *Iron 5*				

VACUUM CLEANER SECTION

DP : TANYA SECTION A9 JIKA TERJAWAB KODE 8 DI A1a
DP : ASK SECTION A9 IF CODED 8 IN A1a
DP: TOLONG TANYAKAN SATU PER SATU RICE COOKER YANG DIMILIKI DARI A7A – A7H, JIKA SUDAH TERISI SAMPAI A7H BARU LANJUT KE RICE COOKER BERIKUTNYA

A9a Berapa Daya Watt penyedot debu/ vakum cleaner tersebut? **(SA)**
*How many the wattage of the vacuum cleaner **(SA)***

< 500 Watt	**1**
500 – 750 Watt	2
751 – 1000 Watt	3
1000 – 1500 Watt	4
'> 1500 Watt	5
Tidak tahu *Don't know*	6

DP: MUNCULKAN JIKA RESPONDEN MENJAWAB DILUAR KODE 6 DI A9A

A9a.2 Interviewer: tolong catat manakaha yang sesuai dari pernyataan berikut **(SA)**
Interviewer: please note which is appropriate in the following statement (SA)

Jawaban ini merupakan klaim responden This answer is the respondent's claim	**1**
Jawaban ini berdasarkan hasil check/ melihat langsung ke alat elektronik This answer is based on the results of checking / looking directly into electronic devices	2

TUNJUKKAN TABLET *SHOW TABLET*

A9b Apakah tipe penyedot debu/ vakum cleaner tersebut? **(SA)**
*What is the type of the vacuum cleaner? (**SA**)*

Penyedot debu untuk lantai	*Floor vacuum cleaner*	**1**
Penyedot debu genggam (handled)	*Handled vacuum cleaner*	2
Penyedot debu robot	*Robotic vacuum cleaner*	3

TUNJUKKAN TABLET *SHOW TABLET*

A9d **Ketika digunakan, pada jam berapa biasanya VAKUM CLEANER tersebut digunakan? (MA)**
*At what time does the VACUUM CLEANER is used? (**MA**)*

00.00	1
01.00	2
02.00	3
03.00	4
04.00	5
05.00	6
06.00	7
07.00	8
08.00	9
09.00	10
10.00	11
11.00	12
12.00	13
13.00	14
14.00	15
15.00	16
16.00	17
17.00	18
18.00	19
19.00	20
20.00	21
21.00	22
22.00	23
23.00	24

DP : TUNJUKKAN BARIS SESUAI JUMLAH PENYEDOT DEBU TERJAWAB DI A1b.8 (Sampai 5 baris)

SHOW ROW ACCORDING NUMEBER OF VACUUM CLEANER ANSWERED IN A1b.7 (up to 5 row)

	A9a	**A9b**	**A9d**
	Wattage (1-6)	Type (1-3)	Time (1-5)
Penyedot debu 1 *Vacuum cleaner 1*			
Penyedot debu 2 *Vacuum cleaner 1*			
Penyedot debu 3 *Vacuum cleaner 3*			
Penyedot debu 4 *Vacuum cleaner 4*			
Penyedot debu 5 *Vacuum cleaner 5*			

WASHING MACHINE SECTION

DP : TANYA SECTION A10 JIKA TERJAWAB KODE 9 DI A1a
DP : ASK SECTION A10 IF CODED 9 IN A1a
DP: TOLONG TANYAKAN SATU PER SATU MESIN CUCI YANG DIMILIKI DARI A10A – A10E, JIKA SUDAH TERISI SAMPAI A10E BARU LANJUT KE MESIN CUCI BERIKUTNYA

A10a Berapa Daya Watt MESIN CUCI tersebut? **(SA)**
*How many the wattage of the WASHING MACHINE **(SA)***

< 250 Watt	**1**
250 – 300 Watt	2
301 – 350 Watt	3
351 – 400 Watt	4
'> 400 Watt	5
Tidak tahu *Don't know*	6

DP: MUNCULKAN JIKA RESPONDEN MENJAWAB DILUAR KODE 6 DI A10A
A10a.2 Interviewer: tolong catat manakah yang sesuai dari pernyataan berikut **(SA)**
Interviewer: please note which is appropriate in the following statement (SA)

Jawaban ini merupakan klaim responden This answer is the respondent's claim	**1**
Jawaban ini berdasarkan hasil check/ melihat langsung ke alat elektronik This answer is based on the results of checking / looking directly into electronic devices	2

TUNJUKKAN TABLET *SHOW TABLET*
A10b Apakah tipe MESIN CUCI tersebut? **(SA)**
*What is the type of the vacuum cleaner? (**SA**)*

Mesin cuci 2 tabung – loading atas	*Washing machine 2 tube – top loading*	**1**
Mesin cuci 1 tabung – loading atas	*Washing machine 1 tube – top loading*	2
Mesin cuci 1 tabung – loading depan	*Washing machine 2 tube – front loading*	3

TUNJUKKAN TABLET *SHOW TABLET*

A10c Berapa kapasitas mesin cuci tersebut? **(SA)**
*How many the capacity of washing machine? (**SA**)*

< 6 kg	**1**
6 – 7 kg	2
8 – 9 kg	3
'> 9 kg	4

A10c.2 Interviewer: tolong catat manakah yang sesuai dari pernyataan berikut **(SA)**
Interviewer: please note which is appropriate in the following statement (SA)

Jawaban ini merupakan klaim responden This answer is the respondent's claim	**1**
Jawaban ini berdasarkan hasil check/ melihat langsung ke alat elektronik This answer is based on the results of checking / looking directly into electronic devices	2

TUNJUKKAN TABLET *SHOW TABLET*

A10e **Ketika digunakan, pada jam berapa biasanya MESIN CUCI tersebut digunakan? (MA)**
*At what time does the WASHING MACHINE is used? (**MA**)*

00.00	1
01.00	2
02.00	3
03.00	4
04.00	5
05.00	6
06.00	7
07.00	8
08.00	9
09.00	10
10.00	11
11.00	12
12.00	13
13.00	14
14.00	15
15.00	16
16.00	17
17.00	18
18.00	19
19.00	20
20.00	21
21.00	22
22.00	23
23.00	24

DP : TUNJUKKAN BARIS SESUAI JUMLAH MESIN CUCI TERJAWAB DI A1b.9 (Sampai 3 baris)

SHOW ROW ACCORDING NUMBER OF WASHING MACHINE ANSWERED IN A1b.9 (up to 3 row)

	A10a	**A10b**	**A10c**	**A10e**
	Wattage (1-6)	Type (1-3)	Capacity (1-4)	Time (1-5)
Mesin cuci 1 *Washing machine 1*				
Mesin cuci 2 *Washing machine 1*				
Mesin cuci 3 *Washing Machine 3*				

WATER DISPENSER SECTION

DP : TANYA SECTION A11 JIKA TERJAWAB KODE 10 DI A1a
DP : ASK SECTION A11 IF CODED 10 IN A1a
DP: TOLONG TANYAKAN SATU PER SATU DISPENSER AIR LISTRIK YANG DIMILIKI DARI A11A – A11E, JIKA SUDAH TERISI SAMPAI A11E BARU LANJUT KE DISPENSER AIR LISTRIK BERIKUTNYA

A11a Berapa Daya Watt DISPENSER AIR LISTRIK tersebut? **(SA)**
*How many the wattage of the ELECTRICAL WATER DISPENSER **(SA)***

< 200 Watt	**1**
200 - 250 Watt	2
251 - 300 Watt	3
301 - 350 Watt	4
351 - 400 Watt	5
401 - 500 Watt	6
> 500 Watt	7
Tidak tahu *Don't know*	8

DP: MUNCULKAN JIKA RESPONDEN MENJAWAB DILUAR KODE 8 DI A11A
A11a.2 Interviewer: tolong catat manakah yang sesuai dari pernyataan berikut **(SA)**
Interviewer: please note which is appropriate in the following statement (SA)

Jawaban ini merupakan klaim responden This answer is the respondent's claim	**1**
Jawaban ini berdasarkan hasil check/ melihat langsung ke alat elektronik This answer is based on the results of checking / looking directly into electronic devices	2

TUNJUKKAN TABLET *SHOW TABLET*
A11b Apakah tipe dari DISPENSER AIR LISTRIK tersebut? **(SA)**
*What is the type of the ELECTRICAL WATER DISPENSER? (**SA**)*

Dispenser air panas dan normal	*Normal & hot water dispenser*	**1**
Dispenser air panas, normal, dan dingin	*Normal, hot, & cool water dispenser*	2

TUNJUKKAN TABLET *SHOW TABLET*
A11c Apakah tipe peletakan galon untuk DISPENSER AIR LISTRIK tersebut? **(SA)**
*What is the type storage placement of the ELECTRICAL WATER DISPENSER? (**SA**)*

Galon di atas	Top water storage	**1**
Galon di atas dengan cooler minuman	Top water storage with chiller	2

Galon di bawah	Bottom water storage	3
Galon di atas dan bawah	Top & bottom water storage	4

A11d Seberapa sering DISPENSER AIR LISTRIK tersebut dicabut dari saluran listrik? **(SA)**
*How often the ELECTRICAL WATER DISPENSER is unplugged? **(SA)***

Setiap hari/ hampir setiap hari	*Daily/ almost daily*	**1**
3 – 4 kali/ minggu	*3 – 4 times/ week*	2
1 – 2 kali/ minggu	*1 – 2 times/ week*	3
Kurang dari 1 kali/ minggu	*Less than 1 time/ week*	4

DP : TUNJUKKAN BARIS SESUAI JUMLAH DISPENSER AIR TERJAWAB DI A1b.10 (Sampai 3 baris)
SHOW ROW ACCORDING NUMBER OF WATER DISPENSER ANSWERED IN A1b.10 (up to 3 row)

	A11a	**A11b**	**A11c**	**A11d**
	Wattage (1-8)	Type (1-2)	Storage placement (1-4)	Unpluged frequency (1-4)
Dispenser 1				
Dispenser 2				
Dispenser 3				

WATER HEATER SECTION

DP : TANYA SECTION A12 JIKA TERJAWAB KODE 11 DI A1a
DP : ASK SECTION A12 IF CODED 11 IN A1a
DP: TOLONG TANYAKAN SATU PER SATU PEMANAS AIR YANG DIMILIKI DARI A12A – A12D, JIKA SUDAH TERISI SAMPAI A12D BARU LANJUT KE PEMANAS BERIKUTNYA

DP : TANYA A12b JIKA TERJAWAB KODE 1 DI A12a
DP : ASK A12b IF CODED 1 IN A12a
A12b Berapa Daya Watt PEMANAS AIR tersebut? **(SA)**
*How many the wattage of the WATER HEATER? **(SA)***

< 300 Watt	**1**
301 - 500 Watt	2
501 - 700 Watt	3
701 - 900 Watt	4
> 900 Watt	5
Tidak tahu *Don't know*	6

DP: MUNCULKAN JIKA RESPONDEN MENJAWAB DILUAR KODE 6 DI A12B
A12b.2 Interviewer: tolong catat manakah yang sesuai dari pernyataan berikut **(SA)**
Interviewer: please note which is appropriate in the following statement (SA)

Jawaban ini merupakan klaim responden *This answer is the respondent's claim*	**1**
Jawaban ini berdasarkan hasil check/ melihat langsung ke alat elektronik *This answer is based on the results of checking / looking directly into electronic devices*	2

A12c Berapa jam PEMANAS AIR tersebut digunakan di hari ketika dipakai? **(SA)**
*How many hours the WATER HEATER is used during the day of usage? (**SA**)*

TUNJUKKAN TABLET *SHOW TABLET*

A12d **Ketika digunakan, pada jam berapa biasanya PEMANAS AIR tersebut digunakan? (MA)**
*At what time does the WATER HEATER is used? (**MA**)*

00.00	1
01.00	2
02.00	3
03.00	4
04.00	5
05.00	6
06.00	7
07.00	8
08.00	9
09.00	10
10.00	11
11.00	12
12.00	13
13.00	14
14.00	15
15.00	16
16.00	17
17.00	18
18.00	19
19.00	20
20.00	21
21.00	22
22.00	23
23.00	24

DP : TUNJUKKAN BARIS SESUAI JUMLAH PEMANAS AIR TERJAWAB DI A1b.11 (Sampai 3 baris)
SHOW ROW ACCORDING NUMBER OF WATER HEATER ANSWERED IN A1b.11 (up to 3 row)

	A12a	**A12b**	**A12c**	**A12d**
	Type (1-2)	Wattage (1-6)	Usage hour (1-24)	Usage time (1-24)
Pemanas air 1				
Pemanas air 2				
Pemanas air 3				
Pemanas air 4				
Pemanas air 5				

OTHER APPLIANCES SECTION

DP : TANYA A13b JIKA TERJAWAB KODE 1 DI A12a, TUNJUKKAN SESUAI JUMLAH DI A1b
DP : ASK A12b IF CODED 1 IN A12a, SHOW ACCORDING QUANTITY IN A1b

CATATAN INTERVIEWER: UNTUK LAPTOP, TELEPON GENGGAM, SPEAKER, ATAU ALAT-ALAT YANG MENGGUNAKAN BATERAI, TANYAKAN DURASI ISI ULANG DAYA LISTRIK (CHARGE)
INTERVIEWER NOTE: FOR LAPTOP, CELL PHONES, SPEAKER, OR OTHER APPLIANCES THAT USING BATTERY, ASK ABOUT THE CHARGING DURATION

DP: TOLONG TANYAKAN SATU PER SATU ALAT ELEKTRONIK YANG DIMILIKI DARI A13A – A13C, JIKA SUDAH TERISI SAMPAI A14C BARU LANJUT KE ALAT ELEKTRONIK BERIKUTNYA

