



Indonesia's Next Cooking Transition

Shifting to non-fossil cooking

IISD REPORT

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Indonesia's Next Cooking Transition: Shifting to non-fossil cooking

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Executive Summary

Subsidized liquefied petroleum gas (LPG) is the primary energy source for cooking in most Indonesian households: 84% of households use LPG for cooking, and this figure increased by 5.5% per year between 2013 and 2022. While LPG has encouraged rapid adoption of clean cooking in Indonesia, the majority of LPG in Indonesia is imported: in 2023, demand for LPG was at 8 million tonnes, with domestic production at only 2 million tonnes, leading to an import bill of IDR 74 trillion (USD 4.8 billion). The LPG subsidy (IDR 80.2 trillion/USD 5.14 billion in 2024) has thus resulted in substantial financial strains on the government's budget along with energy security concerns. Meanwhile, in 2025 the national budget deficit is projected to reach IDR 662 trillion (USD 42.4 billion), making subsidy reform an urgent priority.

Universal LPG subsidies are challenging because the subsidies are not effectively targeted. Although the 3-kg LPG subsidy is intended to support low-income households, in practice it is equally used by all income deciles, making it regressive. Meanwhile, the use of firewood for cooking is still most prevalent among the poorest households, reflecting the limitations of LPG subsidies in reaching some poor households. The ongoing reliance on biomass is exposing these households—especially women and girls—to toxic indoor air pollution and the additional drudgery of collecting firewood.

To reduce dependency on LPG, the Government of Indonesia has been exploring several alternatives for clean cooking solutions, primarily focusing on induction stoves, dimethyl ether (DME), and piped natural gas (“city gas”). We have analyzed these options to provide a clear conceptual roadmap with practical steps for policy-makers on adopting non-fossil cooking technologies in an inclusive way.

Our findings show that induction is the most viable cooking solution for on-grid households for the following reasons:

1. Induction is cheaper for households and the government in a scenario when LPG is not subsidized. This is because cooking with unsubsidized LPG is more expensive than cooking with induction, even on the highest household electricity tariff (IDR 182,400/USD 11.70 per month for cooking on electricity compared with IDR 151,403/USD 9.71 per month for cooking on unsubsidised LPG). According to our analysis, based on these costs, households would save between IDR 25,904 (USD 1.66) and IDR 35,703 (USD 2.29) a month by switching to induction from unsubsidized LPG.
2. Public spending to upgrade the electricity supply to enable the use of induction can also support broader electrification goals, such as for cooling, electric vehicles, rooftop solar, and home batteries.
3. Electrification combined with renewables would provide long-term compatibility with Indonesia's decarbonization goals.
4. DME and city gas, while technically feasible, would lock Indonesia into continued reliance on fossil fuels and large subsidies: DME is economically unviable without substantial subsidies, and the expansion of natural gas would require massive infrastructure investments that would have limited end use and pose stranded asset risks.



Induction would directly benefit households connected to the grid in areas with a reliable electricity supply. The subsidy savings from not using LPG would also free up public funding that could be used to provide targeted clean cooking solutions for rural and remote households. In other words, induction would need to be part of a broader strategy to provide universal access to clean cooking.

Scaling up induction entails both challenges and opportunities. During fieldwork conducted to understand households' experiences, infrastructure readiness, and barriers to uptake of induction, we investigated user experiences in 100 households that had previously been provided with an induction stove as part of a government pilot. The key findings were as follows:

- More than 66% of respondents felt that induction stoves were simpler to use than LPG stoves, more than 50% felt they were safer, and around 40% felt they were cheaper and easier to clean.
- Around 40% of respondents felt that induction stoves were slower than LPG stoves.
- More than 66% mentioned the need to replace cookware as a major drawback (induction requires ferromagnetic cookware).
- Other key issues included higher electricity tariffs, high upfront costs (where stoves and electricity upgrades were not subsidized), and limited access to repair services.
- Fuel-stacking is still common, with most households continuing to use LPG alongside induction stoves, though with substantially reduced LPG usage.

The single largest barrier to induction adoption is the current approach to LPG and electricity subsidies. Because LPG subsidies are universally available, households have limited incentive to shift to alternatives. However, the need to protect people on low income from higher energy prices necessitates a deeper analysis.

In one scenario analyzed, the government could maintain LPG subsidies for low-income households and swap LPG subsidies for induction subsidies for well-off households. The savings on LPG subsidies could be directed into the capital investment required for adopting induction.

If LPG subsidies were maintained for the bottom 60% of households and phased out for the top 40%, the savings would be about IDR 7.61 trillion (USD 459 million) per year. Alternatively, phasing out LPG subsidies for the top 60% households could increase the savings to IDR 11.87 trillion (USD 717 million) per year.

The capital investment required for induction adoption among the top 40% of households ranges from IDR 50.83 trillion to IDR 77.41 trillion (USD 3.12 billion to USD 4.75 billion) without meter upgrades. With meter upgrades, the investment ranges from IDR 95.39 trillion to IDR 158.1 trillion (USD 5.85 billion to USD 9.7 billion). The fiscal breakeven is reached in year 3 without meter upgrades and in year 5 with upgrades.

Beyond this point, the annual net savings continue to grow, demonstrating that targeted LPG subsidy reform can free up fiscal space while advancing progress toward Indonesia's clean cooking and energy transition goals.



In another scenario, similar results could be achieved if the government chose to maintain LPG subsidies for only the bottom 40% of households, as required by law. In this scenario, the potential savings could increase to IDR 11.87 trillion (USD 717 million) per year. These potential savings illustrate the magnitude of the fiscal space that could be reallocated to support electrification efforts and social programs.

In both scenarios, breakeven is achieved within 3 to 5 years, after which the net savings increase significantly each year. This demonstrates that reallocating subsidies to electrification could enhance fiscal efficiency while advancing Indonesia's clean cooking and energy transition goals.

Eventually, the government could also include lower-income households and small businesses in the transition to induction, with capital costs being offset by lower ongoing outlays for LPG subsidies.

Our survey results for household users suggest that savings have indeed been made—though lower than the theoretical amounts suggested above. Assuming a base price of IDR 21,000 per cylinder, households could save around IDR 37,789 (USD 2.44) a month on LPG costs.

Ultimately, though, this transition is not just a technical shift; it is a political economy decision that requires bold, upfront action to secure greater fiscal space and energy resilience in the years ahead.

Electricity tariffs would also need to be reformed. Under Indonesia's current tariff structure, electricity rates are determined by installed capacity (VA). This means that the households with the highest electricity subsidies (450 VA and some 900 VA connections) will automatically be charged higher per-kWh rates when they upgrade to support the use of induction stoves. In fact, their electricity bills will more than triple just by having a higher capacity connection, even if they use no more electricity. This capacity-based pricing discourages households from upgrading or switching to electric cooking. A block tariff system, where the price of electricity is based on consumption tiers rather than capacity, could offer a more transparent and equitable framework.

Our survey results reinforce previous findings that women are the primary cooks; therefore, the transition to non-fossil cooking must address their needs and perspectives. Gender equality and social inclusion (GESI) considerations must be embedded in planning and implementation to ensure that women, who are the most affected by cooking fuel choices, are meaningfully consulted and empowered to participate in decision making. This would mean identifying practical barriers (such as affordability and electricity infrastructure constraints for low-income households), targeting subsidies at women, and providing inclusive community engagement.

The report concludes with a policy roadmap to further promote the use of induction cooking. The roadmap sets out the following measures.



1. Make electricity consumption and upgrades more affordable.

- Revise regulations to reduce the voltage upgrade costs.
- Introduce block tariffs to protect low-consumption households while enabling cost recovery.
- Prioritize grid upgrades in areas with sufficient reserves.
- Fund improvements to household connections and plan for rural and off-grid expansion, such as the New Electricity Installation Assistance Program developed by Indonesia's Ministry of Energy and Mineral Resources.

2. Implement subsidies for induction stoves.

- Provide means-tested support for induction stoves and induction-compliant cookware.
- Reduce dependence on LPG through one-off connection subsidies.

3. Ensure induction equipment suits consumer needs.

- Conduct gender-sensitive needs assessments to guide product design.
- Partner with manufacturers to ensure that functionality matches regional cooking habits.

4. Reform LPG subsidies.

- Test approaches to better target LPG subsidies to women from low-income households, such as recipient-based subsidies (e.g., cash transfers).
- Reform LPG subsidies, with clear milestones and public awareness.

5. Integrate GESI into policy frameworks and budgeting.

- Embed GESI into policy, budgeting, and monitoring and evaluation frameworks.
- Allocate subsidies and training directly to women for empowerment.

6. Run public education campaigns.

- Launch targeted campaigns to promote induction cooking.
- Address cultural habits and engage women as well as men in decision making.



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Abbreviations and Acronyms

AEER	Aksi Ekologi & Emansipasi Rakyat
CO₂	carbon dioxide
CO₂e	carbon dioxide equivalent
DKTS	Integrated Social Welfare Database (Data Terpadu Kesejahteraan Sosial)
DME	dimethyl ether
FGD	focus group discussion
GESI	gender equality and social inclusion
GHG	greenhouse gas
IDR	Indonesian rupiah
IEA	International Energy Agency
IEEFA	Institute for Energy Economics and Financial Analysis
LPG	liquefied petroleum gas
MCB	miniature circuit breaker
MMBtu	1 million British thermal units
NO₂	nitrogen dioxide
PGN	PT Perusahaan Gas Negara
PLN	PT Perusahaan Listrik Negara
SOE	state-owned enterprise
Susenas	National Socioeconomic Household Survey (Survei Sosial Ekonomi Nasional)
USD	United States dollar



1.0 Introduction

Universal access to clean cooking is a key target on the United Nations Agenda for Sustainable Development. It appears under Sustainable Development Goal 7: Ensure access to affordable, reliable, sustainable, and modern energy for all. To deliver on this goal, many governments of developing countries are relying on liquefied petroleum gas (LPG). Globally, LPG subsidies amounted to USD 41 billion in 2022 (Vernon et al., 2023), effectively crowding out funding that could be used to adopt alternative, non-fossil technologies. The use of LPG is also creating energy security challenges, given the need for imports in many countries (including Indonesia) and their inherent price volatility. Therefore, countries need viable non-fossil pathways.

In Indonesia, although LPG subsidies have succeeded in reducing the use of biomass and kerosene (fuels that create harmful indoor air pollution), they have also created a vast subsidy burden (IDR 85,600 billion/USD 5.35 billion in 2024) (Antara News, 2025a) and a high LPG import bill. This has made Indonesia more vulnerable to trade shocks and currency impacts.¹ Meanwhile, the gendered nature of cooking makes women and girls more vulnerable to LPG shortages or price spikes, which can occur even when subsidies are applied. Dependence on LPG is also inconsistent with Indonesia's target of net-zero emissions by 2060, when cooking and electricity need to be derived from non-fossil energy.

To reduce reliance on LPG, the Government of Indonesia has been exploring alternative cooking solutions, such as induction stoves, dimethyl ether (DME, a gas generated from coal), and piped natural gas to cities (known as “city gas”). However, Indonesia currently lacks a cohesive, sustainable approach toward decarbonized cooking solutions that (a) maximize opportunities while minimizing challenges, (b) can ensure equitable access to clean cooking in alignment with global trends in electrification and renewable energy, and (c) adequately address gendered impacts and access to clean cooking for all.

This study contributes to the emerging body of work on this topic in Indonesia (see also Al Irsyad et al., 2022; Damayanti et al., 2025; Hakam et al., 2022). It does so by (a) evaluating Indonesia's clean cooking transition policies, (b) assessing the feasibility of non-fossil cooking technologies, and (c) identifying the policy tools that might be the most effective and encourage the adoption of such technologies in an inclusive way. The primary focus is on induction stoves as a scalable non-fossil option for on-grid households that could also free up public resources for off-grid solutions. The main contribution of this study is a conceptual policy roadmap with practical steps for adopting non-fossil cooking technologies.