A13a Berapa Daya Watt MASING-MASING ALAT tersebut? **(OE)**
*How many the wattage of EACH APPLIANCE? **(OE)***
INTERVIEWER: JIKA SETELAH DICHECK MASIH BELUM TAHU WATT NYA, TULIS SAJA "TIDAK TAHU"

DP: UNTUK A13b & A13c UNTUK KODE 24 (LAPTOP), 32 (TABLET), 33 (HANDPHONE), WORDING 'dipakai' GANTI JADI 'diisi dayanya/ dicharge'
DP: FOR A13a & A13c, FOR CODE 24 (LAPTOP), 32 (TABLET), 33 (CELLPHONE), CHANGE WORDING 'used' BECOME 'charged'

DP: MUNCULKAN JIKA A13A TIDAK TERJAWAB "TIDAK TAHU"
A13a.2 Interviewer: tolong catat manakah yang sesuai dari pernyataan berikut **(SA)**
Interviewer: please note which is appropriate in the following statement (SA)

Jawaban ini merupakan klaim responden *This answer is the respondent's claim*	**1**
Jawaban ini berdasarkan hasil check/ melihat langsung ke alat elektronik *This answer is based on the results of checking / looking directly into electronic devices*	2

A13b Berapa jam MASING – MASING ALAT tersebut digunakan di hari ketika ia **dipakai**? **(SA, RANGE 1 - 24)**
*How many hours the EACH APPLIANCE is used during the day of usage? (**SA, RANGE 1 - 24)***

TUNJUKKAN TABLET *SHOW TABLET*
A13c **Ketika digunakan, pada jam berapa biasanya** MASING – MASING ALAT **tersebut digunakan? (MA)**
*At what time does the EACH APPLIANCE is used? (**MA)***

00.00	1
01.00	2
02.00	3
03.00	4
04.00	5
05.00	6
06.00	7
07.00	8
08.00	9
09.00	10
10.00	11
11.00	12
12.00	13
13.00	14
14.00	15

15.00	16
16.00	17
17.00	18
18.00	19
19.00	20
20.00	21
21.00	22
22.00	23
23.00	24

			Daya (Watt)			Total penggunakan (Jam)			Waktu penggunaan (kode 1-24)
PERALATAN MASAK & RUMAH TANGGA	**COOKING/ HOUSEHOLD APPLIANCE**	*From A1a*	a	b	c	a	b	c	
Pompa air	Water pump	12							
Microwave	Microwave	13							
Oven Listrik	Electric oven	14							
Kompor listrik	Cooktop	15							
Blender	Blender	16							
Mesin pembuat jus/ Juicer	Juicer	17							
Panggangan roti/ Toaster	Toaster	18							
Mixer	Mixer	19							
Exhaust dapur	Kitchen exhaust	20							
ALAT PEMBERSIH	**CLEANING APPLIANCE**								
Mesin pencuci piring	Diswasher machine	21							
PEMANAS/ PENDINGIN	**HEATER/ COOLER**								
PERALATAN KANTOR/ SEKOLAH	**OFFICE/ SCHOOL APPLIANCE**								
Lampu meja	Desk lamp	22							
Komputer PC	Personal computer (PC)	23							
Laptop	Laptop	24							
Printer	Printer	25							
HIBURAN	**ENTERTAINMENT**								
Set top box/ TV Tuner	Set Top Box	26							
Speaker	Speaker	27							
DVD/ VCD player	DVD/ VCD Player	28							
Radio	Radio	29							
Compo/ Mini compo	Compo/ mini compo	30							
Wifi	Wifi	31							
ALAT KOMUNIKASI	**COMMUNICATION APPLIANCE**								

Tablet	Tablet	32							
Telepon genggam (charger handphone)	Cell phone	33							
Telepon kabel/ rumah	Phone (Home)	34							
ALAT KECANTIKAN	**BEAUTY APPLIANCE**								
Catokan	Hair iron	35							
Pengering rambut	Hair dryer	36							
PERALATAN LAINNYA	**OTHER APPLIANCE**								
Pompa air dekoratif (Air mancur/ air terjun/ dll(	Decorative water pump/ Outdoor water feature	37							
Pompa air untuk sirkulasi aquarium	Aquarium water pump circulation	38							
Sepeda listrik	Electric bike	39							
Segway	Segway	40							
Lainnya, _____	Other, specify_____	41							
Lainnya, _____	Other, specify_____	42							
Lainnya, _____	Other, specify_____	43							
Lainnya, _____	Other, specify_____	44							
Lainnya, _____	Other, specify_____	45							
Lainnya, _____	Other, specify_____	46							
Lainnya, _____	Other, specify_____	47							

GAS SECTION

DP : TANYA SECTION A14A JIKA TERJAWAB KODE 42/45 DI A1a
DP : ASK SECTION A14A IF CODED 42/45 IN A1a
Sekarang saya akan bertanya mengenai peralatan yang menggunakan gas yang ada di rumah Anda.
Now I will ask about the equipment that uses gas in your household.

A14a Apakah tipe gas yang digunakan di rumah tangga Anda **(MA)**
What is the type of you gas source in your household? (MA)

Gas Pipa (PNG) *Gas Pipeline*	**1**
Tabung gas (LNG) *Gas Cylinder*	2

TANYAKAN JIKA TERKODE DI A14A TERKODE KODE 1 *ASK IF CODED 1 IN A14A*
A14b Apa saja penggunaan dari gas pipa di rumah Anda? **(MA)**
How many appliances does each GAS PIPELINE have? (SA)

Kompor *stove*	**1**
Pemanas air *Water heater*	2

Lainnya, senbutkan___ *Others, specify___*	3

TANYAKAN JIKA TERKODE DI A14A TERKODE KODE 1 *ASK IF CODED 1 IN A14A*

A14c Berapa jumlah tagihan gas pipa Anda tiap bulannya? **(OE)**
How much is your pipe gas bill each month? (OE)

Rp ( )

TANYAKAN JIKA TERKODE DI A14A TERKODE KODE 2 *ASK IF CODED 2 IN A14A*

A14d Apa saja penggunaan dari gas tabung di rumah Anda? **(MA)**
How many applianes does each GAS CYLIINDER have? (SA)

Kompor *Gas stove*	**1**
Pemanas air *Water heater*	2
Lainnya, senbutkan___ *Others, specify___*	3

TANYAKAN JIKA TERKODE DI A14D TERKODE KODE 1 *ASK IF CODED 1 IN A14 D*

A14e Berapa kg ukuran gas yang digunakan untuk masing-masing KOMPOR GAS yang dimiliki rumah ini? **(SA)**
Which type of gas size used for each GAS STOVE owned by this house? (SA)

3kg	**1**
5.5 kg (gas pink)	**2**
5.5 kg (blue gas / PGN_	3
12kg	4
Gas kaleng ± 300 gr *Canned gas ± 300 gram*	5
Lainnya, sebutkan__ *Others, specify*	6

TANYAKAN JIKA TERKODE DI A14D TERKODE KODE 1 *ASK IF CODED 1 IN A14D*

DP RANGE: 3 – 200

A14f Setiap berapa hari Anda mengganti tabung gas untuk kompor Anda? **(OE)**
in how many days do you change your gas cylinder for your gas stove? (OE)

Frekuensi ganti tabung (hari)			

TANYAKAN JIKA TERKODE DI A14D TERKODE KODE 2 *ASK IF CODED 2 IN A14D*

A14g Berapa kg ukuran gas yang digunakan untuk masing-masing PEMANAS AIR GAS yang dimiliki rumah ini? **(SA)**
Which type of gas size used for each GAS WATER HEATER owned by this house? (SA)

3kg	**1**
5.5 kg (gas pink)	**2**
5.5 kg (blue gas / PGN_	3
12kg	4
Gas kaleng ± 300 gr *Canned gas ± 300 gram*	5
Lainnya, sebutkan__ *Others, specify*	6

TANYAKAN JIKA TERKODE DI A14D TERKODE KODE 2 *ASK IF CODED 2 IN A14A*

A14h Setiap berapa hari Anda mengganti tabung gas untuk pemanas air Anda? **(OE)**

in how many days do you change your gas tube for your water heater? (OE)

Frekuensi ganti tabung (hari) *Frequency of change gas tube (days)*			

HANYA TANYAKAN JIKA RESPONDEN MENJAWAB KODE 43/46 DI A1A *ASK IF CODED 43/46 (KEROSENE STOVE/ KEROSENE LIGHT) IN A14A*

TUNJUKKAN TABLET *SHOW TABLET*

A15 Berapa liter minyak tanah yang Anda habiskan dalam setiap bulannya? **(OE)**
*How many liters kerosene you spent on each month? **(OE)***

Liter *Litre* ( )

BIOMARS

HANYA TANYAKAN JIKA RESPONDEN MENJAWAB KODE 44 DI A1A *ASK IF CODED 44 (WOOD STOVE) IN A14A*

A16B Berapa jam waktu yang Anda habiskan untuk memasak menggunakan tungku kayu, ketika Anda memakainya? **(OE)**
DP: range 0-24 (bisa 2 angka dibelakang koma)
How many hours of time do you usually spend cooking in in the day you use biomass stove? (OE)

TANYA HANYA TANYAKAN JIKA RESPONDEN MENJAWAB KODE 44 DI A1A *ASK IF CODED 44 (WOOD STOVE) IN A14A*

A16c Bahan apa saja yang biasanya Anda gunakan untuk memasak? **(MA)**
What source do you use most often for cooking? (MA)

Kayu *Wood*	**1**
Batok kelapa *Coconut shell*	**2**
Sekam (kulit beras) *Husk*	3
Lainnya, sebutkan__ *Others specify__*	4

SECTION B : OTHER HOUSEHOLD ELECTRICITY INFORMATION

INTERVIEWER KATAKAN : Sekarang, kita akan berbicara mengenai listrik di rumah Anda secara umum
INTERVIEWER READ OUT : Now, we're going to talk about general household electrical

ELECTRICITY BILL

B1 Berapa tagihan listrik Anda dalam 3 bulan terakhir? ***(OE)***
How much your electricity bill in past 3 month? (OE)

	(Rp)
Bulan terakhir *Last month*	Rp ( )
Bulan ke-2 terakhir *Last 2nd month*	Rp ( )
Bulan ke-3 terakhir *Last 3rd month*	Rp ( )

TYPE OF ELECTRICITY INSTALLMENT

B2 Apa tipe listrik PLN yang dipasang di rumah Anda? ***(SA)***
What is the type of PLN electricity installed in your house? (SA)

Pra bayar/ Token *Pre-paid*	1
Pasca bayar/ Meteran *Post-paid*	2

POWER CAPACITY

B3 Apa golongan listrik yang dipasang di rumah Anda? ***(SA)***
INTERVIEWER : Minta ijin untuk melihat meteran jika responden tidak tahu.
What is the class electrical power installed in your house? ***(SA)***
INTERVIEWER: If respondent unable to answer, ask permission to see the indicator

R-1/ 450 VA Subsidi 415 (Rp/ kWh)	1
R-1/900 VA Subsidi 586 (Rp/ kWh)	2
R-1/900 VA-RTM (Rumah Tangga Mampu) Non-Subsidi 1352 (Rp/ kWh)	3
R-1/1300 VA Non-Subsidi 1467,28 (Rp/ kWh)	4
R-1/2200 VA Non-Subsidi 1467,28 (Rp/ kWh)	5
R-2/3500 VA, 4400 VA, 5500 VA Non-Subsidi 1467,28 (Rp/ kWh)	6
R-3/6600 VA ke atas Non-Subsidi 1467,28 (Rp/ kWh)	7

BLACKOUT FREQUENCY

B4 Apakah di rumah Anda terjadi mati listrik secara teratur dari PLN dalam 1 bulan? Jika iya, berapa hari dalam 1 bulan biasanya terjadi mati listrik? ***(SA)***
Is there any regular blackout in a month? If yes, how many days there's blackout in a month? ***(SA)***

Mati listrik per bulan _____kali *Blackout _____times/ month*	1
Tidak sampai 1 bulan 1 kali/ tidak pernah *Not regular in a month/ never*	2

BLACKOUT DURATION

DP : TANYA JIKA MENJAWAB KODE 1 DI B4 *ASK IF NOT ANSWER 1 IN B4*

B5 Apa sumber energi/ penganti listrik yang rumah ini gunakan saat mati listrik? ***(MA)***
What is the energy substitute during blackout? ***(MA)***

Panel surya yang saya miliki *Solar panel*	1

Generator yang saya miliki *Generator*	2
Lilin *candle*	3
Lampu minyak *oil light*	4
Lainnya, sebutkan_____ *Other, specify_____*	5
Lainnya, sebutkan_____ *Other, specify_____*	6
Tidak ada *None*	7

CONSIDERATION IN PURCHASING ELECTRONIC APPLIANCES

HANYA TANYAKAN KE RESPONDEN YANG MENJAWAB KODE 1 DI A1A

B7A.1 Ketika membeli lampu, apa saja yang Anda jadikan pertimbangan utama. Tolong urutkan dari dari ranking 1 – 3. ***(SA)***

When purchase lighting, what are your main consideration? Please select from rank 1 – 3 (SA)

ROTATE ATTRIBUTE	RANK 1	RANK 2	RANK 3
Harga murah *Affordable price*	1	1	1
Merek *Brand*	2	2	2
Tipe lampu (bolham, neon, LED) *Lighting type (incandescent, CFL, LED)*	3	3	3
Hemat listrik *Energy saving*	4	4	4
Produk buatan dalam negeri *Made in local product*	5	5	5
Tingkat pencahayaan (yang penting terang) *Illumination level (high illumination is preferable)*	6	6	6