This working paper is one in a series by the International Institute for Sustainable Development and partners funded by the International Development Research Centre Canada that aims to improve knowledge on gender equality and social inclusion (GESI) in the energy transition.

¹ Most fossil fuel is priced in U.S. dollars on international markets. Importing countries exchange local currency for U.S. dollars to pay for the fuel, which drains foreign exchange reserves and causes the local currency to weaken relative to the foreign currency.



2.0 Methodology and Research Questions

The overarching goal of this research is to establish a clear conceptual roadmap that includes practical steps for policy-makers on the inclusive adoption of non-fossil cooking technologies. We achieve this by addressing the following research questions:

- What are the drivers, constraints, and risks associated with a transition from LPG to the three publicly debated alternative forms of cooking energy: induction stoves, DME, and city gas?
- What policies are needed to facilitate greater adoption of non-fossil cooking aligned with Indonesia's net-zero commitments?
- What policies could help make the transition to non-fossil cooking more inclusive?

We use a mix of qualitative and quantitative methods to answer these questions.

An extensive review of domestic and international literature, policy documents, and media sources was conducted to assess support measures, costs, and future pathways for clean cooking technologies. For each of the technologies—induction stoves, city gas, and DME—the analysis evaluates the following factors:

- **economic and financial:** costs, subsidies, and efficiency
- **health and environmental:** impacts on health and emissions
- **system requirements:** infrastructure and scalability

GESI implications are considered throughout the analysis.

To gain an understanding of the political economy of clean cooking, we conducted focus group discussions (FGDs) and semi-structured, in-depth interviews with 75 stakeholders from the following groups:

- **government:** central, regional, and legislative
- **state-owned enterprises (SOEs):** PT Perusahaan Listrik Negara (PLN), PT Bukit Asam, and PT Perusahaan Gas Negara (PGN)
- **think tanks:** National Research and Innovation Agency (Badan Riset dan Inovasi Nasional)
- **industry organizations:** Center for Oil and Gas Testing (Lemigas)
- **other stakeholders:** non-governmental organizations, consumer groups, private firms, and the media

The discussions explored economic impacts, infrastructure readiness, health risks, and household responses.

Meanwhile, surveys were conducted between January and May 2024 in areas where households had experience with alternative cooking technologies.



The surveys on induction stoves took place in South Denpasar (Bali) and Solo (Central Java) with households that participated in the PLN pilot program (450 VA/900 VA, listed on the Integrated Social Welfare Database (Data Terpadu Kesejahteraan Sosial [DTKS])² and households that did not participate in the pilot program. A questionnaire was completed by 100 households, and in-depth interviews were conducted with 60 of those households (37 in Bali and 23 in Surakarta).

The surveys on city gas took place in East Jakarta, Yogyakarta, Bogor, Cibinong, and Klender. They took the form of 45 questionnaires and 45 interviews. A notable site was Klender flats, which has been connected to city gas since the 1980s.

No survey data was collected on DME because no households had access to DME at the time of the study.

² In Indonesia, “450 VA/900 VA” refers to the two subsidized electricity tariff tiers for households, with 450 VA being the lower tier and 900 VA being a higher (but still subsidized) tier for beneficiaries. The DTKS is used to identify the poorest 40% of the Indonesian population, who are eligible for these subsidized electricity tariffs. Therefore, “DTKS-listed” indicates that a household is recognized as eligible for a government electricity subsidy through this database.

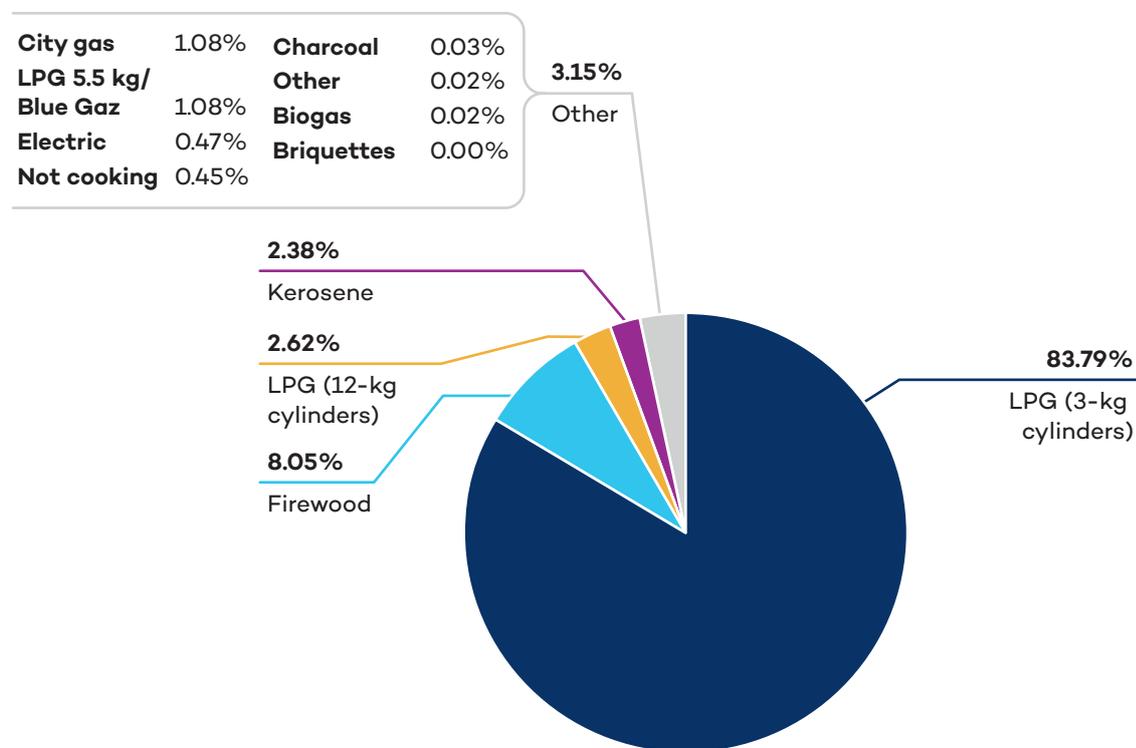


3.0 Context: Indonesia's Cooking Fuels

3.1 The Transition to LPG

Subsidized LPG (3-kg cylinders) is the most common type of cooking fuel in Indonesia, taking up an 83.8% share (Figure 1). This is followed by firewood, non-subsidized LPG, and kerosene. Between 2013 and 2022, the average volume of LPG consumption increased by 5.5% per year (Ministry of Energy and Mineral Resources [Kementerian Energi dan Sumber Daya Mineral], 2024b) as households switched from kerosene to LPG for cooking (Box 1).

Figure 1. Main fuel for cooking in Indonesia, 2024



Source: Authors' calculations based on Susenas, 2024.



Box 1. Indonesia's kerosene-to-LPG conversion program

Indonesia initiated its kerosene-to-LPG conversion program in 2007 to address the high financial burden of kerosene subsidies (Ministry of Energy and Mineral Resources, n.d.), inefficiencies in distribution mechanisms, and misuse of subsidies by unintended beneficiaries. The volatility of global oil prices compounded these issues, with unpredictable impacts on government budgets. The program aimed to reduce kerosene subsidies, improve energy efficiency for lower household costs, and promote cleaner energy alternatives aligned with sustainable development and emissions reduction goals.

National survey data show that the share of Indonesian household using kerosene as their main cooking fuel fell from around 37% to 45% in the mid-2000s (World Bank & Asia Sustainable and Alternative Energy Program, 2013) to about 2.5% by 2023 (Badan Pusat Statistik [BPS] Indonesia, 2023b). It also significantly reduced infant mortality through the use of cleaner fuel during the perinatal period, as well as reducing the prevalence of low birth weight through less exposure to indoor air pollution that affects maternal health (Imelda, 2020b). The key success factors included thorough planning, accurate data management, effective policy implementation, and multistakeholder collaboration.

However, the transition also faced significant challenges. These included resistance to behaviour change; a high need for extensive public awareness campaigns (Ministry of Energy and Mineral Resources, 2007a); and logistical challenges, such as in ensuring the availability of infrastructure like LPG cylinders (Ombudsman of the Republic of Indonesia, 2025). Meanwhile, despite its efforts, the program did not eliminate domestic biomass use, underscoring the complexities of achieving a comprehensive transition.

As future cooking conversion programs are likely to encounter similar challenges, these lessons must inform their planning and execution to ensure success and sustainability.

Although market-priced LPG is available, most households rely on the subsidized 3-kg cylinders (Table 1). These were introduced to improve access to clean cooking for low-income households. However, given that the cylinders are available to all households, the use of subsidized LPG has become widespread. Combined with rising overall LPG consumption and limited domestic supply, this has significantly increased the fiscal burden of LPG subsidies. The government has also struggled to enforce regional price ceilings (HET), which has resulted in inconsistent pricing across provinces (Rahayu, 2022), further complicating subsidy management.

**Table 1.** Main cooking fuels, by expenditure decile*

	1	2	3	4	5	6	7	8	9	10
Subsidized LPG (3-kg cylinders)	76.9	83.3	86.1	87.5	88.0	88.0	88.5	87.7	84.6	68.7
Firewood	20.2	13.4	10.2	8.1	6.7	5.9	4.4	3.7	2.6	1.8
LPG (12-kg cylinders)	0.2	0.3	0.5	0.6	0.8	0.9	1.4	2.0	4.3	16.2
Kerosene	1.7	1.7	1.9	2.3	2.5	2.9	3.0	2.9	3.1	2.2
LPG (5.5 kg/Blue Gaz)	0.1	0.2	0.1	0.3	0.5	0.6	0.9	1.4	2.3	5.1
City gas	0.3	0.5	0.5	0.6	0.9	1.0	1.2	1.3	1.7	3.0
Electricity	0.4	0.4	0.4	0.4	0.4	0.5	0.4	0.4	0.6	0.9
Other**	0.24	0.25	0.20	0.21	0.26	0.32	0.33	0.53	0.81	2.19

* Note: 1: poorest; 10: richest.

** Other = biogas, briquettes, charcoal, and not cooking.

Source: Authors' calculations based on Susenas, 2024.