HANYA TANYAKAN KE RESPONDEN YANG MENJAWAB KODE 2 DI A1A

B7A.2 Ketika membeli KULKAS, apa saja yang Anda jadikan pertimbangan utama. Tolong urutkan dari dari ranking 1 – 3. ***(SA)***

When purchase REFRIGERATOR, what are your main consideration? Please select from rank 1 – 3 (SA)

ROTATE ATTRIBUTE	RANK 1	RANK 2	RANK 3
Harga murah *Affordable price*	1	1	1
Merek *Brand*	2	2	2
Teknologi (inverter, anti bau, anti frostin/ beku) *Technology (inverter, anti smell, no frosting, etc)*	3	3	3
Hemat listrik *Energy saving*	4	4	4
Produk buatan dalam negeri *Made in local product*	5	5	5
Kapasitas kulkas (liter besar/ kecil) *Refrigerator capacity (small/ big capacity)*	6	6	6

HANYA TANYAKAN KE RESPONDEN YANG MENJAWAB KODE 3 DI A1A

B7A.3 Ketika membeli AC/ Pendingin Ruangan, apa saja yang Anda jadikan pertimbangan utama. Tolong urutkan dari dari ranking 1 – 3. ***(SA)***

When purchase AIR CONDITIONER, what are your main consideration? Please select from rank 1 – 3 (SA)

ROTATE ATTRIBUTE	RANK 1	RANK 2	RANK 3
Harga murah *Affordable price*	1	1	1
Merek *Brand*	2	2	2
Teknologi (inverter, anti bau, anti bakter, dll) *Technology (inverter, anti smell, antibacteria, etc)*	3	3	3
Hemat listrik *Energy saving*	4	4	4
Produk buatan dalam negeri *Made in local product*	5	5	5
Kapasitas AC (Watt/ PK) *Air Conditioner capacity (Watt/ PK)*	6	6	6

HANYA TANYAKAN KE RESPONDEN YANG MENJAWAB KODE 4 DI A1A

B7A.4 Ketika membeli TELEVISI, apa saja yang Anda jadikan pertimbangan utama. Tolong urutkan dari dari ranking 1 – 3. ***(SA)***

When purchase TELEVISION, what are your main consideration? Please select from rank 1 – 3 (SA)

ROTATE ATTRIBUTE	RANK 1	RANK 2	RANK 3
Harga murah *Affordable price*	1	1	1
Merek *Brand*	2	2	2
Teknologi (HD, Ultra HD, LED, OLED dll) *Technology HD, Ultra HD, LED, OLED, etc.)*	3	3	3
Hemat listrik *Energy saving*	4	4	4
Produk buatan dalam negeri *Made in local product*	5	5	5
Ukuran (Inch) *Size (Inch)*	6	6	6

HANYA TANYAKAN KE RESPONDEN YANG MENJAWAB KODE 5 DI A1A

B7A.5 Ketika membeli KIPAS ANGIN, apa saja yang Anda jadikan pertimbangan utama. Tolong urutkan dari dari ranking 1 – 3. ***(SA)***

When purchase ELECTRIC FAN, what are your main consideration? Please select from rank 1 – 3 (SA)

ROTATE ATTRIBUTE	RANK 1	RANK 2	RANK 3
Harga murah *Affordable price*	1	1	1
Merek *Brand*	2	2	2
Teknologi (pengatur waktu, swing/ ayun, etc) *Technology (timer, swing, etc)*	3	3	3
Hemat listrik *Energy saving*	4	4	4
Produk buatan dalam negeri *Made in local product*	5	5	5
Ukuran kipas/ turbin *Size (blade)*	6	6	6

HANYA TANYAKAN KE RESPONDEN YANG MENJAWAB KODE 6 DI A1A

B7A.6 Ketika membeli RICE COOKER, apa saja yang Anda jadikan pertimbangan utama. Tolong urutkan dari dari ranking 1 – 3. ***(SA)***

When purchase RICE COOKER, what are your main consideration? Please select from rank 1 – 3 (SA)

ROTATE ATTRIBUTE	RANK 1	RANK 2	RANK 3
Harga murah *Affordable price*	1	1	1
Merek *Brand*	2	2	2
Teknologi (kukus, slow cooker, pembuat bubur, dll) *Technology (steam, slow cooker, poridge maker, etc)*	3	3	3
Hemat listrik *Energy saving*	4	4	4
Produk buatan dalam negeri *Made in local product*	5	5	5

Kapasitas (liter beras) *Capacity (litre of rice)*	6	6	6

DP: JIKA TERKODE 4 DI SALAH SATU PERTANYAAN B7A.1-B7A.6

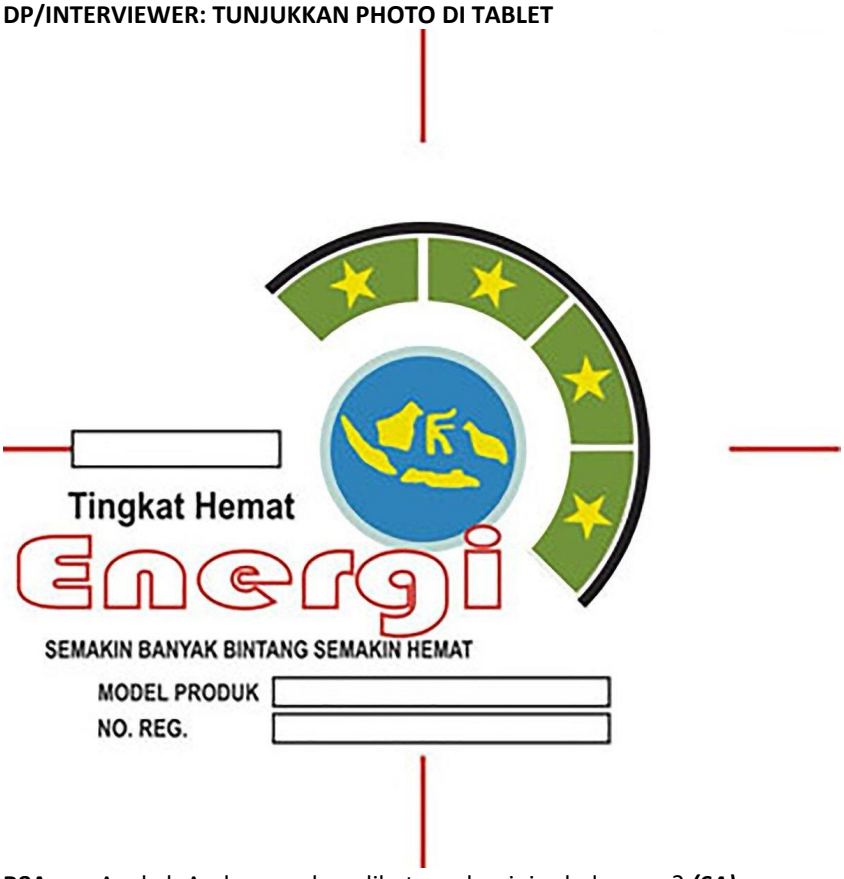
ROTATE ANSWER

B7B Apakah yang Anda jadikan panduan untuk menentukan alat elektronik yang hemat energi? ***(MA)***
What do you make a guide to determine electronic devices that are energy efficient? (MA)

Label hemat energi *Energy saving label*	1
Watt *Wattage*	2
Menanyakan ke sales/ penjaga toko nya secara langsung *Ask the salesperson directly*	3
Rekomendasi dari teman/keluarga *Recommendations from friends / family*	4
Lainnya, sebutkan_____ *Other, specify*	5
Lainnya, sebutkan_____ *Other, specify*	6

AWARENESS LOGO

DP/INTERVIEWER: TUNJUKKAN PHOTO DI TABLET



B8A Apakah Anda pernah melihat gambar ini sebelumnya? ***(SA)***
Have you ever seen this picture before? (SA)

Ya *Yes*	1
Tidak *Never*	2

TANYAKAN KE RESPONDEN YANG MENJAWAB KODE 1 DI B8A

ROTATE ANSWER

B8B Menurut Anda, apa arti dari bintang pada gambar tersebut? ***(SA)***

What do you think the meaning of the stars in the picture? (SA)

Semakin banyak bintang, semakin hemat energi *The more stars, the more energy efficient*	1
Semakin sedikit bintang, semakin hemat energi *The fewer stars, the more energy efficient*	2
Semakin banyak bintang, semakin terjangkau *The more stars, the cheaper*	3
Semakin sedikit bintang, semakin terjangkau *The fewer stars, the cheaper*	4

OCCUPANCY RATE PER YEAR

B9 Rata-rata dalam 1 tahun, berapa hari biasanya rumah ini kosong (contoh mudik, ada rumah yang lain dll) sehingga penggunaan listrik sangat kecil? ***(OE)***

In an average year, how many days this house usually empty (for example: go to home town, has another house, etc) which impact to the smalll electricity usage? (OE)

DP: RANGE : 0 – 356

			Hari *Days*

WILLINGNESS TO PAY

B10 Jika sebuah peralatan elektronik mempunyai fitur hemat energi, berapa % anda mau membayar lebih tinggi dibanding harga biasa? ***(SA)***

If an electronic appliance has energy saving features, how many % do you willing to pay more compared to regular price? (SA)

_____(% higher)	1
Tidak tahu/ belum ada bayangan *Don't have any idea*	2

_____(% higher)

SECTION D : DEMOGRAPHIC PROFILE

INTERVIEWER KATAKAN : Sekarang, kita akan berbicara situasi di rumah Anda *INTERVIEWER READ OUT : Now, we're going to ask about your household situation*

MARITAL STATUS

TUNJUKKAN TABLET SHOW TABLET

D1 Mana dari pilihan ini yang paling tepat dalam menggambarkan status Anda saat ini? **(SA)** *What best describes your status, are you…? **(SA)***

Menikah dan sudah punya anak ***Married with kids***	1
Cerai/berpisah dan sudah punya anak *Widowed/divorced with kids*	2
Menikah tapi belum punya anak ***Married without kids***	3
Cerai/berpisah tapi belum punya anak *Widowed/divorced without kids*	4
Belum menikah ***Single***	5

NUMBER OF CHILD

DP : TANYA JIKA TERKODE 1 ATAU 2 DI D1 *ASK OF CODED 1 OR 2 IN D1*

D2 Berapa banyak anak yang Anda miliki? **(SA)** *How many child that you have? (SA)*

Satu *One*	1
Dua *Two*	2
Tiga *Three*	3
Empat *Four*	4
Lima *Five*	5
Enam *Six*	6
Tujuh atau lebih *Seven of more*	7

NUMBER OF HEAD HOUSEHOLD

D3A Ada berapa kepala rumah tangga di rumah Anda saat ini? **(SA)** *How many heads of households are there in your house right now? (SA)*

NUMBER OF FAMILY MEMBER

D3B Termasuk Anda sendiri, berapa orang yang ada di rumah Anda (tidak termasuk supir, pembantu, dll)? **(SA)** *Including yourself, how many person in your household (Exclude driver, helper, employee, etc) (SA)*

Saya sendiri *Myself*	1
Dua *Two*	2
Tiga *Three*	3
Empat *Four*	4
Lima *Five*	5
Enam *Six*	6

Tujuh *Seven*	7
Delapan *Eight*	8
Sembilan atau lebih *Nine of more*	9

ROLE OF HH MEMBER

DP : TANYA JIKA TIDAK TERKODE 1 DI D3 *AKS IF NOT CODED 1/ IN D3*

D4 Dengan siapa sajakah Anda tinggal di rumah tangga Anda? Tolong pilih semua jawaban yang sesuai dari daftar berikut ini. **(MA)** *With whom do you live in your household? Please choose all that apply from this list (MA)*

Kakek/nenek *Grandparents*	01
Orang tua *Parents*	02
Pasangan *Spouse*	03
Anak-anak *Children*	04
Kakak/adik laki-laki/perempuan *Brothers/sisters*	05
Sanak keluarga *Relatives*	06
Teman *Friends*	07
Lainnya (Sebutkan _____) *Others*	08

HOUSEHOLD INCOME

TUNJUKKAN TABLET *SHOW TABLET*

D6 Dari kisaran berikut ini, di nomor manakah total penghasilan rumah tangga Anda? **(SA)** *Of following range, which number suitable with your toto household income? (SA)*

Range	Code
More than Rp. 50.000.000,- Lebih dari Rp. 50.000.000,-	
Rp. 30.500.001 – Rp. 50.000.000,-	
Rp. 20.000.001 – Rp. 30.000.000,-	
Rp. 15.000.001 – Rp. 20.000.000,-	
Rp. 10.000.001 – Rp. 15.000.000,-	
Rp. 7.500.001 – Rp. 10.000.000,-	
Rp. 5.000.001 – Rp. 7.500.000,-	
Rp. 4.000.001 – Rp. 5.000.000,-	
Rp. 3.000.001 – Rp. 4,000,000-	
Rp. 2.000.001 – Rp. 3,000.000,-	
Rp. 1.00.001 – Rp. 2.000.000,-	

Rp. 1000.000,- and below	
Refused Menolak	99

SES QUESTION SET

PERTANYAAN-PERTANYAAN UNTUK KLASIFIKASI SES RESPONDEN (D8.a-D8.e)
QUESTIONS TO DETERMINE RESPONDENT'S SES (D8.a-D8.e)