Table 2. Household consumption of 3-kg LPG cylinders, by decile

Decile (1: poorest; 10: richest)	3-kg LPG cylinder consumption (kg in last month)	Share of total 3-kg LPG cylinders consumed (%)	Number of households using 3-kg LPG cylinders
1	17,121,049	10.2	8,075,392
2	18,649,201	11.11	8,138,328
3	18,214,778	10.85	7,781,842
4	17,455,705	10.4	7,337,131
5	17,761,055	10.58	7,191,280
6	16,818,000	10.02	7,017,636
7	15,997,711	9.53	6,631,489
8	16,317,863	9.72	6,770,236
9	15,449,387	9.2	6,649,289
10	14,139,044	8.42	7,123,996

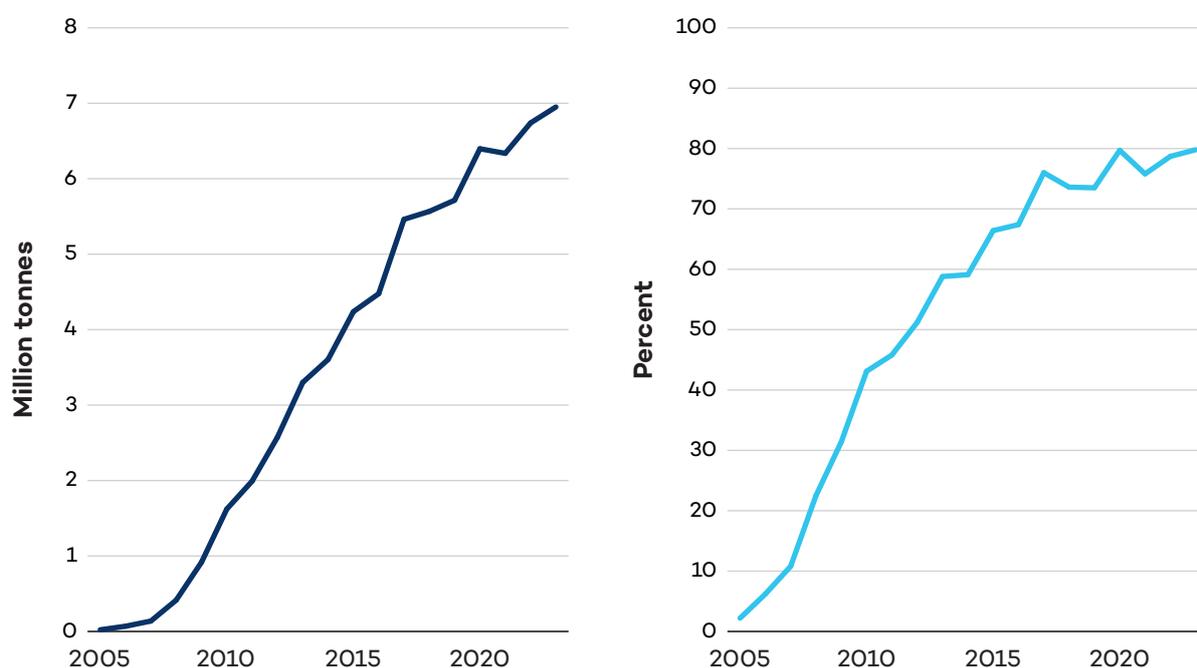
Source: BPS Indonesia, 2024.



Given the situation outlined above, all household deciles, from richest to poorest, consume subsidized LPG, and they do so at a relatively constant rate (Table 2). Therefore, groups that have relatively less need for financial support are benefiting substantially.

The growing demand for LPG has led to an increased reliance on imports (Figure 2). In 2023, demand for LPG reached 8 million tonnes, while domestic production of LPG was only 1.98 million tonnes (Ministry of Energy and Mineral Resources, 2024b). Therefore, the government has had to import about 6.9 million tonnes of LPG annually.

Figure 2. LPG imports by weight and as a share of total LPG sales in Indonesia, 2005–2023



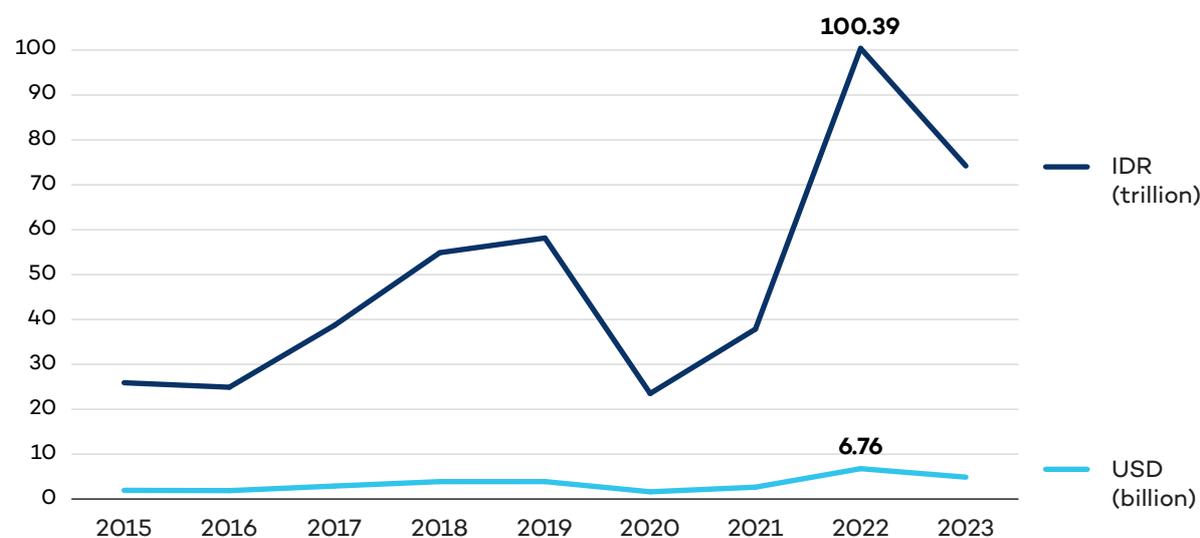
Source: Ministry of Energy and Mineral Resources, 2007b, 2008, 2010, 2012, 2014, 2016, 2019, 2021, 2023, 2025.

As the price of LPG has increased, this has contributed to the rise in LPG subsidies. The price of LPG follows the international oil price and depends on the exchange rate (with fuel generally purchased in U.S. dollars on international markets). Price hikes, including a major spike in 2022 following Russia's invasion of Ukraine (Figure 3), have not been passed on to consumers in the regulated (subsidized) domestic retail price. These unpredictable fiscal impacts have placed a significant financial strain on the government and have led to a growing subsidy burden. This burden is driven both by rising consumption (which increases the need for subsidies) and price volatility (which can trigger sharp spikes in subsidy spending, as observed in 2022 and 2023). In addition, high import levels pose risks of a disruption to supply.

According to the national budget for 2023, LPG subsidies cost IDR 74,000 billion (USD 4.8 billion), or approximately 45% of the total energy subsidy budget.



Figure 3. Actual spend on LPG subsidies, 2015–2023



Source: Ministry of Finance of the Republic of Indonesia, Directorate General of Treasury, 2016, 2018, 2020, 2022, 2023.

3.2 Attempts to Target and Reform LPG Subsidies

The Government of Indonesia has made several attempts over the years to rationalize LPG subsidies, primarily by improving the subsidy distribution system and diversifying sources of energy.

The most recent initiative came in February 2025, when the government attempted to introduce a new distribution scheme by requiring retailers to register through the Online Single Submission system; customers would then need to present their national identification number to purchase subsidized LPG (Tempo, 2025). However, the scheme did not include quotas or purchase limits, and it was poorly introduced. Just 4 days after the scheme's implementation, President Prabowo revoked the regulation following widespread confusion, long queues, and reports of fatalities linked to delayed access (Tempo, 2025). The House of Representatives (Dewan Perwakilan Rakyat) has since called on the Ministry of Energy and Mineral Resources to provide clarification, noting that Commission XII was not consulted prior to rollout (Tempo, 2025).

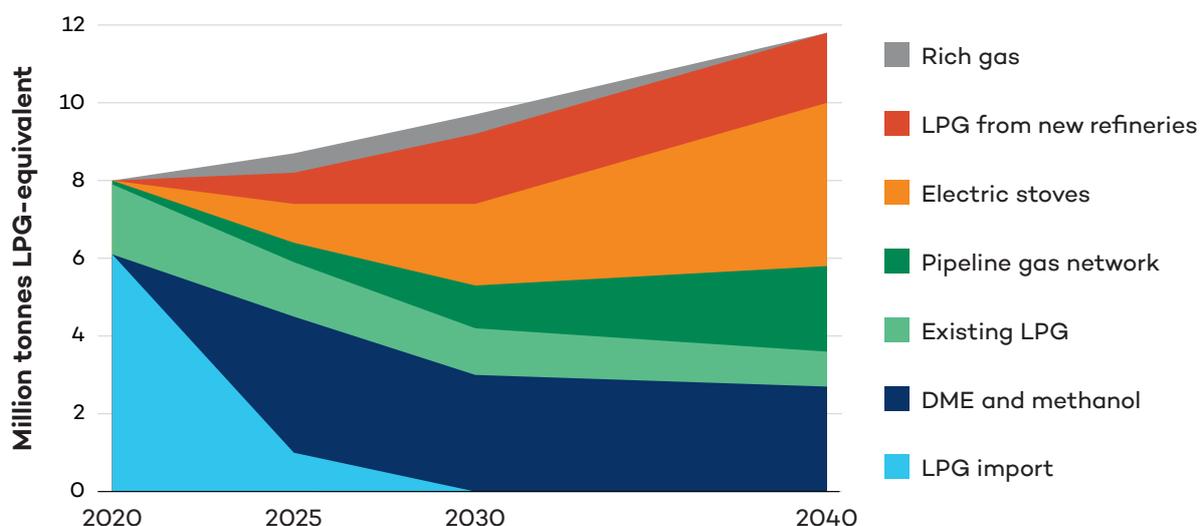
The Ministry of Energy and Mineral Resources is planning to form a task force to enforce subsidy targeting and address the significant inefficiencies in distribution. Its priority is to carry out a comprehensive review of the subsidy delivery method and propose new mechanisms, such as a direct cash transfer or a blended system of hybrid approaches combining product-based subsidies and a cash transfer for improved effectiveness (Ministry of Energy and Mineral Resources, 2024a). However, similar reviews have been conducted many times before by agencies such as the National Team for the Acceleration of Poverty Reduction (Tim Nasional Percepatan Penanggulangan Kemiskinan) and by other think tanks (Kuehl et al., 2021), and these have not yet led to meaningful progress in reform.



3.3 The LPG Substitution Program

The government released the National LPG Substitution Strategy in 2021 to phase out LPG subsidies and imports by diversifying the energy supply (Figure 4; Christian & Suryadi, 2021). The aim by 2025 was to have partially replaced LPG by DME and methanol (31% of LPG demand), induction stoves (22% of LPG demand), and city gas (11% of LPG demand), as well as to have ramped up domestic production of LPG and rich gas; however, to date, virtually none of this transition has taken place (Christian & Suryadi, 2021).

Figure 4. National LPG Substitution Strategy, 2020–2040



Source: Dewan Energi Nasional, 2021.



4.0 Identifying the Best LPG Substitution Option for Indonesia

This section compares the three main alternative cooking fuel technologies under consideration by the Indonesian government—induction stoves, DME, and city gas—based on the literature review and interviews. Each option presents distinct opportunities and challenges in terms of economic viability, technological maturity, environmental impact, and long-term sustainability. The analysis is intended to support strategic decision making by highlighting the strengths and risks of each pathway in the context of Indonesia's energy transition and subsidy reform goals. Table 3 summarizes the key issues for each option.

Table 3. Comparison of alternatives to LPG for cooking in Indonesia

	Induction stoves	DME	City gas
Government target	18.1 million units by 2030	1.4 million tonnes per year to offset 1 million tonnes of LPG imports	4 million household connections by 2024
Economic viability	Potential LPG savings of IDR 10,200 billion (USD 686 million) per year if scaled	Estimated annual loss of IDR 5,600 billion (USD 377 million); DME cost nearly double that of LPG	High infrastructure cost, low margins, requires subsidies
Technological readiness	Mature and widely available	Technically feasible but costly; technological readiness is improving	Technically viable; infrastructure-intensive
Environmental impact	Initially there would be a slight rise in emissions owing to coal-fired generation, but a shift from coal to renewables would align with long-term goals for electrification and decarbonization	Coal-based production would approximately double emissions	Would expand fossil infrastructure; risks stranded assets
Policy challenges	Regulatory approval; budget allocation; consumer incentives	Pricing would need to be below LPG, requiring large subsidies; investors have withdrawn from production	Regulatory revision (Presidential Regulation 6/2019) on fixed gas pricing
Subsidy requirements	Incentives needed for adoption	Estimated USD 354/tonne subsidy needed for viability	Substantial subsidies and guarantees needed for private investment



	Induction stoves	DME	City gas
Long-term risks	Grid reliability in remote areas; consumer hesitancy	Economic losses; misalignment with net-zero goals	Stranded assets; incompatibility with International Energy Agency (IEA) net-zero recommendations

Source: International Institute for Sustainable Development.