KARTU BANTU SHOWCARD

D8.a Hanya untuk tujuan klasifikasi saja, dengan bantuan kartu ini, mohon sebutkan termasuk dalam kelompok manakah jumlah pengeluaran rumah tangga Anda perbulannya, yaitu keseluruhan pengeluaran untuk makanan, pakaian,kendaraan/transport, listrik dan lain sebagainya perbulannya tetapi tidak termasuk pengeluaran-pengeluaran besar yang tidaktetap? **(SA)**
For qualification purposes only, with the help of this showcard, could you please tell which of the following best represents your total monthly household expenditure, that is, total expenditure every month for food, clothes, transportation, electricity, etc., but not including irregular large expenditures? ***(SA)***

INTERVIEWER: *TUNJUKKAN KARTU DEFINISI HAL-HAL YANG TERMASUK PENGELUARAN BULANAN RUMAH TANGGA UNTUK MEMBANTU RESPONDEN PLEASE SHOW THE FOLLOWING DEFINITION OF TOTAL MONTHLY HOUSEHOLD EXPENDITURE TO HELP RESPONDENT*

SES	Range	Code	Score		
A1	*More than Rp. 7.000.000,-* Lebih dari Rp. 7.000.000,-	1	5	**Termasuk:** ***Includes:*** *Daily food* Makanan sehari-hari *Electricity, water* Listrik dan air *Phone / HP* Telpon / HP *Gas / Kerosene* Gas / Minyak Tanah *Soap, Cosmetic* Sabun, Kosmetik *Maid's wages* Gaji pembantu *Children's school fees* Biaya sekolah anak *Transportation, Petrol* Transportasi, Bensin *Cigarette* Rokok *Monthly rent* Sewa bila dibayar bulanan *Monthly fee/ premium* Pungutan, premi asuransi yang dibayar bulanan	**Tidak termasuk:** ***Excludes:*** *Rent, if paid yearly* Sewa bila dibayar tahunan *Installment payments* Pembayaran cicilan *Household furniture* Furnitur rumah tangga *Household appliances* Peralatan rumah tangga *Recreation/entertainment* Rekreasi *Any irregular expenses* Pengeluaran tidak rutin
	Rp. 6.000.001 – Rp. 7.000.000,-	2	4		
A2	Rp. 5.000.001 – Rp. 6.000.000,-	3	4		
	Rp. 4.500.001 – Rp. 5.000.000,-	4	3		
	Rp. 4.000.001 – Rp. 4.500.000,-	5	3		
B	Rp. 3.000.001 – Rp. 4.000.000,-	6	3		
	Rp. 2.500.001 – Rp. 3.000.000,-	7	3		
C1	Rp. 2.000.001 – Rp. 2.500.000,-	8	3		
	Rp. 1.750.001 – Rp. 2.000.000,-	9	3		
C2	Rp. 1.500.001 – Rp. 1.750.000,-	10	3		
	Rp. 1.250.001 – Rp. 1.500.000,-	11	3		
D	Rp. 900.001 – Rp. 1.250.000,-	12	2		

E	Rp. 750.001 – Rp. 900.000,-	13	2
	Less than Rp. 750.000,- Rp. 750.000,- atau kurang	14	1
	Refused Menolak	99	*STOP*

***KARTU BANTU** SHOWCARD*

D8.b

Manakah dari berikut ini yang paling sering digunakan di dalam rumah tangga Anda sebagai sumber air minum? **(SA)**

*Which of the followings that you use most often in your household as source of drinking water? **(SA)***

	Code	Score
Branded packaged water Air kemasan bermerek	1	8
Refill water Air isi ulang	2	6
Tap water in meter Ledeng meteran	3	5
Tap water in retail Ledeng eceran	4	5
Artesian well/ pump Sumur bor/ pompa	5	4
Protected well Sumur terlindung	6	2
Unprotected well Sumur tak terlindung	7	2
Protected spring Mata air terlindung	8	1
Unprotected spring Mata air tak terlindung	9	1
*River*Air sungai	10	1
Rain Air hujan	11	1
Others Lainnya	12	1

***KARTU BANTU** SHOWCARD*

D8.c

Manakah dari bahan bakar berikut ini yang paling sering digunakan di rumah tangga Anda untuk memasak kebutuhan sehari - hari? **(SA)**

*Which of the followings that you use most often in your household as fuel for daily cooking? **(SA)***

	Code	Score
Electricity Listrik	1	5
LPG 12 kg Gas elpiji 12 kg	2	4
LPG 3 kg/ 5kg/ 10kg Gas elpiji 3 kg/ 5 kg/ 10 kg	3	2
Natural Gas Gas kota/ Alam	4	2
Kerosene Minyak tanah	5	2
Wood Kayu	6	1
Charcoal Arang	7	1
Bricket	8	1
Other Lainnya	9	1
Not cooking Tidak memasak	10	1

***KARTU BANTU** SHOWCARD*

D8.d

JANGAN DITANYAKAN, KLASIFIKASIKAN DARI JAWABAN DI B3 _____(DP : TRANSFER DARI B3) **(SA)**

*DON'T ASKED, CLASSIFY FROM ANSWER IN B3 _____(DP: TRANSFER FROM B3) **(SA)***

	Code	Score

*2.201 watt or more*2.201 watt atau lebih	1	8
1.301 – 2.200 watt	2	6
901 – 1.300 watt	3	5
451 – 900 watt	4	4
*450 watt or less*450 watt atau kurang	5	3
*No electricity*Tidak memiliki sambungan listrik	6	1
*Without meter*Tanpa meteran	7	1

D8d, autocode dari B3
Kode 1 jika terkode 5/6/7 dan di B3
Kode 2 jika terkode 3/4 di B3
Kode 3 jika terkode 1/2 di B3

D8.e **INTERVIEWER:** *HITUNG SELURUH SKOR DARI a+b+c+d CALCULATE ALL SCORE FROM a+b+c+d*

SCORE a	SCORE b	SCORE c	SCORE d	Total Score

INTERVIEWER: TRANSFER TOTAL SKOR a+b+c+d SESUAI DENGAN RANGE YANG ADA DI TABEL DI BAWAH INI TRANSFER SCORE a+b+c+d TO THE RANGE IN THIS BELOW TABLE	
	Code
20 – 26 (Upper 1)	1
17 – 19 (Upper 2)	2
14 – 16 (Middle 1)	3
11 – 13 (Middle 2)	4
7 – 10 (Lower 1)	5
1 – 6 (Lower 2)	6

HOUSE OWNERSHIP

D9 Apakah status kepemilikan dari rumah ini? **(SA)** *What is the ownership status of this house? (SA)*

Milik sendiri *Self owned*	1
Sewa *Rent*	2
Lainnya *Others*	3

OCCUPATION

D10 **INTERVIEWER:** TANYAKAN JENIS PEKERJAAN RESPONDEN, LALU SESUAIKAN DENGAN DAFTAR DI BAWAH INI. TAPI JANGAN BACAKAN PILIHANNYA. **(SA)** *ASK RESPONDENT OCCUPATION, THEN MATCH WITH THE LIST BELLOW. BUT DO NOT READ OUT THE OPTIONS.* ***(SA)***

Bekerja dengan keluarga *Employed by family*	1	
Pegawai swasta – Staf *Private employee – Staff level*	2	
Pegawai swasta – Manajer Junior/Eksekutif *Private employee – Junior Manager/Executive*	3	
Pegawai swasta – Manajer Menengah *Private employee – Middle Manager*	4	
Pegawai swasta – Manajer Senior/Direktur *Private employee – Senior Manager/Director*	5	
Pegawai Negeri – Golongan I *State employee – Level I*	6	
Pegawai Negeri – Golongan II *State employee – Level II*	7	
Pegawai Negeri – Golongan III dan di atasnya *State employee – Level III and above*	8	
Profesional (misal: guru, pengacara, dokter, notaris) *Professional (e.g., teacher, lawyer, physician, public notary)*	9	
Pengusaha (< 10 pegawai) *Businessman (< 10 employees)*	10	
Pengusaha (10 – 50 pegawai) *Businessman (10 – 50 employees)*	11	*LANJUTKAN CONTINUE*
Pengusaha (> 50 pegawai) *Businessman (> 50 employees)*	12	
Broker *Broker*	13	
Online shop *Online shop*	14	
Pemilik toko / warung *Small shop owners*	15	
Buruh berketrampilan (misal: tukang kayu, tukang kebun, mekanik, tukang las) *Skilled labor (e.g., carpenter, gardener, mechanic, welder)*	16	
Buruh tanpa ketrampilan *Unskilled labor*	17	
Ibu Rumah Tangga *Housewife*	18	
Pelajar / Mahasiswa *Student*	19	
Menganggur / sedang mencari pekerjaan *Unemployed / looking for job*	20	
Pensiunan *Pensioner*	21	
Petani / nelayan *Farmer / fisherman*	22	
Lainnya (sebutkan _____) *Other (specify _____)*	23	

EDUCATION

KARTU BANTU SHOWCARD

D11 Apakah tingkat pendidikan terakhir yang telah Anda **tamatkan**? **(SA)** ***What is you highest completed education level? (SA)***

Tidak ada pendidikan formal *No formal education*	1	
Sekolah Dasar *Primary school*	2	
SMP *Junior high school*	3	
SMU / SMK *Senior high school*	4	LANJUTKAN *CONTINUE*
Akademi / Politeknik (D3) *Diploma / Junior college*	5	
Universitas (S1) *College / University*	6	
Master / Ph.D. (S2/S3) *Master / Ph.D.*	7	

INTERVIEW SELESAI DAN TERIMA KASIH

INTERVIEW FINISHED AND THANK YOU

Appendix D. Help Card

A2E. JENIS LAMPU / TYPES OF LIGHTING PRODUCTS

Lampu Bohlam

Lampu Neon

Lampu LED

Lampu Halogen

Lampu Hybrid Halogen

A4C. JENIS AC / TYPES OF AC

AC Split

AC Window

AC Standing

AC Portable

A9B. PENYEDOT DEBU / VACUUM CLEANER

PENYEDOT DEBU UNTUK LANTAI

PENYEDOT DEBU GENGGAM

PENYEDOT DEBU ROBOT

A5C. TIPE TV / TYPES OF TV

TV tabung

- Bentuknya cembung

LCE/LED TV

- Menggunakan teknologi lampu LED dalam penerangan TV nya. Teknologi terbaru yang umum dimiliki TV flat screen

Plasma TV

- Bentuknya sudah flat, lebih canggih dibanding TV tabung

TV OLED

- Teknologi yang paling baru dibandung LED. TV OLED tidak menggunakan lampu di dalam sistem penerangannya. Dan lebih hemat dibanding semua jenis TV

A8B. JENIS SETRIKA / TYPES OF IRON

JENIS SETRIKA BIASA/PLAT

- JENIS SETRIKA YANG TENAGA PANASANYA DIHASILKAN DARI PLAT NYA (SETRIKA BIASA)

SETRIKA UAP

- JENIS SETRIKA YANG TENAGA PANASNYA DIHASILKAN DARI UAP AIR DARI SETRIKA NYA.
- LEBIH EFISIEN KARENA BISA DIGUNAKAN TANPA MEMBOLAK-BALIKKAN PAKAIAN
- BISA DIGUNAKAN UNTUK BANYAK JENIS PAKAIAN TANPA MERUSAK BAHAN (KEBAYA, JAS DLL)

Appendix E. Matrix of the Available Input Variables for the Surveyed Appliances

INPUT VARIABLES AVAILABLE AS INDIVIDUAL VALUES PER UNIT USED IN THE HOUSEHOLD							
No.	Appliances	Wattage[1]	Hours in use[2]	Frequency of use (days per month)	Age of appliances	Frequency of unplugging[3]	Technology type
1	Rice cooker	x	x	x	A1	NA	x
2	Refrigerator	x	x	x	x	NA	x
3	Lighting	x	x	x	NA	NA	x
4	TV	x	x	x	x	NA	A1
5	Fans	x	x	x	A1	NA	NA
6	AC	x	x	x	x	NA	A1
7	Water dispenser	x	x	x	NA	x	NA
8	Washing machine	x	x	x	NA	NA	NA
9	Iron	x	x	x	NA	NA	NA
10	Vacuum cleaner	x	x	x	NA	NA	NA
11	Water heater	x	x	x	NA	NA	NA
[1]Equal and random assignment for the defined ranges of nameplate wattage							
[2]1.0 hour unit for the reported time of the day—individually adjusted with Hour Fraction Factor							
[3]Assuming 8 hours of unit being unused every time the unit is unplugged At the following unplugging frequency, the active hours in-use is as listed; - Daily/almost daily; 7 times unplugging/week; 16 hours in-use/day - 3 – 4 times/week; 3.5 times unplugging/week; 20 hours in-use/day - 1 – 2 times/week; 1.5 times unplugging/week; 22.3 hours in-use/day - Less than once/week; 0.5 times unplugging/week; 23.4 hours in-use/day							
NA = not available; A1 = available, not used							

INPUT VARIABLES AVAILABLE AS SINGLE REPORTED VALUES FOR ALL UNITS USED IN THE HOUSEHOLD					
No.	Appliances	Wattage[1]	Hours in use[2]	Frequency of use (days per month)	Number of appliance unit
12	Water pump	x	x	x	x
13	Speaker	x	x	x	x
14	Laptop	x	x	x	x
15	Wifi	x	x	x	x
16	DVD/ VCD Player	x	x	x	x
17	Personal computer (PC)	x	x	x	x
18	Aquarium water pump circulation	x	x	x	x
19	Electric oven	x	x	x	x
20	Vacuum cleaner	x	x	x	x
21	Radio	x	x	x	x
22	Emergency lamp	x	x	x	x