4.1 Induction Stoves

Indonesia's nationally determined contribution includes the aspirational target that the use of induction stoves will reach over 18.1 million units by 2030 under the unconditional mitigation scenario (i.e., without foreign financial support) (Republic of Indonesia, 2022a). PLN has projected that, if 15.3 million households adopt induction stoves by 2028, the government could save up to IDR 10.2 trillion annually in LPG import costs (Safitri & Setiawan, 2020). However, a comprehensive national roadmap to achieve this target has yet to be developed.

The public response to the induction conversion plan has been mixed. A 2020 survey of 1,006 respondents by the Ministry of Energy and Mineral Resources and the Bisnis Indonesia Intelligence Unit (Ministry of Energy and Mineral Resources, personal communication, September 16, 2020) found:

- 39% were hesitant to switch,
- 37% were willing to adopt induction stoves, and
- 27% preferred LPG.

Key concerns included:

- high costs of replacing cooking equipment (45%),
- fear of increased electricity bills (64%), and
- doubts about stove efficiency (35%).

To promote the transition and as a demonstration project in advance of a G20 Summit to be held in Bali in 2022, PLN launched a pilot in July 2022 across South Denpasar in Bali Province and Surakarta City in Central Java Province, targeting 1,907 poor households with 450-VA connections and a reliable electricity supply. This effort was a corporate action supported by the Ministry of Energy and Mineral Resources to encourage the use of induction stoves, especially for PLN customers with low-voltage connections.

PLN provided each household with a two-burner induction stove for free. Given that each stove was rated at 1,000 W, PLN upgraded the households' power supply to 2,200 VA with a dedicated miniature circuit breaker (MCB). They also provided two ferrous cooking pans to minimize the additional costs.



The total fixed cost per household amounted to IDR 3,820,368 (USD 257), which included the stove provision and capacity upgrades. PLN offered a subsidized electricity rate of IDR 415 per kWh (compared with IDR 495/kWh) to compete with the cost of subsidized LPG. The yearly additional subsidy cost was IDR 78,720 (USD 5.30), bringing the total per-household cost to IDR 3,899,088 (USD 263).

The program allowed PLN to monitor stove usage and estimate the reductions in LPG consumption. Mandated by the government, the program cost IDR 7.44 billion (USD 500,107) to implement for all beneficiaries.

Table 4. Estimated costs of the PLN induction stove project pilot program

Component	Item	Cost (IDR)
Fixed cost	Cost of stove (including Internet of Things and cookware) (a)	1,530,000
	Material cost and adjusted services (MCB and installation) (b)	300,000
	Operational survey (c)	40,418
	Marketing, education, repair (d)	N/A
	Total I (a + b + c + d)	1,870,418
	Cost of upgrading meters from 450 VA to 2,200 VA (A)	1,949,950
	Total II (Total I + A)	3,820,368
Variable cost	Additional subsidy for 450 VA (IDR 495/kWh – IDR 415/kWh); average consumption for each household for cooking only is 82 kWh/month*—per year per household	78,720
Program cost	Full cost (fixed cost + variable cost) in a year for one household	3,899,088
	Full cost in a year for 1,907 users (planned program beneficiaries)	7,435,560,816

*Note: 82 kWh/month is equivalent to a monthly LPG consumption of 11.4 kg (1 kg LPG = 7.19 kWh). This information was obtained from the FGD with PLN.

Source: Authors' estimates based on in-depth interview with PT PLN (PLN, personal communication, April 5, 2024).

PLN reported initial resistance from some households regarding the use of induction stoves. Their concerns revolved around safety, comfort, and the potential for increased electricity costs. To address these issues, PLN provided education, outreach, and assistance to beneficiary households, both directly and through social media, by creating a WhatsApp group. Communication within this group was initially very active, serving as a platform for PLN and the community to interact and share experiences of using electric stoves.

The program was initially allocated IDR 540 billion to distribute free induction stoves to 300,000 households by the end of 2022. However, at the end of September 2022, PLN



terminated the pilot project owing to criticism from Indonesia's House of Representatives (Primadhyta, 2022). The commission of the House of Representatives that handles energy-related issues raised concerns about rushing the program, citing risks such as:

- rising electricity bills;
- limited electricity access and unstable electricity supply in many areas; and
- the relatively high upfront cost of induction stoves and compatible cooking equipment.

The House of Representatives recommended targeting induction stove programs at households with sufficient electrical capacity, ensuring they could use the technology effectively without requiring costly upgrades (CNBC Indonesia, 2022).

Despite these concerns, the 2020 survey findings suggest that potentially one third of respondents were willing to adopt, and another third could be persuaded through effective incentives and targeted outreach. Together, this represents a sizable opportunity to expand adoption, if barriers are addressed through well-crafted policies and interventions.

4.1.1 Health Impacts of Induction

During the use phase, induction stoves have minimal health effects, given their very low emissions of pollutants such as benzene (Aemro et al., 2021; Gould et al., 2023). Aemro et al. (2021) conducted a randomized controlled trial among households, using both induction and LPG stoves. The participants were randomly assigned to cook with one type of stove for a 2-day monitoring period and then to switch to the other stove during a subsequent 2-day period. The order of stove use was also randomly determined. The results indicated that using LPG stoves for 48 hours increased personal nitrogen dioxide (NO₂) exposure by 9.9 parts per billion—50% higher than the average exposure from induction stoves. Additionally, the average personal exposure to fine particulate matter with a diameter of 2.5 micrometers or less (PM_{2.5}) was 11 micrograms per cubic metre (µg/m³) higher (95% CI, -0.1–22.8), a 44% increase, during the gas stove usage period than during the induction stove period. These findings are significant because the transition to cleaner cooking fuels has been shown to reduce the prevalence of low birth weight, indicating that fetal exposure to indoor air pollutants is a critical factor (Imelda, 2020a).

4.1.2 Climate Implications of Induction

Carbon dioxide (CO₂) emissions from cooking in Indonesia are relatively minor, accounting for approximately 2.531 kg per household annually (Wulandari, 2021). When compared to the total greenhouse gas (GHG) emissions in Indonesia, which amounted to 612 million tonnes CO₂e a year in 2023 (Ministry of Environment and Forestry, n.d.), GHG emissions from cooking represent a minute fraction. Shifting to induction stoves, which rely on electricity, would marginally increase these emissions but would still constitute an insignificant portion of the country's total CO₂ emissions.

Induction stoves produce higher GHG emissions than LPG stoves, but induction has the potential to become a lower-emitting alternative—if Indonesia accelerates the decarbonization of its electricity grid. The estimates suggest that if 1 million households were to switch



from LPG stoves to induction stoves using electricity from the grid, GHG emissions would increase by approximately 6.5 million tonnes of carbon dioxide equivalent (CO₂e), assuming a fuel stacking rate of 20% (Christian & Suryadi, 2021). The same source further indicates that, even if the share of renewable energy in power generation were raised to 60% (with the remaining 40% still derived from coal), such a policy would still result in additional emissions of around 2.5 million tonnes of CO₂e. Moreover, Christian and Suryadi (2021) argue that, in order to reach parity with the GHG emissions associated with LPG stoves, the electricity emissions factor would need to decline from 892 gCO₂e per kWh (as of 2021) to approximately 250 gCO₂e per kWh: equivalent to a renewable energy share of about 78%.

This underscores that switching to induction stoves must be paired with accelerating the decarbonization of the grid to deliver climate benefits and align with Indonesia's net-zero goals to 2060.

4.2 Dimethyl Ether

The government has long considered DME—a compound that can be produced from Indonesia's vast coal reserves—as a strategic alternative to LPG. When pressurized, DME can be handled and stored as a liquid, making it usable for household cooking (Institute for Energy Economics and Financial Analysis [IEEFA], 2020).

In alignment with this ambition, the government initiated a DME production plan in Tanjung Enim, South Sumatra, under Presidential Decree 109 in November 2020 (Republic of Indonesia, 2020b). This was designed to operate for over 20 years, utilizing 6 million tonnes of low-grade coal annually to produce 1.4 million tonnes of DME (Republic of Indonesia, 2024). The strategic aim was to offset up to 1 million tons of LPG imports per year, reducing Indonesia's reliance on foreign fuel sources (PT Pertamina, 2020).

The project encountered funding challenges, as the U.S. company Air Products and Chemicals Inc. withdrew its initial investment of USD 2.1 billion, citing disagreements over economic and business aspects (Rahayu, 2023). This withdrawal highlights a broader global trend of financial institutions reducing their investments in coal-based projects owing to sustainability concerns (Coca, 2023).

PT Bukit Asam has since engaged with East China Engineering Science and Technology Co. with the aim of resuming the DME initiative. However, as of November 2025, no official new partner has been announced and the project remains undeveloped. Despite this, the Government of Indonesia is still actively planning to expand its DME initiatives, with six new project sites and an estimated investment of IDR 164 trillion (Rachman, 2025). It is considering financing the expansion through the newly established sovereign investment agency, Danantara (Rachman, 2025).

Although coal gasification for DME production is technically feasible, it requires substantial upfront investment and faces uncertain operating economics. The proposed DME plant in Tanjung Enim will incur an estimated annual loss of USD 377 million against the estimated LPG savings of USD 19 million (IEEFA, 2020). The cost of producing DME stands at USD 470 per tonne—nearly double the price Indonesia currently pays for LPG imports (IEEFA, 2020).



Government policy dictates that DME pricing should stay below LPG prices for it to be a viable alternative. However, between 2001 and 2021, DME prices were lower than LPG prices for only 15 months over the entire 20-year period (IEEFA, 2022). This pricing challenge stems from the high sensitivity of DME production costs to factors including project scale, technology, location, and operational efficiencies.

To maintain profitability, the project would require a government subsidy of at least USD 354 per tonne (Peh, 2023), which contradicts its original purpose of reducing LPG-related subsidies. Currently, the only subsidy allocated specifically for DME is the 0% royalty incentive under the Job Creation Law (Ministry of the State Secretariat, 2020).

4.2.1 Health Impacts of DME

DME has been proposed as a transitional fuel. At the point at which it is burned, it produces fewer CO₂ emissions than traditional fossil fuel, such as LPG, and it can be derived from renewable sources, such as biomass; however, when production, storage, and use are taken into consideration, DME's full life cycle emissions are much higher than those of LPG (Seltenrich, 2024). The health impacts of burning DME remain under-researched (Seltenrich, 2024).

4.2.2 Climate Impacts of DME

Under a full life cycle analysis, DME has much higher emissions than LPG. Estimates indicate that for every 1.4 million tonnes of DME produced, approximately 4.26 million tonnes of CO₂e emissions are released: five times the emissions associated with LPG production (Aksi Ekologi & Emansipasi Rakyat [AEER], 2020). Additionally, assuming that the DME project target is met, the projected GHG emissions associated with DME could increase by 1.9 million tonnes of CO₂ in 2024 and by 2.4 million tonnes of CO₂ in 2030 (Gardian, 2022). Producing DME also means prolonging the use of low-rank coal; this poses risks of local environmental degradation, including potential impacts on water quality and significant land disturbances.

Furthermore, with the addition of DME plants, a 1,200-MW coal power plant, and expanded port facilities, the coal reserves in Tanjung Enim, which would have lasted 99 years at the current production rate, could be depleted in just 35 years. The rapid consumption of coal would lock in high emissions for decades, primarily benefiting the coal industry.

4.3 City Gas

The city gas program aims to supply natural gas through pipelines directly to households, offering an alternative to LPG and kerosene while addressing national energy security, fiscal efficiency, and environmental goals. The target was 4 million connections by 2024, but only 815,000 households have been connected so far (Antara News, 2025b).