INPUT VARIABLES AVAILABLE AS SINGLE REPORTED VALUES FOR ALL UNITS USED IN THE HOUSEHOLD					
No.	Appliances	Wattage[1]	Hours in use[2]	Frequency of use (days per month)	Number of appliance unit
23	Tablet	x	x	x	x
24	Blender	x	x	x	x
25	Hair dryer	x	x	x	x
26	Cell phone	x	x	x	x
27	Set Top Box	x	x	x	x
28	Compo/ mini compo	x	x	x	x
29	Mixer	x	x	x	x
30	Desk lamp	x	x	x	x
31	Decorative water pump/ Outdoor water feature	x	x	x	x
32	Toaster	x	x	x	x
33	Hair iron	x	x	x	x
34	Kitchen exhaust	x	x	x	x
35	Microwave	x	x	x	x
36	Juicer	x	x	x	x
37	Phone (Home)	x	x	x	x
38	Dishwasher machine	x	x	x	x
39	Segway	x	x	x	x
40	Printer	x	x	x	x
41	Electric flashlight	x	x	x	x
42	Electric bike	x	x	x	x
43	Cooktop	x	x	x	x
44	Night lamp	x	x	x	x
45	Decorative lights	x	x	x	x
46	Coffee grinder	x	x	x	x
47	Electric Mosquito Coils	x	x	x	x
48	Electric sewing machine	x	x	x	x
49	Electric kettle	x	x	x	x
50	Mosquito rackets	x	x	x	x
51	Keyboard	x	x	x	x
52	Play Station	x	x	x	x
53	Receiver	x	x	x	x
54	Game console	x	x	x	x
55	Amplifier	x	x	x	x
56	Electric guitar	x	x	x	x
57	HT (Handy Talky)	x	x	x	x

INPUT VARIABLES AVAILABLE AS SINGLE REPORTED VALUES FOR ALL UNITS USED IN THE HOUSEHOLD					
No.	Appliances	Wattage[1]	Hours in use[2]	Frequency of use (days per month)	Number of appliance unit
58	CCTV	x	x	x	x
59	Compressor	x	x	x	x
60	Power Bank	x	x	x	x
61	Electric welding	x	x	x	x
62	Aquarium	x	x	x	x
63	Drilling machine	x	x	x	x
64	TV Satellite dish	x	x	x	x
[1]Exact nameplate wattage as listed; mean of known nameplate wattage assigned for unknown wattage					
[2]Full hour integer values--adjusted with Hour Fraction Factor					

Appendix F. Rice Cooker UEC Regression Model

A regression analysis was performed to generate a mathematical model that utilize the survey's individual household responses for rice cooker. These variables include dry rice labeled volume or rice cooker capacity, nameplate wattage for the unit's cooking function, age of the rice cooker, and frequency of use in hours per day. All of these variables were incorporated into Formula (1) and were used in calculating UEC values of the rice cooker unit as reported by each household.

$$UEC = 60.3737 + (72.9733 \times Container\ Volume) + (0.11734 \times Cooking\ Wattage) + (0.09914 \times Warming\ Energy\ Use) \quad (1)$$

where UEC is the annual rice cooker unit energy consumption in kWh/year, $Container\ Volume$ is the estimated container capacity of the rice cooker in the unit of L, $Cooking\ Wattage$ is the adjusted cooking wattage that includes national average of cooking event in the unit of W, and $Warming\ Energy\ Use$ is the adjusted warming energy use that includes average warming power and duration.

The following formulas are provided for $Container\ Volume$, $Cooking\ Wattage$, and $Warming\ Energy\ Use$.

$$Container\ Volume = 0.8 \times 2.172 \times Capacity\ (dry\ rice\ labeled\ volume) \quad (2)$$

- 0.8; 80% water fill specified in the drafted national test procedure for rice cooker
- 2.172; average ratio of container volume in reference to dry rice labeled volume (CLASP Rice Cooker Market Study product data – measured container volumes of 14 models)

$$Cooking\ Wattage = 1.434 \times Cooking\ Nameplate\ Wattage \quad (3)$$

- 1.434, average cooking event for residential use from Ipsos 500-person rice cooker survey (CLASP Rice Cooker Market Study)
- To note, the survey doesn't include cooking event per use

$$Warming\ Energy\ Use = 0.107 \times Warming\ Time \times Cooking\ Wattage$$
$$Warming\ Time = (Rice\ Cooker\ Usage\ at\ noted\ time\ of\ the\ day) - (1.434 \times 0.5) \quad (4)$$

- 0.107, average ratio of warming energy consumption per hour to cooking energy per cooking occurrence (CLASP Rice Cooker Market Study performance data – 133 models performance data)
  - The warming energy ratio was obtained from a database established from 14 models that were tested according to the drafted test procedure defined by EBTKE for the draft rice cooker regulation, and 119 models with modeled performance data based on test results and retail product specifications
  - In EBTKE's draft procedure, cooking energy consumption was measured per cooking occurrence, and warming energy consumption for the duration of 5 hours warming function use
  - Warming energy consumption per hour was calculated by taking the ratio of the measured warming energy and the defined duration of 5 hours
- (1.434 x 0.5), cooking duration in hours; estimated 30 minutes per cooking
  - 1.434, average cooking event for residential use from Ipsos 500-person rice cooker survey (CLASP Rice Cooker Market Study)

Outcome of the regression analysis is provided in as follows, along with the plotted UEC data and UEC regression model in Figure AF1.

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.9826
R Square	0.9655
Adjusted R Square	0.9647
Standard Error	16.7840
Observations	133.0

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	3	1018074.46	339358.15	1204.67	4.10E-94
Residual	129	36339.64	281.70		
Total	132	1054414.10			

	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	60.37374	5.78733	10.43206	7.51E-19
Container volume	72.97329	1.70561	42.78429	4.47E-78
Cooking wattage	-0.11734	0.01268	-9.25357	6.02E-16
Warming energy use	0.09914	0.00938	10.56675	3.48E-19

	Lower 95%	*Upper 95%*	*Lower 95.0%*	*Upper 95.0%*
Intercept	48.92337	71.82412	48.92337	71.82412
Container volume	69.59870	76.34788	69.59870	76.34788
Cooking wattage	-0.14243	-0.09225	-0.14243	-0.09225
Warming energy use	0.08058	0.11771	0.08058	0.11771

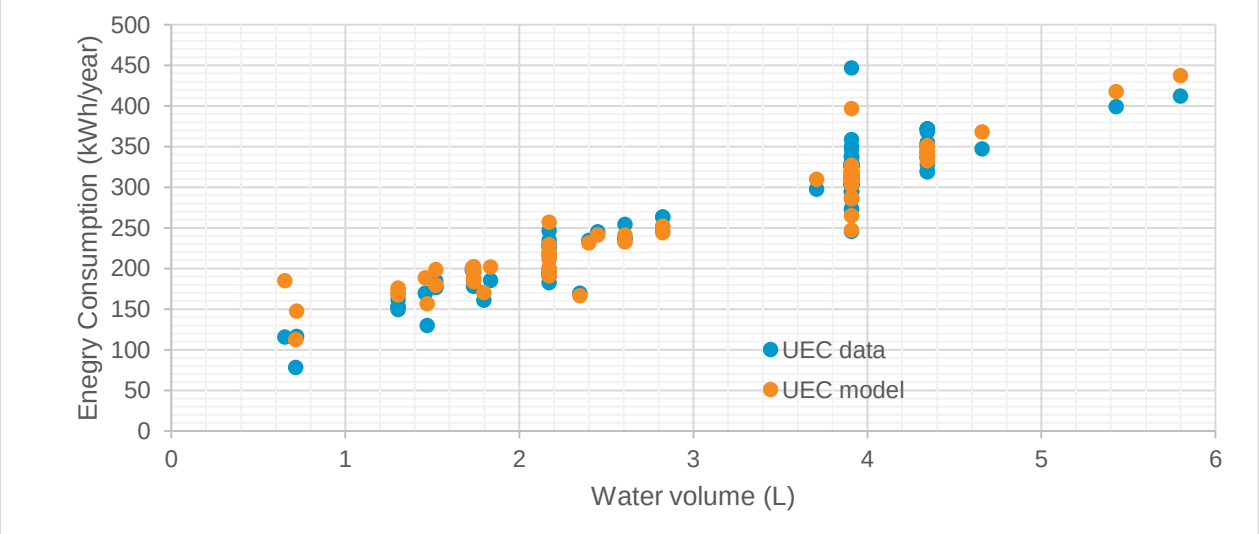


Figure AF1: Regression model of the rice cooker performance data

Appendix G. Refrigerator UEC Regression Model

A regression analysis was performed to generate a mathematical model that utilize the survey's individual household responses for refrigerator. These variables include gross volume of the refrigerator unit and the nameplate wattage of the unit. Detailed explanation behind the generated model is provided in the following subsection. These variables were incorporated into Formula (5) and were used in calculating UEC values of the refrigerator unit as reported by each household.

$$UEC = 255.595 + (-0.53303 \times Wattage) + (0.686 \times Adjusted\ Volume) \quad (5)$$

where UEC is the annual refrigerator unit energy consumption consistent with IEC 62552:2015 test standard in kWh/year, $Wattage$ is the nameplate refrigerator power rating in W, and $Adjusted\ Volume$ is the estimated adjusted volume according to temperature targets and compartment volumes in L.

The following formulas are provided for $Wattage$ and $Adjusted\ Volume$.

$$Adjusted\ Volume = Capacity\ (gross\ volume) \times Factor\ by\ Refrigerator\ types \quad (6)$$

- Factor by types:
  - 1.034 for single door
  - 1.1431 for double door, freezer, side by side
  - 1 for mini fridge

Additional assumption was applied in calculating UEC to incorporate $Age\ of\ refrigerator$, by defining 1.37% UEC increase for the reported age of refrigerator unit[86].

Regression Approach

Evaluating the distribution of annual energy consumption tested according to IEC 62552:2015, two clusters were observed for 33 refrigerator models, among which 10 are single-door models and 23 are double-door (CLASP Refrigerator Market Study). In the first cluster, energy consumption values are above 400 kWh for 2 single-door and 10 double-door models. As for the second cluster, annual energy consumption values are below 400 kWh for 8 single-door and 13 are double doors models. Regression models were generated for both clusters as shown in Figure AG1.

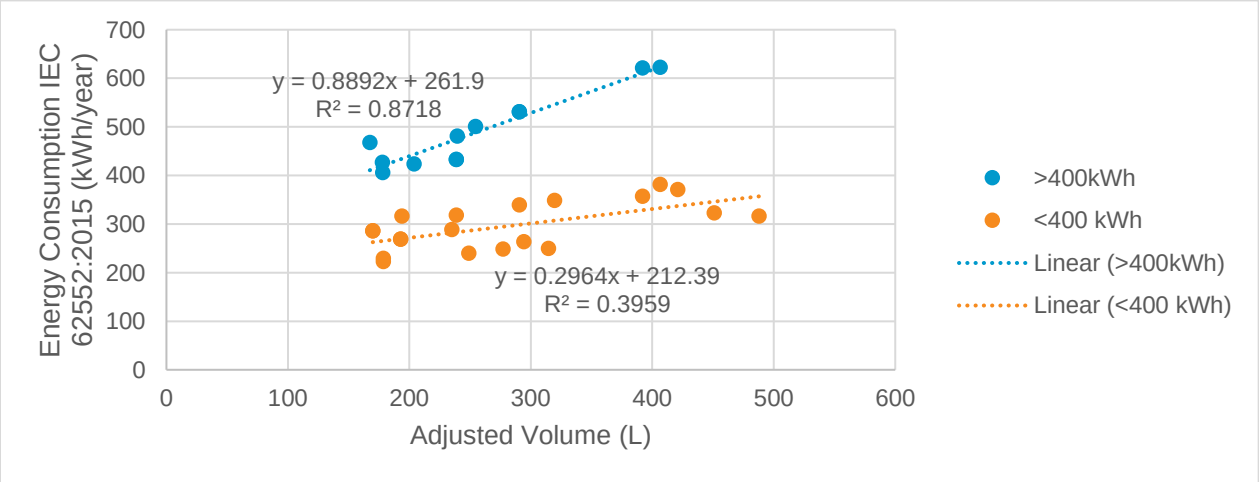


Figure AG1: Regression models of two identified clusters in refrigerator performance data

[86] Based on estimated degradation from Miller & Pratt regression analysis work to measure the average effect of annual degradation on appliance energy use (1998). US Department of Energy. (2009). Preliminary technical support document: energy efficiency program for consumer products: refrigerator, refrigerator-freezers, and freezers (EERE-2008-BT-STD-0012 COMMENT 22).

These regression models were then applied to both clusters to generate all possible combinations of energy consumption scenarios based on unit characteristics of wattage and adjusted volume. These generated values are plotted in Figure AG2, labeled as “UEC model 1” and “UEC model 2”. Both values from these datasets were then averaged, to obtain a single representative equation through regression. These values are labeled as “UEC model avg -reg” in Figure AG2. This approach taken to average the two clusters was applied to capture the wide variance observed in refrigerator efficiency and generate base UEC values that would likely fall within the middle-range performance of all models currently available in the market.

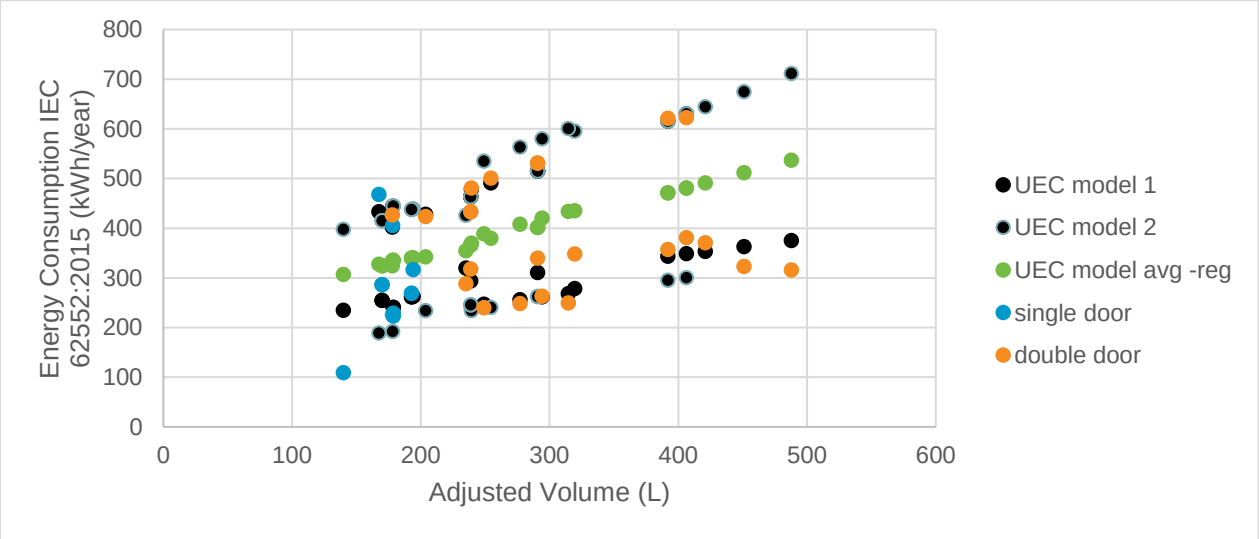


Figure AG2: Modeled and averaged energy consumption values for 33 refrigerator performance data

Outcome of the regression analysis is provided as follows.

Regression Statistics	
Multiple R	0.984979
R Square	0.970184
Adjusted R Square	0.968196
Standard Error	11.44471
Observations	33

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	2	127858.3	63929.16	488.0785	1.31E-23
Residual	30	3929.439	130.9813		
Total	32	131787.8			

	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	255.5947	15.90157	16.07355	2.75E-16
Wattage	-0.53303	0.180384	-2.95498	0.006034
Adjusted volume	0.685987	0.022423	30.59239	3.54E-24

	Lower 95%	*Upper 95%*	*Lower 95.0%*	*Upper 95.0%*
Intercept	223.1194	288.0701	223.1194	288.070073
Wattage	-0.90142	-0.16464	-0.90142	-0.1646374
Adjusted volume	0.640192	0.731782	0.640192	0.73178192

Appendix H. Water Pump UEC Regression Model

A regression analysis was performed to generate a mathematical model that utilize the survey's individual household responses for water pump. These variables include the reported number of water pump unit used in the household, the nameplate wattage of the unit, the frequency of use, and the number of household members. Formula (7) below was used in calculating UEC values of the water pump unit as reported by each household.

$$UEC = \frac{(Wattage \times Daily\ Operating\ Time \times Monthly\ Operating\ Frequency \times 12\ months)}{1000} \quad (7)$$

where UEC is the annual energy consumption of the water pump unit(s) in kWh/year, $Wattage$ is the nameplate water pump power rating in W, and $Daily\ Operating\ Time$ is the estimated running time of the water pump unit(s) in the unit of hour, $Monthly\ Operating\ Frequency$ is the reported frequency of use in days per month.

$$Daily\ Operating\ Time = \frac{Number\ of\ Household\ Members \times Daily\ Water\ Use\ per\ Person}{Water\ Pump\ Flow\ Rate} \times \frac{hour}{60\ minute} \quad (8)$$

where $Number\ of\ Household\ Members$ is the number of person in residence, $Daily\ Water\ Use\ per\ Person$ is the standard reference amount of clean water usage per person, defined by PLN electricity class, $Water\ Pump\ Flow\ Rate$ is the amount of water flow rate estimated based on the available performance data collected from 13 pumps in the unit of L/min, for a standard suction height of 12 m.

$$Water\ Pump\ Flow\ Rate = \left((0.0672 \times Wattage) + 5.2472\right) \times Number\ of\ Water\ Pump \quad (9)$$

where $Daily\ Water\ Use\ per\ Person$ values of 100 L/min per person for R-1/450 VA and R-1/900 VA subsidy; 150 L/min per person for R-1/900 VA non-subsidy; 210 L/min per person for R-1/1300 VA; and 250 L/min per person for R-1/2200 VA, R-2/3500 VA, and R-3/6600 VA.[87] The plotted data for the 13 pumps along with the regression model for a reference suction height of 12 m is provided in Figure AH1.

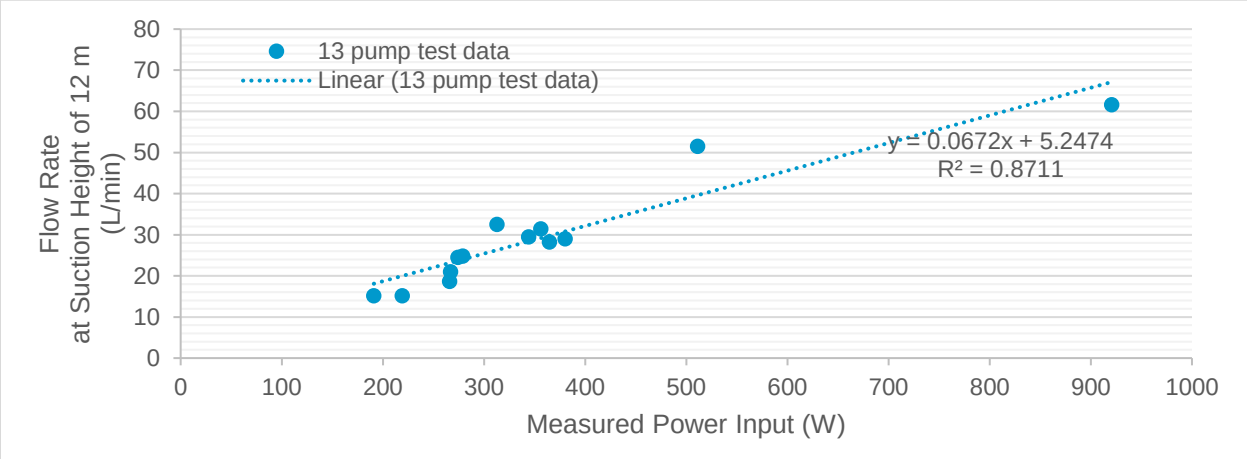


Figure AH1: Linear regression of the 13-pump data at a reference suction height

[87] Suoth, A. E., Purwati, S. U., & Andiri, Y. (2018). Water consumption pattern in a regular housing: Water consumption case study in Griya Serpong housing in Tangerang Selatan. Ecolab No. 2, 12(2018), 53 - 102. https://media.neliti.com/media/publications/280311-pola-konsumsi-air-pada-perumahan-teratur-367ff662.pdf

Appendix I. List of Hour Fraction Factor, UEC Adjustment Factor, Wattage Deviation, and Use Frequency Deviation

Appliance	Hour Fraction Factor[88]	UEC Adjustment Factor[89]	Wattage Deviation[90]	Use Frequency Deviation[91]
Rice cooker/warmer	Appendix F	Appendix F	1.5%	+60%[92]
Refrigerator	Appendix G	Appendix G	6.6%	0.0%
Lighting	1.00	1.00	14.7%	-9.0%
Water pump	Appendix H	Appendix H	-7.6%	0.0%
Television	1.00	0.50	4.8%	-25.0%
Electric fan	1.00	0.90	-5.3%	-15.0%
Air Conditioner	1.00	0.80[93]	-8.4%	-27.0%
Dispenser	1.00	0.14[94]	5.8%	0.0%
Iron	0.50	0.50	8.6%	-27.0%
Cell phone	0.20	0.50	0.0%	0.0%
Washing machine	1.00	0.50	5.3%	-7.0%
Blender	0.02	0.90	16.5%	0.0%
Speaker	1.00	0.25	13.1%	0.0%
DVD/ VCD Player	1.00	0.50	11.2%	0.0%
Water heater	0.05	1.00	0.0%	0.0%
Radio	1.00	0.50	-6.4%	0.0%
Personal computer (PC)	1.00	0.20	-37.0%	0.0%
Wifi	1.00	0.75	0.0%	0.0%
Cooktop	0.50	0.90	0.0%	0.0%
Mixer	0.05	0.90	-5.8%	0.0%
Decorative water pump/ Outdoor water feature	1.00	0.90	0.0%	0.0%
Microwave	0.02	0.90	35.7%	0.0%
Kitchen exhaust	1.00	0.90	0.0%	0.0%
Laptop	1.00	0.20	0.0%	0.0%
Desk lamp	1.00	1.00	0.0%	0.0%
Set Top Box	1.00	0.90	0.0%	0.0%
Compo/ mini compo	1.00	0.25	32.5%	0.0%

[88] Appliance-specific values defined by CLASP
[89] Appliance-specific values defined by CLASP
[90] Percentage difference between the wattage of the appliance as observed by the surveyor versus claimed by the respondent. Positive percentages indicate higher observed wattage as compared to the claimed.
[91] Percentage difference between between the use frequency of the appliance as recordd in a diary versus claimed by the respondent. Positive percentages reflect higher number of operating hours noted in the diary as compared to the claimed use duration.
[92] Equivalent to UEC increase of +8.6% for the representative unit. Applied in quantifying upper-end case in Figure 57, in Section 6.4.1.
[93] Assuming compressor operating time at 80% of the total in-use duration of the AC
[94] Calculated based on the referenced 0.75 kWh/day (equivalent to 31.25 Wh hourly average energy use) specified as maximum energy consumption listed in the energy efficiency criteria for hot bottled water dispensers in Hong Kong's voluntary labeling scheme released in 2017. The value was calculated for the national representative unit of normal and hot water dispenser (90% share), rated at 223 W for the national average power rating. A factor 0.14 was obtained from the ratio of 31.25 Wh defined in Hong Kong for hot water dispenser and the maximum energy use from the average power rating of 223 Wh. https://www.emsd.gov.hk/filemanager/en/content_358/VEELS%20Water%20Dispenser%202017__draft.pdf.

Appliance	Hour Fraction Factor[88]	UEC Adjustment Factor[89]	Wattage Deviation[90]	Use Frequency Deviation[91]
Tablet	1.00	0.20	0.0%	0.0%
Juicer	0.05	0.90	-26.6%	0.0%
Aquarium water pump circulation	1.00	0.90	0.0%	0.0%
Electric oven	1.00	0.50	-4.4%	0.0%
Hair dryer	0.25	0.90	5.9%	0.0%
Vacuum cleaner	0.50	0.90	36.9%	0.0%
Toaster	0.17	0.90	7.5%	0.0%
Emergency lamp	1.00	0.90	0.0%	0.0%
Phone (Home)	0.17	0.50	0.0%	0.0%
Hair iron	0.25	0.90	20.8%	0.0%
Printer	0.05	0.90	-24.5%	0.0%
Dishwasher machine	1.00	0.90	0.0%	0.0%
Electric bike	1.00	0.50	0.0%	0.0%
Segway	1.00	0.50	0.0%	0.0%
Electric flashlight	0.17	0.25	0.0%	0.0%

Appendix J. List of Energy Consumption Estimates and Uncertainty Ranges

Appliance	Projection (Household)	Household Appliance Penetration	Stock (unit)	Estimated energy consumption in 2019 (GWh)	Energy consumption per 1% penetration (GWh/%)	Estimated national average UEC (kWh/year)
Rice cooker	45,062,554	69%	45,586,664	15,057	218	330
Refrigerator	44,730,604	69%	45,545,264	14,354	209	315
Lighting	65,235,368	100%	351,833,537	13,112	131	37
TV	60,963,445	93%	65,413,797	6,378	68	98
Fans	42,071,425	64%	55,444,825	5,153	80	93
AC	3,443,788	5%	3,970,392	5,057	958	1274
Water dispenser	13,216,912	20%	13,257,061	2,420	119	183
Washing machine	18,873,528	29%	18,982,099	1,066	37	56
Iron	45,650,244	70%	45,847,996	1,063	15	23
Water pump	22,585,930	35%	22,651,598	961	28	42
Cell phone	50,918,989	78%	96,736,064	338	4	3
Speaker	7,502,410	12%	8,393,072	215	18	26
Laptop	5,906,068	9%	6,296,511	179	20	28
Wifi	856,866	1.3%	856,866	81	62	95
DVD/ VCD Player	9,129,845	14%	9,198,319	62	4	7
Personal computer (PC)	861,291	1.3%	923,572	62	47	67
Aquarium water pump circulation	334,283	0.5%	354,557	41	80	116
Cooktop	198,448	0.3%	198,448	35	116	177
Water heater	611,951	0.9%	659,711	33	35	49