Indonesia is a net importer of LPG, but a net exporter of natural gas (International Energy Agency [IEA], 2022). Therefore, using natural gas for cooking would reduce LPG imports. However, exports of natural gas are tied to long-term agreements, which prevents



the diversion of this resource for domestic use. In addition, production is declining and Indonesia's ongoing net export status is uncertain (Purwanti, 2025).

Reducing gas exports to offset LPG imports does not automatically improve the trade balance, unless the unit value of LPG imports exceeds the value of natural gas exports per million British thermal units (MMBtu). Indonesia's average LPG import price in 2024 was approximately USD 550 to USD 580 per metric tonne, translating to USD 10 to USD 11 per MMBtu (Muliawati, 2025; Rakhmanto, 2025). This suggests that, from a purely fiscal standpoint, substituting LPG imports with domestic gas use could yield modest trade balance gains, assuming that the infrastructure and delivery costs are contained. However, the actual impact on the trade balance remains limited. According to PGN estimates, connecting 4 million households to city gas could reduce LPG imports by about 6.15% of current import volumes (Rakhmanto, 2025). While it does contribute to subsidy savings (by an estimated IDR 2.69 trillion per year), the macroeconomic effect on the trade balance will remain relatively small unless the project is scaled significantly.

Initially, the development of city gas benefited from strong government support and investment, with substantial funding allocated through the national budget, SOEs, and public-private partnerships. However, 2022 marked the final year of budget-funded investments. As a result, that year, only 20% of the target of 40,000 households was achieved (Republic of Indonesia, 2020a, 2022b). From 2023, the government planned for private investors to take over development via public-private partnerships. So far, PT PGN has not succeeded in securing private sector investments to continue the development of city gas networks (CNBC Indonesia, 2024).

To address this, the government is currently revising Presidential Regulation 6/2019 to facilitate private sector involvement in developing the city gas network. A key incentive would include fixing upstream prices at USD 4.72 per MMBtu, compared to historical fluctuations of between USD 2.19 and USD 6.45, with 2022 recording the highest price (U.S. Energy Information Administration, 2025).

Despite regulatory efforts, experts have highlighted some persistent challenges: high investment costs, low demand, constrained margins, and limited commercial viability without subsidies (Kontan, 2023). Some experts have recommended aligning prices closer to those of subsidized LPG, maintaining sufficient margins for gas distributors, and securing government guarantees through budget support to improve project feasibility and accelerate deployment (Kontan, 2023). However, this would require substantial subsidies from the government in addition to the infrastructure costs, which makes it an economically unsound option.

Achieving the city gas network target for 2024 would require a fivefold expansion from its current state, resulting in massive emissions from materials and construction. It would also imply further exploration of oil and gas reserves and more fossil fuel infrastructure. There is also a risk of the distribution network becoming a stranded asset if policies, prices, or consumer preferences move away from natural gas—as is occurring in other countries, such as Australia (Victoria State Government, 2023) and the European Union (Grote et al., 2022).



4.3.1 Health Impacts of City Gas

While natural gas is often considered cleaner than biomass, recent studies have highlighted its health risks. Burning natural gas produces pollutants whose emissions can lead to respiratory irritation, an increased risk of asthma, and long-term health effects. For example, NO₂ levels in poorly ventilated kitchens can exceed outdoor air quality standards within minutes of gas stove use, posing serious respiratory risks. Benzene, a known carcinogen, has been detected at levels exceeding global benchmarks during gas stove operation. Additionally, incomplete combustion of natural gas can result in the formation of volatile organic compounds, further contributing to indoor air pollution (Seltenrich, 2024).

4.3.2 Climate Impacts of City Gas

On combustion, natural gas emits 1.97 kg CO₂e/m³, about 25% less than LPG's 3.27 kg CO₂e/m³ when it comes to thermal output (Aprilia, 2022; Ministry of Energy and Mineral Resources, 2020). However, 1 kg of LPG contains more energy than 1 m³ of natural gas; the emissions for the same amount of energy are almost identical. Moreover, rapidly expanding the city gas infrastructure would result in significant emissions from construction and would lock in fossil fuel dependency for decades. The natural gas value chain, including distribution, is also associated with methane leakages, which adds an environmental burden equivalent to 35% of direct CO₂ emissions from natural gas combustion (Shirizadeh et al., 2023).

4.4 Conclusions from the Analysis of Fuel Substitution Options

The analysis presented in this section leads us to conclude that induction stoves are the most viable option to support Indonesia to transition away from LPG. DME is financially unviable, and its adoption would only introduce a new subsidy burden while increasing GHG emissions. City gas would require large infrastructure subsidies, and the investments would not support broader access to energy, electrification, or climate objectives.

Transitioning to induction stoves offers health benefits by minimizing exposure to harmful pollutants. While DME and natural gas represent cleaner alternatives to biomass, they still pose health risks that must be carefully managed. Induction stoves, with their negligible emissions at point of use, represent a safer and more sustainable option for improving indoor air quality and reducing the health risks associated with cooking (Seltenrich, 2024).

Induction stoves also provide a clean cooking alternative that could lower GHG emissions when paired with a decarbonized electricity grid. Unlike DME and city gas, induction stoves are not dependent upon fossil fuel extraction or long-term infrastructure investments tied to high-emissions fuels; their carbon intensity can decrease with renewable energy deployment.



5.0 Barriers and Opportunities in Transitioning to Induction Stoves: outcomes from consultations

This section presents the results from interviews, FGDs, and surveys conducted to understand the barriers and opportunities in transitioning away from LPG to induction stoves, as the most viable—and the only non-fossil—solution the government is considering. It also identifies adjustments in policy support tools that can facilitate reduced indoor air pollution and alleviate shortages of cooking fuel, which disproportionately affect women and children. An analysis of the relative costs of LPG and induction is also provided and is based on data gathered through the fieldwork.

5.1 Induction Pilot Consultations

This section includes the results from the questionnaire (completed by 100 households who participated in the induction-cooking pilot in Bali and Solo) and the in-depth interviews (conducted with 60 of those households).

5.1.1 Descriptive Statistics

Most of the respondents were women (59%), though the proportion of women varied significantly between the provinces (over 70% in Solo, 51% in Bali). The respondents were between 18 and 85 years old, and the average age was 49. Their educational backgrounds also differed: 83% of respondents in Bali had completed senior high school or a higher level of education, compared with 76% in Solo, indicating a somewhat higher level of educational attainment among the respondents in Bali. This disparity is linked to the gender composition of the respondents: in both provinces, in general the women were less educated than the men, although both genders in Bali were more educated than their counterparts in Solo. Reflecting this trend, the employment rates were higher in Bali, with 78% of respondents holding jobs compared with 59% in Solo.

The household characteristics were similar across the two regions. Around two thirds of the respondents reported monthly spending of between IDR 1.5 million and IDR 3 million (USD 95 and USD 191). The Balinese households had a slightly better financial status and tended to be larger. Home ownership rates were slightly higher in Bali (76%) than in Java (73%).

Significant differences emerged in relation to electricity connection and reliability. In Solo, 95% of households had either a 450-VA or a 900-VA connection, while in Bali, over 33% of households had a connection of 2,200 VA or more. This reflects the better quality of electricity provision in Bali, where 37% of respondents reported never experiencing power outages, compared with only 27% in Solo. Conversely, nearly 10% of households in Solo reported frequent or regular power outages—a problem no household in Bali reported.

The appendix presents additional descriptive statistics related to the respondents and their households.



5.1.2 Barriers to Adopting Induction Cooking

The sections below discuss the major barriers to induction cooking identified in the surveys and interviews.

5.1.2.1 Economic, Practical, Cultural, and Technical

Respondents reported two primary motivations for joining the induction stove program: the opportunity to experience new cooking technology, and the fact that the program was free of charge. This indicates a willingness among households to transition, provided the necessary support and incentives are in place.

Nearly two years into the program, almost 90% of the participants were still using their induction stoves frequently (Table 5), suggesting that the stoves are perceived as useful and reliable. Before the program, nearly all the participating households relied exclusively on stoves fuelled by 3-kg LPG cylinders for cooking. Most continued to use these alongside their new induction stove: over 90% of households in Solo and over 76% in Bali said they continued to use LPG always or often. Nevertheless, induction stoves also demonstrated high levels of utilization, with 88% of households in Solo and 89% in Bali reporting that they used them routinely—either always or often. In Bali, households used induction more than they used LPG, with almost a quarter of households rarely or never using LPG.

Table 5. Frequency of using types of cooking technology

	LPG	Electric stove	Gas	Firewood	Kerosene	Other
Solo						
Always	60.98	51.22	2.44			
Often	31.71	36.59				
Rarely	2.44	9.76				
Never	4.88	2.44	97.56	100	100	100
Bali						
Always	35.59	55.93				
Often	40.68	33.9				
Rarely	20.34	10.17		8.47	6.78	
Never	3.39		100	91.53	93.22	100

Note: The figures show the percentages of sampled households who used a type of cooking technology at each frequency. Some households used more than one cooking technology.

Source: Authors' calculations.

The respondents highlighted several advantages of induction stoves over LPG. These included greater practicality, improved safety, and ease of cleaning, and led to cleaner and more comfortable kitchens with minimal accident risks. Table 6 summarizes the respondents'



comments on the benefits and drawbacks of induction stoves compared with LPG, which provides insights into user preferences and the remaining barriers to adoption.

Table 6. Advantages and disadvantages of induction stoves compared with LPG

Advantages						
	Faster	Simpler	Cheaper	Safer	Easy to clean	Kitchen more comfortable
Solo	12	59	44	49	32	27
Bali	15	75	39	53	42	39
Overall sample	14	68	41	51	38	34
Disadvantages						
	Need to replace cookware	Higher electricity bills	Small cooking volume	Longer cooking time	Power outages	Risk of accidents
Solo	76	0	32	41	10	0
Bali	59	3	20	46	0	0
Overall sample	66	2	25	44	4	0

Note: The figures show the percentages of respondents who answered “yes” when asked about each advantage and disadvantage. Percentages for Bali and Solo refer to respondents within each site. Percentages in the Overall Sample rows refer to the overall sample (N=100).

Source: Authors' calculations.

More than two thirds of respondents felt that induction stoves were simpler to use than LPG stoves, and more than half felt they were safer. Around 40% felt they were cheaper, and a similar percentage felt they were easier to clean, while only around a third felt they made the kitchen more comfortable and a mere 14% felt they were faster. The feedback from elderly users was largely positive, with some using induction stoves proficiently and even discontinuing LPG use altogether.

These survey findings align with insights gathered from in-depth interviews conducted with some households. For example, induction stoves were felt to be slower than LPG stoves because the stoves in the pilot program ran on only 1,000 W. To provide the same cooking speed as LPG, electric stoves need to operate at least 1,500 W.

The current LPG subsidy scheme and unlimited access to 3-kg LPG cylinders, especially in the bigger cities, contributes to households continuing to perceive the induction stoves as supplements to their LPG stoves, rather than as replacements. The subsidies make LPG significantly cheaper than induction stoves (especially if we consider the expense of upgrading the electricity connection, purchasing an induction stove, and buying compatible cookware).



People are used to subsidized LPG, so they have very little financial incentive to invest in new cooking technology that they are less familiar with.

A major barrier to adopting induction stoves is the uncertainty about how using more electricity will affect household bills. Many respondents were unsure about the cost of using an induction stove, and some believed it would significantly increase their electricity expenses. Lack of transparency around how tariffs are calculated further complicates the issue. These concerns are justified and are analyzed in Section 5.1.3.

More than two thirds of survey respondents in Bali and in Solo mentioned the need to replace cookware as the most significant drawback of induction stoves. Induction stoves require cookware made from ferromagnetic materials to function properly. Unfortunately, this was not widely known, even among cookware retailers. Other key issues cited were the slow speed of cooking (44%) and restrictions on cooking volumes (25%).