Appliance	Projection (Household)	Household Appliance Penetration	Stock (unit)	Estimated energy consumption in 2019 (GWh)	Energy consumption per 1% penetration (GWh/%)	Estimated national average UEC (kWh/year)
Electric oven	433,643	0.7%	433,643	25	38	58
Vacuum cleaner	400,861	1%	400,861	24	40	61
Radio	2,901,991	4.4%	2,924,816	19	4	6
Kitchen exhaust	86,740	0%	99,112	16	124	166
Emergency lamp	1,013,840	2%	1,291,485	14	9	11
Tablet	2,309,135	4%	2,575,966	13	4	5
Blender	17,808,392	27.3%	17,867,035	13	0	1
Hair dryer	648,565	1.0%	659,977	12	12	18
Set Top Box	243,683	0%	243,683	9	23	35
Compo/ mini compo	1,052,530	2%	1,062,133	7	4	6
Mixer	6,169,270	9.5%	6,199,148	6	1	1
Desk lamp	695,848	1.1%	739,347	6	6	9
Decorative water pump/ Outdoor water feature	213,079	0.3%	213,079	6	18	27
Toaster	326,228	0.5%	326,228	5	9	14
Hair iron	692,588	1.1%	702,080	4	4	6
Microwave	301,249	0.5%	301,249	2	3	5
Juicer	654,109	1.0%	654,109	1	1	2
Home phone	91,566	0.1%	91,566	0.5	4	6
Dishwasher machine	23,867	0.0%	23,867	0.4	11	16

Appliance	Projection (Household)	Household Appliance Penetration	Stock (unit)	Estimated energy consumption in 2019 (GWh)	Energy consumption per 1% penetration (GWh/%)	Estimated national average UEC (kWh/year)
Segway	6,859	0.0%	6,859	0.3	29	45
Printer	1,125,187	1.7%	1,152,623	0.3	0.2	0
Electric flashlight	135,851	0.2%	135,851	0.2	1	2
Electric bike	31,577	0.0%	31,577	0.2	4	6

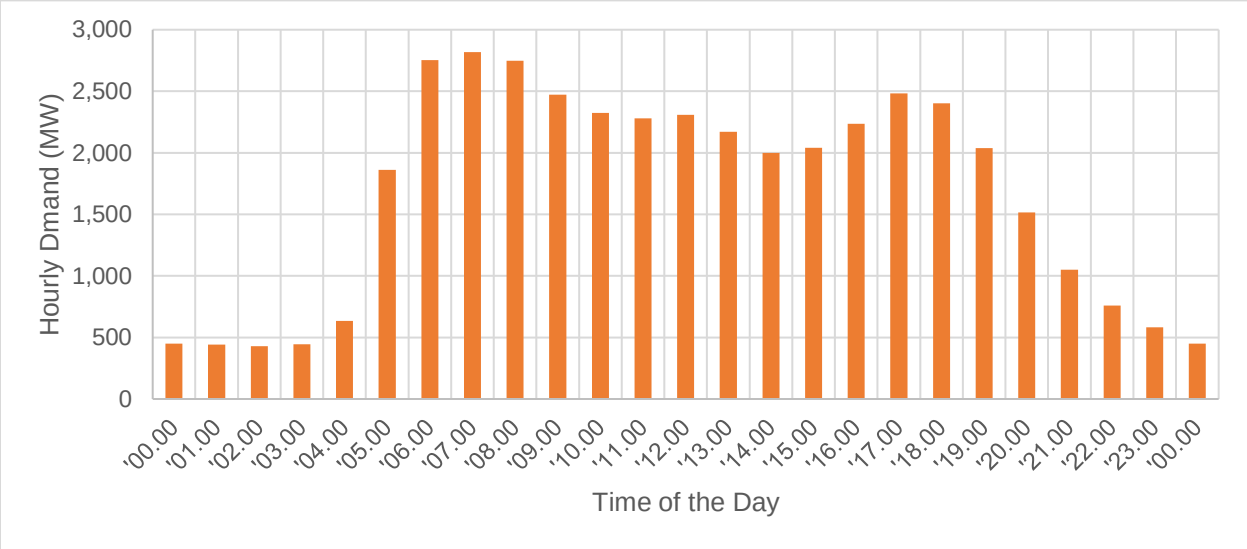
Uncertainty Ranges

Appliance	Lower End	Best Estimate	Upper End	Positive Uncertainty % from Best Estimate	Negative Uncertainty % from Best Estimate
Rice cooker/warmer	15,057	15,057	16,576	10%	0.0%
Refrigerator	14,354	14,354	15,296	7%	0.0%
Lighting	11,932	13,112	15,039	15%	-9%
Television	4,783	6,378	6,682	5%	-25%
Electric fan	4,109	5,153	5,153	0.00%	-20%
Air Conditioner	3,265	5,057	5,057	0.00%	-35%
Dispenser	2,420	2,420	2,561	6%	0%
Water pump	888	1,066	961	-10%	-17%
Washing machine	991	1,063	1,123	6%	-7%
Iron	776	961	1,154	20%	-19%
Other 32 appliances	1,099	1,232	1,297	5%	-11%
Uncategorized	43,242	37,064	32,018	-14%	17%

Appendix K. Peak Demand and Other Temporal Impacts of the Appliances

Rice Cooker

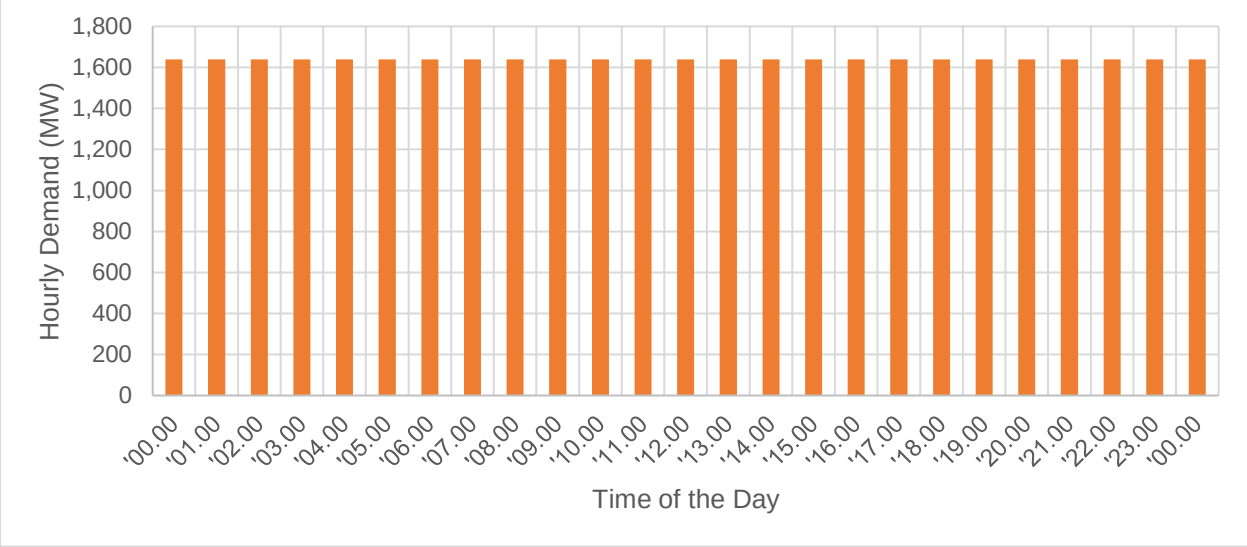
Given the extensive daily use in nearly 70% of households in Indonesia, daily energy consumption of rice cookers is estimated at nearly 41,200 MWh, making it Indonesia's highest energy consuming appliance.



National power demand of Rice Cooker on Weekdays and Weekends

Refrigerator

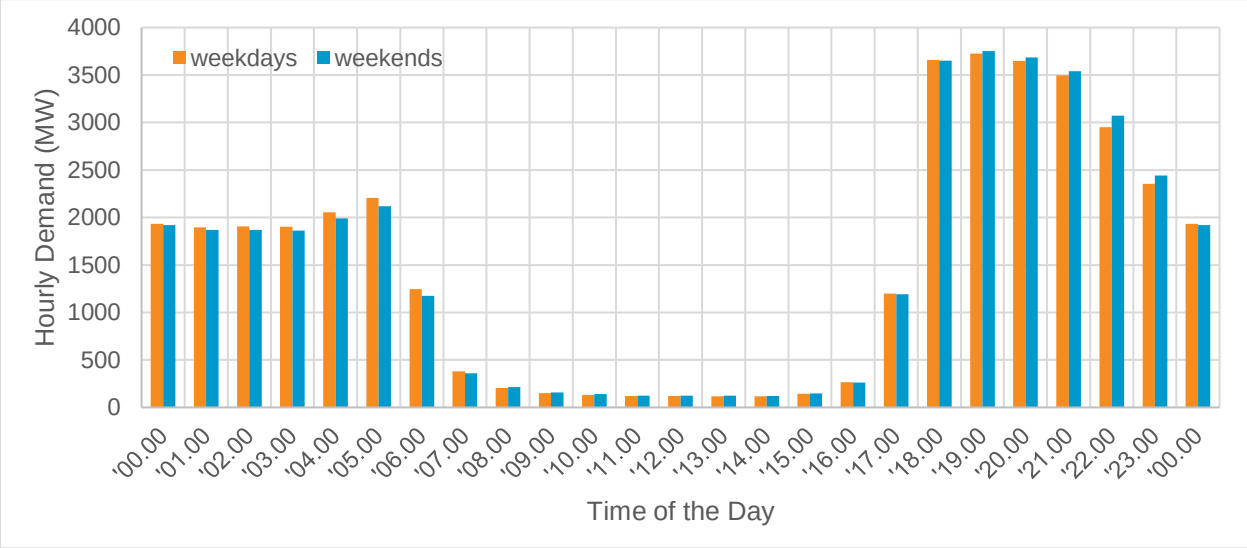
For refrigerator, the survey identifies that 61% of respondent almost never plug off the refrigerator within a year. The survey estimated daily energy consumption of nearly 39,400 MWh at the national level.



National power demand of Refrigerators on Weekdays and Weekends

Lighting

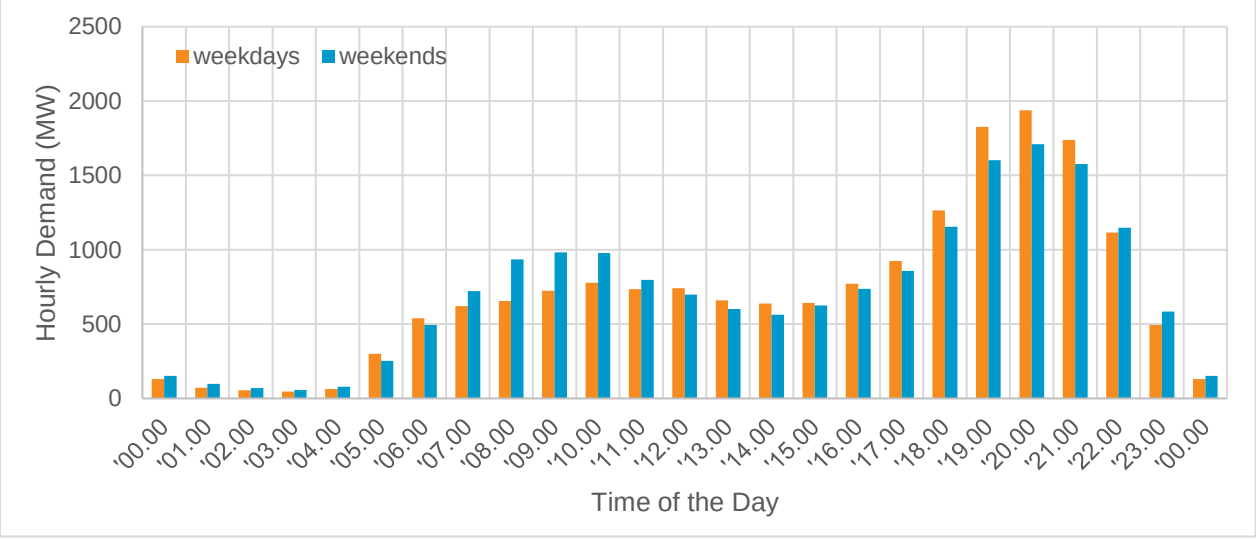
Lighting use in weekdays and weekends are considerably similar. Peak energy consumption for lighting range from 18:00 to 05:00. Lighting in households consume 36,000 MWh of electricity nationwide.



National power demand of Lighting on Weekdays and Weekends

Television

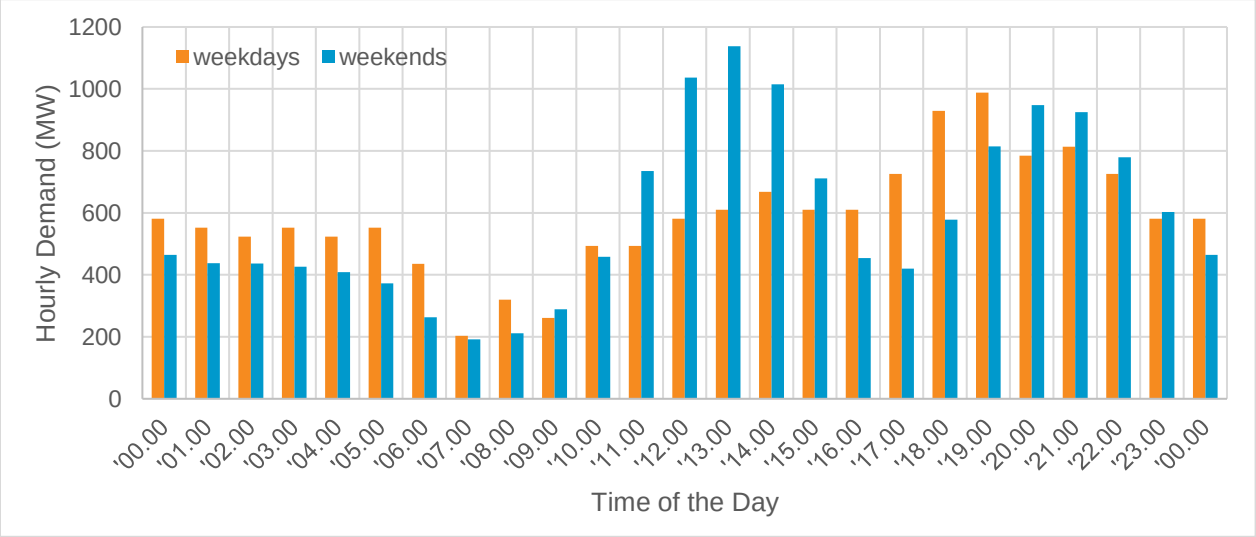
Peak energy consumption from TV usage is between 18:00 to 22:00. In the weekends, more people watch TVs in the morning from 07:00 to 11:00. Nearly 17,500 MWh of daily energy use can be accounted for TV in Indonesia.



National power demand of Television on Weekdays and Weekends

Electric Fan

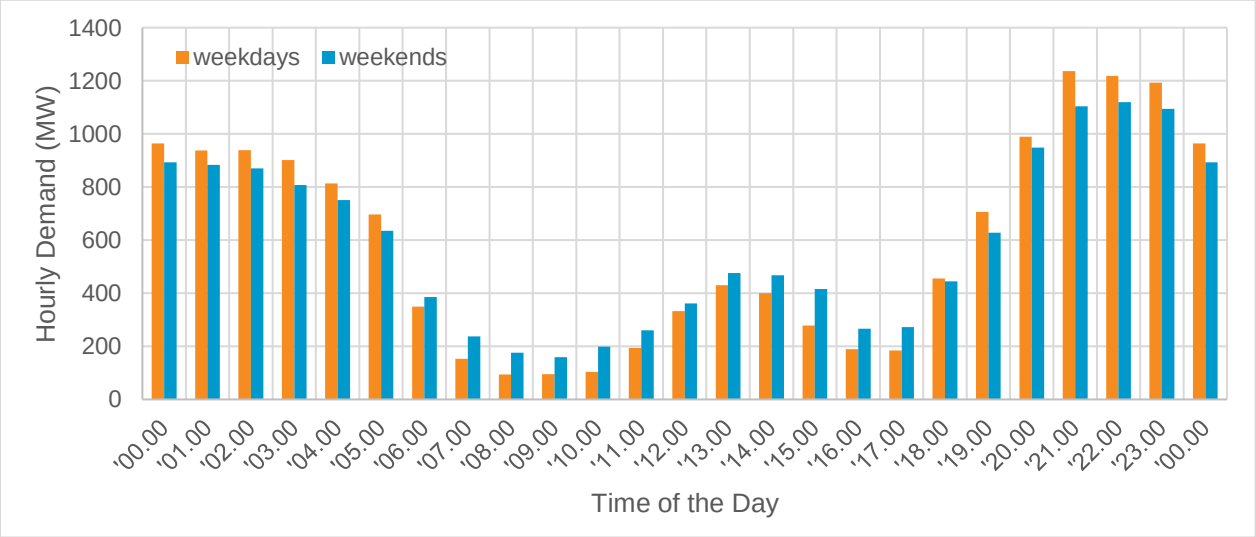
Use patterns in weekdays and weekends are very similar, with slight shifts between the day and the evening. Daily national energy consumption for fans amounts to over 14,100 MWh in households.



National power demand of Electric Fan on Weekdays and Weekends

Air Conditioner

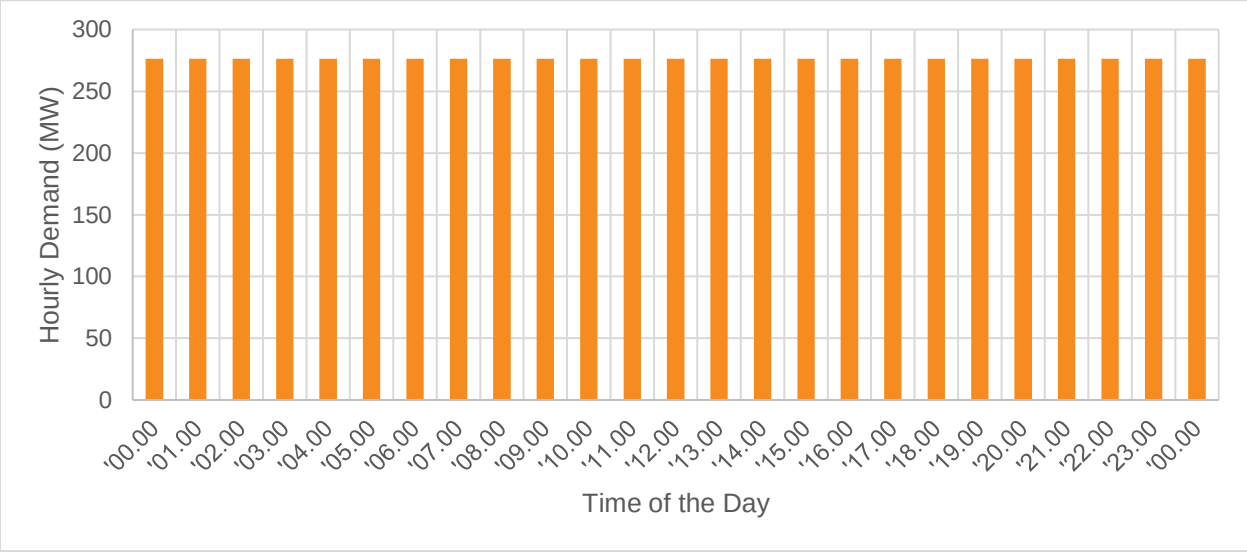
Use patterns in the weekdays and the weekends for AC are very similar, with an average difference in energy use at around 10%. This may be driven by the slight increase from 07:00 to 17:00 in the weekends, which is likely due to longer duration spent staying indoor during weekend. Energy use for AC in residential households is estimated to be nearly 13,900 MWh daily.



National power demand of Air Conditioner on Weekdays and Weekends

Water Dispenser

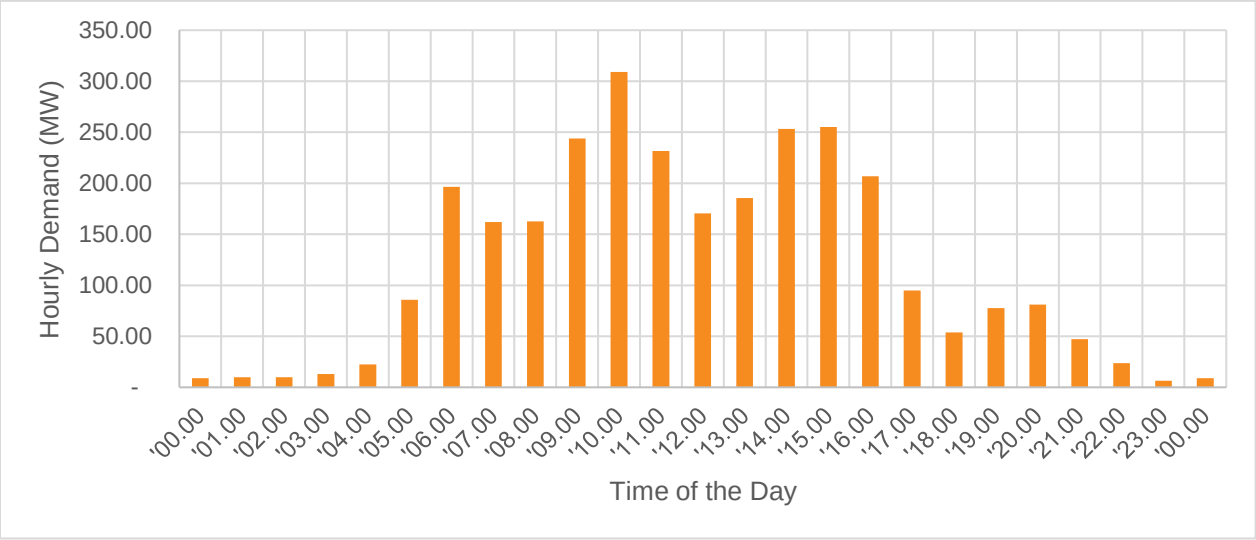
For water dispenser, 67% of the respondents almost never plug off the water dispenser within the year. Based on the surveyed distribution and use frequency, daily energy consumption of water dispensers amounts to nearly 6,700 MWh.



National power demand of Water Dispenser on Weekdays and Weekends

Washing Machine

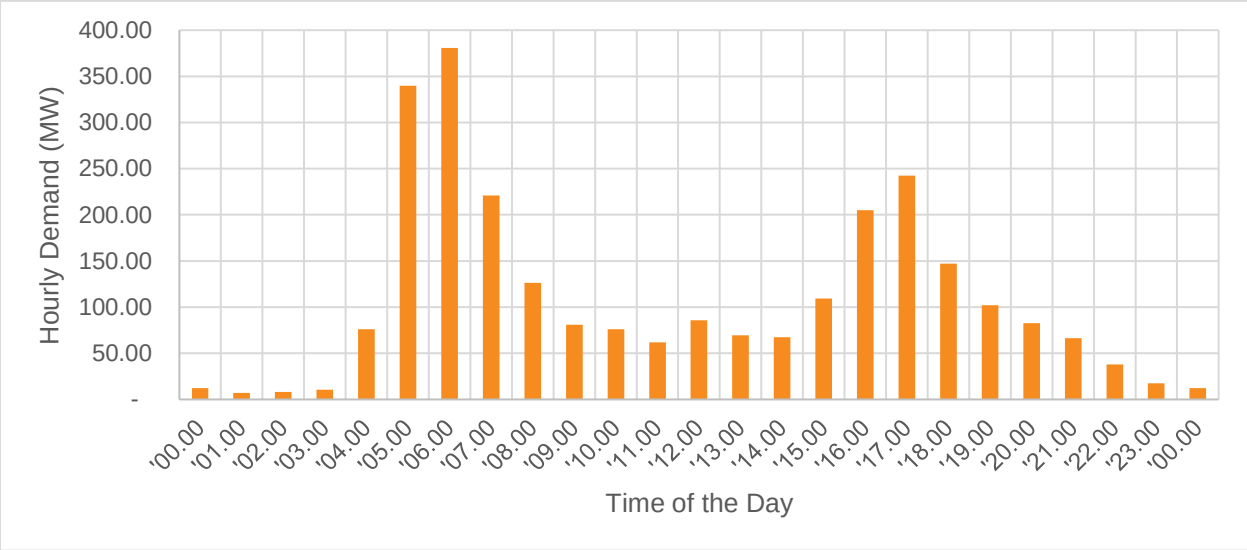
Based on the survey, washing machines are mostly used early in the day starting from 05:00, peaking at 08:00 and slowly reduced until noon. Daily energy consumption estimated nationally is 2,900 MWh.



National power demand of Washing Machine on Weekdays and Weekends

Electric Iron

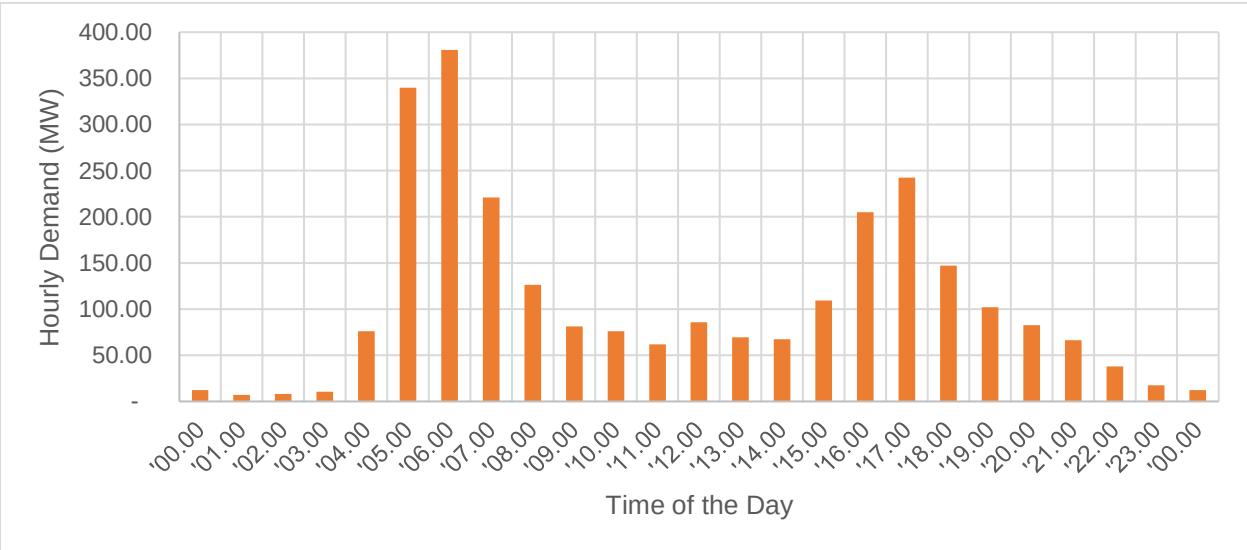
Based on the usage pattern collected in this survey, electric irons are most actively used during the day, starting from 05:00 to nearly 18:00. Evening usage at nearly one-third of the energy share then begins at 18:00 to late evening at 22:00. Daily energy consumption for electric irons is estimated at 2,918 MWh.



National power demand of Electric Iron on Weekdays and Weekends

Water Pump

The hourly use data spikes indicate that water pump is mostly used during early time of day with the minimum usage during midnight. During peak usage, the energy consumption surpasses 350 MWh per hour from 05:00 to 06:00. Daily energy consumption estimated for water pumps is 2,600 MWh.



National power demand of Water Pump on Weekdays and Weekends