Our in-depth interviews confirmed these findings, with the respondents expressing frustration about the need to replace cookware and to purchase additional equipment to accommodate larger cooking needs. The cooking equipment provided by the pilot project often did not align with household needs, especially in terms of cooking volume and the diversity of cooking habits across the regions. Bali households received equipment for boiling water, steaming, and frying, whereas in Java a frying pan and general purpose pans were distributed. Meanwhile, the size of steaming pans commonly used in Bali differs from what is commonly used in Java. Not all dishes—grilled dishes in particular—could be prepared on induction stoves. The cookware provided was therefore not versatile enough to support some traditional cooking methods, so households needed to continue using LPG or charcoal stoves for these specific needs. Also, households frequently had to revert to LPG stoves for larger cooking needs.

There were no significant differences in the respondents' health concerns related to cooking on an induction stove compared with using LPG. This is likely because of the relatively short duration of the program and the fact that LPG has lower toxic emissions than those of kerosene or wood stoves.

The absence of induction stove repair service centres was noted as creating a significant maintenance challenge. While PLN offered responsive support during the warranty period, households struggled to find repair services after the warranty expired. Several participants reported stove damage to PLN, but because the warranty period had expired they had to cover the costs of the repair themselves. This lack of accessible maintenance options discourages long-term use and creates additional barriers to adoption.

Despite the challenges, the program was well received, with 69% of respondents wanting it to continue and 30% uncertain; only one household opposed it. Currently, the pilot remains part of PLN's corporate social responsibility efforts, but its sustainability is unclear.

The findings also underscore the need for better alignment between program design and household needs, increased awareness of costs and cookware requirements, and more robust post-warranty support systems to encourage long-term adoption.



As Indonesia explores the feasibility of scaling up induction cooking, it is essential to consider the broader implications across sectors and stakeholder groups. The following subsections examine the key dimensions of this transition: loss of livelihoods and the implications for women.

5.1.2.2 Loss of LPG-Related Livelihoods

A national shift to induction would affect thousands of formal and informal jobs. Indonesia has a vast LPG distribution network, especially for bottled LPG, which accounts for 70% of the market (Kashyap, 2024). This network includes retailers, delivery agents, wholesalers, and logistics personnel. Given the scale—serving 57 million households—thousands of people are likely employed in distribution (BPS Indonesia, 2023a). There is also significant informal employment in LPG stove repair services. Stove repairers often operate as small-scale technicians or microenterprises, and in each region their numbers may be in the thousands, depending on the regional penetration of LPG.

A family in Surakarta that sells LPG and repairs gas stoves expressed concerns about the economic implications of a widespread shift to induction stoves. The husband, who currently earns an income repairing gas stoves, requested training in repairing induction stoves so that he could sustain his livelihood. This underscores the importance of equipping communities with new skills to adapt to changing energy technology. In any induction stove value chain, LPG-related livelihoods can be supported to increase the community-wide benefits.

5.1.2.3 Implications Related Primarily to Women

Marginalized and remote communities in Indonesia face significant barriers to accessing LPG, owing to critical gaps in the distribution system. As revealed in the FGDs, women are mostly responsible for procuring fuel, and they often have to travel long distances or wait in lengthy queues owing to limited supply and quota constraints. There is some willingness to pay for non-subsidized LPG for the sake of having fuel to cook with, but its availability and accessibility are still a barrier for residents in these more remote areas.

This situation usually becomes more challenging during periods of high demand, such as during religious holidays, or in the event of transport delays, especially in areas that rely on sea transport. Vulnerable groups, including pregnant women and elderly people, face the greatest hardship during these times. They struggle to secure essential fuel supplies in the face of fluctuating prices and ever-changing distribution schedules.

These kinds of systemic inefficiencies emphasize the urgent need for equitable distribution reforms and robust infrastructure development. For urban and peri-urban households with a reliable electricity supply, induction stoves represent a more reliable and stable option, while also reducing dependence on traditional LPG supply chains. Access to induction stoves can significantly improve the lives of women in particular by saving them time, which they can then redirect toward more productive activities. For households with poor access to electricity or an unreliable supply, off-grid cooking solutions (such as biogas or solar-powered induction stoves and pressure cookers) present a promising pathway.

If LPG subsidies were more effectively targeted at the poorer households, it could free up fiscal space to invest in these decentralized, clean cooking technologies.



5.1.3 The Economic Case for Transitioning to Induction Stoves

Whether a household or the government can save money from transitioning from LPG to induction depends on the following factors:

- electricity tariffs
- eligibility for and access to subsidized LPG
- capital costs for the induction stove, cookware, and an electricity upgrade

The following subsections identify under what circumstances a transition to induction can save money. First, we examine the running costs (of electricity and LPG) for households. Second, we examine a scenario where the government targets LPG subsidies at the poorest 60% of the population and transitions the remainder to induction stoves.

5.1.3.1 Running Costs: LPG versus electricity

The average LPG consumption in Indonesia is 11.4 kg per month per household (author's calculation based on BPS Indonesia, 2023b). Without subsidies, 11.4 kg of LPG would cost IDR 182,400 at market prices at the time of writing. In terms of heat energy, this is equivalent to electricity consumption of 82.1 kWh per month, which would cost IDR 151,403 at the highest applicable tariff for consumers with a connection of 3,500 VA or above. Therefore, in a situation where neither LPG nor electricity was subsidized, switching to induction would be around 17% cheaper for all households on the basis of the running costs alone. However, the existence of subsidies means further analysis is required.

To adopt induction cooking, households will need to upgrade their connection to the grid—but Indonesia's electricity tariff structure uses a capacity-based pricing model that discourages them from doing this. A customer's electricity rates are determined by the installed capacity (VA) at the household. All customer classes receive subsidies,³ but households with higher-capacity power connections pay higher tariffs. However, these tariffs are not reflective of the actual cost of generating electricity. Outside the pilot program, households with the most-subsidized electricity tariffs (those with 450-VA connections and the subsidized tier of 900 VA, as opposed to the non-subsidized 900-VA group) are automatically charged higher rates per kWh if they upgrade to a connection of 1,300-VA or more to support the use of an induction stove, even if their consumption remains modest (Table 7). Upgrading from a 450-VA connection to a 1,300-VA connection would result in a household's electricity bill tripling—even if they use no additional electricity.

³ PLN does not sell electricity at market value to any customer group, which is why an "electricity compensation" item is included in the state budget to compensate for PLN selling under market value. "Electricity subsidy" (for customers with 450-VA or 900-VA connections) and "electricity compensation" are two different budget items.

**Table 7.** Household electricity tariffs in Indonesia, July 2024

Customer classification	Installed capacity (VA)	Tariff (IDR per kWh)
Heavily subsidized	450	415
Heavily subsidized	900	605
R-1/TR	900	1,352
R-1/TR	1,300	1,445
R-1/TR	2,200	1,445
R-2/TR	3,500–5,500	1,700
R-3/TR	Above 6,600	1,700

Note: R-1/TR (Household 1 – Low voltage), R-2/TR (Household 2 – Low voltage), R-3/TR (Household 3 – Low voltage).

Source: Hasibuan, 2025.

Therefore, the cost to a household of using an induction stove that consumes the equivalent of 11.4 kg of LPG depends on the household's electricity tariff (Table 8). For households who are eligible for heavily subsidized electricity, switching to induction cooking is cheaper than using LPG, whether the LPG is subsidized or not. For those on less-subsidized electricity tariffs, switching to induction is more costly than using subsidized LPG (which, in theory, they are not eligible for because they are wealthier households) but cheaper than using unsubsidized LPG.

Table 8. Monthly cost of using a 2,000-W induction stove, by installed electrical capacity

	450 VA	900 VA (heavily subsidized)	900 VA (less subsidized)	1,300 and 2,200 VA	3,500 VA or above
Electricity consumption (kWh) equivalent to 11.4 kg of LPG	89.1	89.1	89.1	89.1	89.1
Unit price for electricity (IDR per kWh)*	495	605	1,352	1,445	1,700
Cost of induction cooking (IDR per month)	44,097	53,896	120,443	128,701	151,403
Cost of cooking with subsidized LPG (IDR per month)	79,800	79,800	79,800	79,800	79,800



	450 VA	900 VA (heavily subsidized)	900 VA (less subsidized)	1,300 and 2,200 VA	3,500 VA or above
Cost of cooking with unsubsidized LPG (IDR per month)	182,400	182,400	182,400	182,400	182,400
Impact of switching from subsidized LPG to induction	35,703	25,904	-40,643	-48,901	-71,603
Impact of switching from unsubsidized LPG to induction (running costs only)	138,303	128,504	61,957	53,699	30,997

Note: *The unit price of electricity is based on Regulation 7 of 2024 introduced by the Ministry of Energy and Mineral Resources (2024c) on electricity tariffs provided by PLN.

Source: Authors.

In practice, the survey results from the pilot program suggest that the savings made were lower than the theoretical amount suggested above. Table 9 shows the cost comparisons before and after transitioning to induction stoves according to the respondents' experiences during the pilot. Assuming a base price of IDR 21,000 per LPG cylinder, households saved around IDR 73,500 a month. Even after accounting for their higher electricity bills, households reported net savings of approximately IDR 37,789 per month.

Table 9. Comparison of running costs: LPG and induction

Item	Before transition	After transition	Change
Monthly electricity bill	IDR 118,258	IDR 153,969	+IDR 35,711
Monthly LPG usage	5.7 cylinders (3 kg each)	2.2 cylinders (3 kg each)	-3.5 cylinders
Monthly LPG cost	IDR 119,700	IDR 46,200	-IDR 73,500
Net monthly savings			IDR 37,789 (after accounting for the higher electricity bill)

Note: Calculations assume that household connections were upgraded from 450 VA to 2,200 VA. Running costs only (not including the associated capital costs of the induction stove, cookware, and upgraded connection).

Source: Authors' calculations based on survey data.

5.1.3.2 Subsidy Savings from Transitioning to Induction Stoves, Including Capital Upgrades

This section presents two scenarios for reforming LPG subsidies and transitioning to induction stoves. In **scenario A**, LPG subsidies are targeted at the **bottom 40%** of households (by income), while **scenario B** extends the subsidy coverage to the **bottom**



60%. Using national consumption data, income decile analysis, and capital cost estimates for converting to induction stoves, we estimate the net fiscal savings under each scenario, assuming that subsidy savings are used to support the uptake of induction stoves among the remaining top 60% (scenario A) or top 40% (scenario B) of households. Electricity tariff subsidies are not considered, because the tariffs for higher-income households are less subsidized.

To estimate the capital cost of transitioning the top 40% and top 60% of households from LPG stoves to induction stoves, we identified the number of households within all income groups that currently use LPG for cooking. Next, we calculated the average cost of providing each household with an induction stove and compatible cookware (Table 10). Around three-quarters (77%) of Indonesian households are limited to a capacity of 900 VA, which is insufficient for induction stoves that run on 1,000 VA to 2,000 VA. Therefore, most households would require an upgrade to their electricity supply.

We then multiplied this per-household cost by the total number of target households to derive the overall capital expenditure required to support the transition. The analysis is based exclusively on household-level consumption of 3-kg LPG cylinders and excludes industrial and commercial usage. The data was derived from a nationally representative survey of approximately 345,000 households, with consumption estimates weighted to ensure statistical validity and accurate extrapolation to the national level.

Table 10. Average cost of providing an induction stove and compatible cookware

Item	IDR	USD
Stove (including Internet of Things and cookware)	1,530,000	93.83
Materials and service upgrades (MCB and installation)	300,000	18.40
Operational (survey)	40,418	2.48
Meter upgrading from 450 VA to 2,200 VA	1,639,750	100.56
Total cost	3,510,168	215.27

Note: We used the exchange rate as of August 2, 2025: IDR 16,306 = USD 1.

Source: Authors' calculations based on discussion with PLN.

The key findings are presented in Table 11.

**Table 11.** Key findings for targeting households to switch to induction stoves

Item	Scenario A: Top 60% of households	Scenario B: Top 40% of households
Use of total subsidized LPG	57.47%	36.87%
Monthly LPG consumption	96,483.06 tonnes	61,904 tonnes
Annual LPG consumption	1,157,796.71 tonnes	742,848 tonnes
Monthly LPG subsidy savings	IDR 988.95 billion (USD 59.69 million)	IDR 634.52 billion (USD 38.30 million)
Annual LPG subsidy savings	IDR 11.87 trillion (USD 717 million)	IDR 7.61 trillion (USD 459.30 million)

Note: We used the exchange rate as of August 2, 2025: IDR 16,306 = USD 1.

Source: Authors' calculations.

As shown in Table 11, if the LPG subsidy were to remain targeted at the bottom 60% of households (scenario B) while encouraging the top 40% to transition to induction stoves, the potential fiscal savings from reducing spending on LPG subsidies would be about IDR 7.61 trillion (USD 459.3 million) per year. Expanding the induction transition target to the top 60% of households (scenario A) could further increase the annual savings to about IDR 11.87 trillion (USD 717 million). These potential savings illustrate the magnitude of the fiscal space that could be reallocated to support electrification and social programs.

Table 12. Total capital expenditure required to support the transition to induction cooking

		IDR (trillion)	USD (billion)
Scenario A: Top 60%	Without upgrading meters from 450 VA to 2,200 VA	77.41	4.75
	With upgrading meters from 450 VA to 2,200 VA	158.1	9.7
Scenario B: Top 40%	Without upgrading meters from 450 VA to 2,200 VA	50.83	3.12
	With upgrading meters from 450 VA to 2,200 VA	95.39	5.85

Note: We used the exchange rate as of August 2, 2025: IDR 16,306 = USD 1.

Source: Authors' calculations.

However, realizing this transition would require an upfront investment. As can be seen from Table 12, the total capital expenditure needed to support the shift is estimated at around IDR 77.41 trillion (USD 4.75 billion) without upgrading meters and at around IDR 158.1 trillion (USD 9.7 billion) with upgrading meters from 450 VA to 2,200 VA. For the top 40% group, the corresponding investment amounts to IDR 50.83 trillion (USD 3.12 billion) and IDR



95.39 trillion (USD 5.85 billion), respectively. These figures highlight the trade-off between the potential fiscal gains from subsidy reform and the substantial infrastructure investments required to ensure an equitable and sustainable transition to electric cooking.

Table 13. Net savings from transitioning to induction (without upgrading electricity meters) (IDR trillion)

Time (years)	Scenario A: Top 60% of households			Scenario B: Top 40% of households		
	Capital expenditure without meter upgrades from 450 VA to 2,200 VA	Annual savings from removing LPG subsidies	Net savings	Capital expenditure without meter upgrades from 450 VA to 2,200 VA	Annual savings from removing LPG subsidies	Net savings
0	77.41	11.87	-65.54	50.83	7.61	-43.21
1	-	15.90	-49.64		10.20	-33.01
2	-	21.31	-28.33		13.67	-19.34
3	-	28.55	0.23		18.32	-1.02
4	-	38.26	38.49		24.55	23.53
5	-	51.27	89.76		32.90	56.43

Note: We used the exchange rate as of August 2, 2025: IDR 16,306 = USD 1.

Source: Authors' calculations.

To assess the long-term fiscal viability of transitioning either the top 40% or the top 60% of households from subsidized LPG to induction stoves, a net fiscal impact model was used. This model calculates the annual net savings by subtracting the upfront capital expenditure required for introducing induction stoves from the projected LPG subsidy savings. Two approaches were considered: one excluding electricity meter upgrades and one including them. In both scenarios, LPG consumption is projected to increase by 3.4% per year.⁴

As shown in Table 13, to transition the top 60% of households (scenario A) without excluding meter upgrades, the initial capital expenditure is estimated at IDR 77,410 billion (USD 4.75 billion). The annual fiscal savings from removing LPG subsidies start at IDR 11,870 billion (USD 0.73 billion) in Year 0 and increase steadily to IDR 51,270 billion (USD 3.15 billion) by Year 5. The net savings remain negative in the early years but turn positive between Year 2 and Year 3—reaching IDR 230 billion (USD 0.014 billion) in Year 3 and growing to IDR 89,760 billion (USD 5.51 billion) by Year 5. This indicates that the investment could reach a breakeven point after the third year, after which the transition yields substantial fiscal returns.

⁴ Authors' calculation based on material presented by Ario Panggi Pramono of the Ministry of Energy and Mineral Resources during a discussion activity entitled Unlocking Sustainable Future for Indonesia: A Deep Dive on Energy Subsidy Reform and Energy Transition Strategy, held in Jakarta on November 26, 2024 (Pramono, 2024).



On the other hand, transitioning the top 40% of households (scenario B) will require a lower initial capital expenditure, at IDR 50,830 billion (USD 3.12 billion). The annual savings from subsidy removal begin at IDR 7,610 billion (USD 0.47 billion) and rise to IDR 32,900 billion (USD 2.02 billion) by Year 5. Similar to scenario A, the net savings are negative in the first 3 years but approach breakeven by Year 4 IDR 23,530 billion (USD 1.44 billion) and turn strongly positive thereafter, reaching IDR 56,430 billion (USD 3.46 billion) by Year 5.

Table 14. Net savings from transitioning to induction (with upgrading electricity meters) (IDR trillion)

Time (years)	Scenario A: Top 60% of households			Scenario B: Top 40% of households		
	Capital expenditure with meter upgrades from 450 VA to 2,200 VA	Annual savings from removing LPG subsidies	Net savings	Capital expenditure with meter upgrades from 450 VA to 2,200 VA	Annual savings from removing LPG subsidies	Net savings
0	158.1	11.87	-133.40	95.39	7.61	-87.77
1	-	15.90	-117.49	-	10.20	-77.57
2	-	21.31	-96.19	-	13.67	-63.90
3	-	28.55	-67.63	-	18.32	-45.38
4	-	38.26	-29.37	-	24.55	-21.03
5	-	51.27	21.90	-	32.90	11.87
6	-	68.7	77.77	-	44.08	55.95

Note: We used the exchange rate as of August 2, 2025: IDR 16,306 = USD 1.

Source: Authors' calculations.

For the approach that includes the cost of meter upgrades, the fiscal dynamics change considerably due to the higher upfront investment required (Table 14). To transition the top 60% of households (scenario A), the total capital expenditure rises to IDR 158,100 billion (USD 9.70 billion) trillion in Year 0. Although annual LPG subsidy savings start at IDR 11,870 billion (USD 0.73 billion) and increase steadily to IDR 68,700 billion (USD 4.21 billion) by Year 6, the large initial outlay keeps net savings negative during the first four years. The breakeven point is reached by around Year 5, when net savings turn positive at IDR 21,900 billion (USD 1.34 billion). These savings continue to grow to IDR 77,770 billion (USD 4.77 billion) by Year 6.

The total investment needed to transition the top 40% of households (scenario B) is lower at IDR 95,390 billion (USD 5.85 billion), but the pattern is similar. Annual savings begin at IDR 7,610 billion (USD 0.47 billion), rising to IDR 44,080 billion (USD 2.70 billion) by Year 6. The net savings remain in deficit through to Year 4 but turn positive by Year 5 (IDR 11,870 billion (USD 0.73 billion)) and continue increasing to IDR 55,950 billion (USD 3.43 billion) in Year 6.



In summary, the fiscal analysis shows that transitioning higher-income households from subsidized LPG to induction stoves is both financially and programmatically viable within a medium-term horizon. While the upfront capital expenditure—especially when meter upgrades are included—is substantial, the long-term fiscal gains from reducing spending on LPG subsidies outweigh the initial investment. For both scenarios, breakeven is achieved within 3 to 5 years, after which the net savings increase significantly each year. This demonstrates that reallocating subsidies to electrification can enhance fiscal efficiency while advancing Indonesia's clean cooking and energy transition goals.

The growing LPG consumption among higher-income households also poses a mounting fiscal risk, especially in the context of Indonesia's constrained budget environment. With the 2025 national deficit projected to reach IDR 662 trillion (USD 40 billion), subsidy reform becomes an urgent priority. Phasing out LPG subsidies for the top 40% to 60% of households could yield annual savings of approximately IDR 7.61 trillion to IDR 11.87 trillion (USD 459 million to USD 717 million), freeing resources for investment in social protection, infrastructure, or electrification. Over time, the government could also expand the transition to include lower-income households and small businesses, with the capital costs offset by declining LPG subsidy outlays.

Ultimately, this transition is not merely a technical or financial adjustment—it is a strategic political economy decision that demands decisive upfront action to secure greater fiscal space, strengthen energy security, and build long-term resilience for Indonesia's energy system.

5.2 Transmission and Distribution Infrastructure Limitations

PLN's pilot program for the transition to induction stoves aimed to increase electricity consumption and reduce oversupply in certain provinces. However, many provinces face transmission and distribution infrastructure challenges, and overcapacity is not a universal issue. Addressing these infrastructure gaps, especially in rural areas, will require significant investment, which may be in conflict with PLN's financial priorities.

Excess electricity from overbuilt coal-fired power plants owing to incorrect demand projections has left PLN with costly take-or-pay contracts. According to statements from the Dewan Perwakilan Rakyat (National Parliament) Budget Committee, Indonesia's electricity oversupply could reach 41 GW by 2030, and each unused gigawatt imposes an estimated IDR 3,000 billion in annual costs due to take-or-pay obligations (MetroTV News, 2024).

Optimizing this surplus through induction stoves would help, as would broader electrification of end-use activities (such as charging electric vehicles). The deployment of 1 million induction stoves in Indonesia is estimated to add around 0.7 TWh of electricity consumption annually—a figure that underscores the scale of the cooking-appliance transition (Yayasan Humanis dan Inovasi Sosial, 2022). However, although grid conditions vary across Indonesia, the additional demand from 1 million induction stoves would represent only a small fraction of national electricity consumption. Some areas with limited reserve margins may still require local wiring upgrades at the household level, but the scale of the overall power system remains far larger than the incremental load created by adopting induction stoves. Nonetheless, strategic planning is critical to remove any potential bottlenecks that would affect reliable energy access and equitable adoption across regions.



5.3 Political Economy

The transition from LPG to induction stoves in Indonesia faces significant political economy barriers, largely rooted in entrenched vested interests in the energy sector. These barriers complicate policy implementation and create resistance to change despite the economic and environmental benefits of induction stoves.

One of the primary barriers is the fact that the distribution of LPG involves a well-established network of producers, distributors, and retailers. Several of our respondents pointed out that it was well known that having connections to members of the House of Representatives in Commission VII was closely associated with gaining LPG distribution licences.

With Indonesia being a carbon-intensive economy, oil and gas is a lucrative business, and it is supported by powerful stakeholders, including SOEs like PT Pertamina, which plays a central role in importing and distributing subsidized LPG. Any policy aiming to reduce LPG subsidies or promote alternative technologies like induction stoves might be seen as a threat to business as usual, leading to resistance from actors benefiting from the status quo.

However, the interests across the LPG value chain are not uniform. LPG importers and distributors benefit from the margin they take along the value chain, and the volume of LPG (and therefore their income) would reduce if subsidies were removed. On the other hand, subsidies can be a burden for implementing SOEs. Public companies are often expected to provide fuel at a loss that needs to be cross-subsidized from elsewhere in the business (such as upstream activities or non-subsidized fuel sales). Even if fully reimbursed by governments, transfers to SOEs are often late (Indrawan, 2020). Both impact an SOE's balance sheet and credit rating. Therefore, SOEs can be allies of subsidy reform if it means they can then provide products at market prices. The vested interests along the value chain need to be mapped, and strategies need to be put in place for consulting these parties and reducing their opposition to reform.

Another challenge lies in the interplay between energy subsidies and political incentives. Subsidized LPG is seen to secure political support from the middle classes and the low-income households that rely on it for daily cooking. Nobody likes to pay higher energy prices. Politicians may hesitate to advocate for subsidy cuts or a shift to induction stoves for fear of a public backlash (McCulloch, 2023). Subsidies are often seen as part of the social contract in several countries, and reforms have often led to protests and even riots (McCulloch et al., 2021), especially when the high upfront costs of alternatives—in this case, induction stoves and the electricity required for their operation—can be perceived as a financial burden. This political risk reinforces the reluctance to disrupt the established LPG system.



6.0 Roadmap

This section sets out a roadmap for adopting non-fossil cooking technologies in Indonesia in an inclusive way, providing practical steps for policy-makers based on the analysis from our research. Induction stoves are not universally suitable, so they should be included only as part of a broader strategy to address diverse household needs. Measures to support non-fossil off-grid solutions for remote and rural households are also necessary to ensure equitable access to modern cooking technologies.

In this section we set out the policy changes needed to scale up induction as a key part of a comprehensive solution. The recommendations are organized around thematic areas, each with a summary of the issue followed by the policy solution. The policy changes are sequenced, but the government will be able to determine detailed timing and budgetary allocations.

All the following policy approaches will be more effective if developed using co-production. Co-production is a process in which all parties—recipients and providers—have input into the design and implementation of the policy, thereby maximizing the potential for the final strategy to meet their needs. Women, as the primary cooks, must be involved in creating clean cooking transition policies, through meaningful consultation and co-production. The needs of traditionally disadvantaged groups also need to be incorporated.

1. Make electricity consumption and upgrades more affordable for lower-income households.

Rationale

- High electricity tariffs and the cost of upgrading household connections discourage the adoption of induction stoves.

Policy adjustments

- Revise the Ministry of Energy and Mineral Resources' Regulation 27/2017 (Ministry of Energy and Mineral Resources, 2017) to reduce the cost (IDR 1.6 million) of upgrading household electricity meters from 450 VA to 2,200 VA, especially for subsidized households.
- Implement a block tariff system that charges for electricity in blocks of consumption (for example, the first 50 kWh at a very low tariff, the next 100 kWh at a higher tariff, and so on) to enable households to use more electricity without paying more for each unit. This will facilitate electrification while ensuring that those with very low levels of consumption receive highly subsidized rates.
- Consider providing separate metering for induction cooking to track electricity consumption more accurately. This will make it easier to implement targeted tariff subsidies linked specifically to cooking.



2. Address electricity supply, transmission, and distribution challenges.

Rationale

- Many regions with insufficient electricity reserves cannot currently support induction stoves without significant infrastructure upgrades.

Policy adjustments

- Provide funding to PLN to upgrade connections on a means-tested basis for households wishing to switch to induction. Prioritize areas with reliable grid capacity (ideally aligned with overcapacity regions) while avoiding regions with minimal reserves until such constraints have been addressed.
- Develop long-term plans to fill gaps in the distribution infrastructure, especially in off-grid and rural areas. Fund improvements to household connections and make plans for rural and off-grid expansion, such as the New Electricity Installation Assistance Program developed by Indonesia's Ministry of Energy and Mineral Resources.

3. Implement subsidies for induction stoves.

Rationale

- Targeted, one-off subsidies for induction stoves and cookware will lower barriers to switching and reduce ongoing spending on LPG subsidies.

Policy adjustment

- Implement means-tested subsidies for induction stoves and compatible cookware to assist lower-income households.

4. Ensure induction equipment suits consumer needs.

Rationale

- Limited functionality and cookware compatibility hinder adoption.

Policy adjustments

- Conduct region-specific needs assessments regarding cooking equipment. This should target women as the primary cooks and evaluate the needs of under-represented groups, including elderly people.
- The government and PLN should work with manufacturers to improve the availability of mass-market induction cooktops at various price points, ensuring that their cooking power is comparable to that of LPG stoves.
- Bundle with designing complementary cookware that replicates regional cooking methods, such as grilling.
- Establish mandatory labelling standards that provide information about a stove's power output, power usage, and other details identified as necessary following consultations with consumers.



5. Improve maintenance and repair services.

Rationale

- Post-warranty maintenance and repair options are scarce, leading to usability challenges in the long term.

Policy adjustments

- Consider introducing a scheme where households can exchange a broken stove for a new one: in many cases, the cost of repair can be more expensive than the cost of a new induction stove.
- Establish partnerships between PLN, local governments, and technical institutions (e.g., the National Professional Certification Body) to train and certify induction stove repair technicians, fostering the creation of local jobs.
- Provide subsidized apprenticeships for electricians specializing in induction installation and repair, with a proportion of the apprenticeships allocated to women.

6. Ensure that LPG subsidies are directly targeted at households.

Rationale

- LPG subsidies are intended for the poorer households, so targeting this group would be consistent with existing policy, reduce the regressive effect of current universal access, and free up savings that could be redirected to expanding the adoption of induction stoves and reducing political resistance to LPG subsidy targeting.

Policy adjustments

- Support subsidy reform with a comprehensive plan. Develop a plan to gradually phase out LPG subsidies for well-off households, with clear milestones and a timeline. The plan should be accompanied by a public awareness campaign on alternative forms of support for poorer households and the long-term savings and environmental benefits.
- Shift to a direct-targeted subsidy mechanism. Transitioning from commodity-based subsidies to recipient-based subsidies—such as through cash transfers—will ensure that financial aid is provided directly to targeted individuals or groups without locking in fossil fuel use.
- Make women the recipients of subsidies, to build their empowerment as decision-makers and financial stakeholders on cooking-related matters.
- Leverage digitalization for subsidy distribution. Improve subsidy targeting with accurate population data to reduce errors of inclusion and exclusion.
- Address vested interests and political economy barriers by establishing a unified approach that integrates input from stakeholders across government agencies, SOEs, the private sector, and civil society. To address vested interests in the LPG supply chain, align incentives with the broader goal of transitioning to sustainable energy solutions, and mitigate resistance through dialogue and stakeholder engagement.



7. Integrate GESI into policy frameworks and budgeting.

Rationale

- Limited integration of GESI into clean-cooking policies is a significant barrier to achieving equitable access to induction stoves.

Policy adjustments

- Develop a gender-responsive policy framework to address the specific needs of women, elderly people, and other under-represented groups. This could include targeted training programs and public awareness campaigns.
- Incorporate GESI considerations into national and regional energy policies, including monitoring and evaluation frameworks. Regularly assess participation rates and outcomes from women and vulnerable groups.
- Allocate dedicated budgets to GESI-related initiatives, such as to technical training programs specifically designed for women and subsidies directly passed to women.

8. Run public education campaigns.

Rationale

- An awareness campaign is needed to reduce misconceptions about induction cooking and promote its use, including to publicize the real-world positive experiences from the Java–Bali pilot. Specifically, the campaign is needed to (a) address common concerns about costs, cooking habits, equipment, and maintenance, and (b) increase demand for induction, creating economies of scale that can drive down prices and make induction more affordable for lower-income households.

Policy adjustments

- Coordinate a comprehensive public information campaign across relevant departments to promote induction stoves as modern, clean, and efficient.
- Tailor campaigns to urban and rural households; reflect local cultural and regional cooking habits to improve acceptance.
- Engage men and women, acknowledging that women are the primary cooks but men often make decisions about equipment and expenditure.



7.0 Conclusion

Indonesia's transition to non-fossil cooking is constrained by a complex web of vested interests, subsidy politics, and infrastructural and technical challenges. Addressing these barriers requires a nuanced approach that balances the interests of key stakeholders, in particular women as the primary cooks, while gradually shifting the incentives toward cleaner and more sustainable cooking technologies.

Of the three technologies the government is considering for diversification away from LPG, only induction is a non-fossil alternative and one that is aligned with a modern and low-carbon energy system. Our assessment confirms that induction is the most suitable non-fossil solution for most on-grid households in switching from LPG. However, it is not without challenges, which we have addressed in our suggested roadmap.

The most pragmatic approach involves targeting LPG subsidies to poorer households while encouraging wealthier and middle-class urban households to adopt induction stoves, potentially with capital subsidies to improve political acceptance of the shift. Rapid adoption by these higher-income groups could significantly reduce overall LPG consumption, even if fuel-stacking—using multiple cooking fuels concurrently—persists. Over time, it makes financial sense to transition all households and small businesses from subsidized LPG to induction, given that the upfront capital costs are repaid over several years through lower LPG subsidies. This pathway would ultimately lead to significant long-term savings.

The roadmap can also help to

- free up subsidy budgets that could be redirected to solutions for households that are still without access to clean cooking;
- create mass demand that would, in turn, foster economies of scale in manufacturing and markets, driving innovation and reducing prices for induction, which would lead to cheaper and better products being available for lower-income households;
- support electricity infrastructure and pricing policies that can also facilitate broader end-use electrification (cooling, batteries, rooftop solar, and electric vehicles); and
- reduce the long-term emissions intensity of cooking by adding more renewable energy to the grid.

Transitioning to non-fossil cooking solutions requires a multidimensional approach that addresses gender equity, accessibility, education, financial support, and policy readiness. One major challenge is that both LPG and induction cooking have difficulty in reaching remote and rural households without ready access to distribution networks or the grid. Identifying solutions for this group was beyond the scope of this project. Collaborative efforts across stakeholder groups, comprehensive infrastructure development, and tailored regional strategies are essential to overcome the existing barriers and ensure a just and sustainable energy transition.



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Appendix. Descriptive Statistics for Households Surveyed in the Induction Pilot Program

Variable	Description	Category or statistic	% in each category or mean		
			Java	Bali	Total
Gender	Gender of respondents	Men	29.27	49.15	41.00
		Women	70.73	50.85	59.00
Age	Age of respondents	Mean	49.2	49.0	49.1
Education	Highest level of education achieved	Elementary school	24.39	11.86	17.00
		Junior high school	19.51	11.86	15.00
		Senior high school, college, or university	56.10	76.27	68.00
Employment	Working	Percentage working	58.54	77.97	70.00
Consumption	Consumption per month	<IDR 1,500,000	14.63	6.78	10.00
		IDR 1,500,001–IDR 3,000,000	63.41	66.10	65.00
		IDR 3,000,001–IDR 4,500,000	17.07	18.64	18.00
		IDR 4,500,001–IDR 10,000,000	4.88	6.78	6.00
		>IDR 10,000,000	0.00	1.69	1.00
Size	Household size	2 people	12.20	11.86	12.00
		3–4 people	63.41	52.54	57.00
		5–6 people	21.95	28.81	26.00
		7–8 people	2.44	6.78	5.00



Variable	Description	Category or statistic	% in each category or mean		
			Java	Bali	Total
Status	Status of home ownership	Owned	73.17	76.27	75.00
		Rented	7.32	8.47	8.00
		Owned by parents/other	19.51	15.25	17.00
Electrical connection	Capacity of household electricity connection	450 VA	41.46	18.64	28.00
		900 VA	53.66	44.07	48.00
		1,300 VA	4.88	0.00	2.00
		2,200 VA	0.00	11.86	7.00
		3,500 VA–5,500 VA	0.00	25.42	15.00
Reliability	Reliability of electricity supply	Usually	9.76	0.00	4.00
		Seldom	63.41	62.71	63.00
		Never	26.83	37.29	33.00

Source:

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