

## THE BOTTOM LINE

Adoption of liquefied petroleum gas as a clean cooking solution is lagging behind Kenya's 2030 development goal, despite several government initiatives taken along the LPG value chain. The government's strategy has so far focused on reducing the cost of LPG and increasing its use among lower-income Kenyans. Sustainable uptake might be accelerated by taking vigorous regulatory steps to reduce the consumer price and minimize unlicensed LPG sales, reviewing the economics underpinning the intervention scheme, creating an enabling environment for LPG adoption by upper- and middle-income groups, developing annual uptake targets, and devising a better metric for measuring progress toward those targets.

## Kenya's Strategy to Make Liquefied Petroleum Gas the Nation's Primary Cooking Fuel

**Will Kenya meet the 35 percent target it has set for adoption of LPG as a cooking fuel by 2030?**

**A low level of use and high end-user price currently cloud the outlook**

Universal access to modern energy services by 2030 is one of the three goals of the Sustainable Energy for All (SE4All) initiative launched by the United Nations in 2011. After Kenya joined SE4All in 2012, a stocktaking revealed that Kenyans relied predominantly on traditional sources of cooking energy. About 84 percent of the population cooked with solid fuels (wood, charcoal, or agricultural residue), and 5 percent used kerosene. Cooking with these fuels affects the health of millions of Kenyans while causing environmental and social damage. An estimated 15,000 Kenyans die each year from air pollution, and at least 40 percent of childhood deaths are caused by respiratory illness.<sup>1</sup> Meanwhile, wood resources are being depleted faster than they can be replenished. (Between 1990 and 2005, Kenya lost 5 percent of its forest cover.) Wood fuel production, household cook stoves, and heating technologies are generally inefficient and wasteful.

To deal with the problem, Kenya's government set a long-term goal of having 42 percent of households adopt clean cooking fuels. The goal was embedded in Kenya's Vision 2030 Second Medium-Term Plan (2013–17) in alignment with the SE4All country action agenda. Liquefied petroleum gas (LPG) was to contribute 35 percent, biofuels 5 percent, and electricity 2 percent. A strategy was

developed to reduce the cost of LPG and thereby expand its use among lower-income Kenyans.

The government converted the 35 percent goal into a benchmarked per capita consumption target of 15 kilograms of LPG per year by 2030—a sharp expansion from a baseline of just 2 kilograms in 2013 (table 1). Africa's average LPG consumption is 3 kilograms per capita per year. South Africa, whose economy is roughly the size of Kenya's, consumes much more: about 6 kilos per capita per year (as of 2015). As a result of effective government intervention, Senegal and Ghana, whose economies are smaller than Kenya's, consume between 5 and 10 kilos per capita per year.

Even in Kenya's top income quintile, only 10 percent of consumers use LPG, compared with 45–85 percent in comparable African countries. In the other quintiles less than 2 percent use it. Most Kenyans living in rural areas—which means most Kenyans—do not pay for their cooking fuel, as they tend to gather their own firewood. The largest potential market segment is formed by upper- and middle-income households living in urban areas.<sup>2</sup>

LPG is expensive in Kenya relative to the cost of competing fuels (table 2). No recent analysis has been done to persuade Kenyans of the energy cost efficiency of LPG. But in 2013 the cost of one year of cooking with LPG (approximately \$350) was much higher than the cost of cooking with kerosene (\$200) or coal (\$150). In 2017, kerosene (inclusive of value-added tax, VAT) was still cheaper than LPG (which is now exempt from VAT).



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<sup>1</sup> According to the 2016 Global Burden of Disease study, the figure was 16,600.

<sup>2</sup> According to Dalberg–GLPGP (2013), lower-income households have an income of less than K Sh 10,000/month; middle-income households, between K Sh 10,000 and 40,000; upper-income households, more than K Sh 40,000/month. US\$1 ≈ K Sh 100.

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**Table 1.** Actual and projected LPG consumption, 2013–30

	Actual				Target				
	2013	2015	2016	2017	2017	2022	2026	2027	2030
Kilograms per capita	2	~2.1	~2.8	—	—	—	—	—	15
Thousands of metric tons (including industry)	60	149	174	64 (est.)	—	—	~1,100	—	—
Percentage of households	9	—	—	—	14	19	—	26	35
Percentage of population	5	—	< 7	—	—	—	—	—	—

Source: SE4All Kenya Action Agenda, Kenya National Bureau of Statistics, World Bank/WHO, PDC, Dalberg–GLPGP.

— = data not available. (The Kenya National Bureau of Statistics has not released 2018 consumption data.)

**Table 2.** 2017 retail prices of various cooking fuels

Monthly average	
Fuel	Price
Firewood	Free (if collected)
Charcoal	~ K Sh 81 for a 4 kg tin (K Sh 20/kg)
Kerosene	~ K Sh 67/liter
LPG	~ K Sh 160/kg (K Sh 82/liter )

Source: Kenya National Bureau of Statistics.

**Table 3.** Cost breakdown of LPG price, 2013

Cost item	US\$/ton	Share of total price (%)
Landed supply cost	1,466	61.9
Global reference price	808	34.1
Shipping cost	380	16.1
Storage	278	11.7
Bulk transport	82	3.5
Filling	70	3.0
Margins	750	31.7
Dealer	350	14.8
Distributor	205	8.7
Retailer	195	8.2
	2,368	100.1

Source: Dalberg–GLPGP (2013).

Note: Shares do not add to 100 percent because of rounding.

Several factors contribute to the high consumer price. Apart from fluctuations in the international import price, the landed supply cost is persistently high owing to the absence of an open tender system for bulk storage of LPG, and the margins retained by dealers, distributors, and retailers are unusually high (table 3). To this must be added the substantial costs consumers pay for their cylinders, the stove, and accessories needed to use the gas.

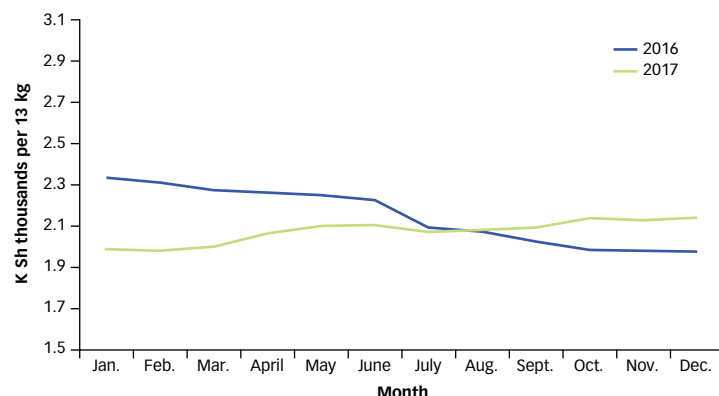
The top five of Kenya's 44 licensed LPG dealers account for about 80 percent of the market. Cylinders are available in 1, 3, 6, 13 kilogram sizes. Seventy percent of current demand is for the 6 kilogram size; 20 percent for the 13 kilogram size. Small, inexpensive burners fit on 6 kilogram cylinders, but the 13 kilogram size requires a more expensive stove. Because the larger cylinders are heavy and refilling points are few, consumers also face the expense of transportation to have their cylinders refilled.

Most retailers raised their prices by 15 percent in early 2017, following a global surge in gas prices (figure 1). Retail prices in the first quarter of 2018 remained where they stood at the end of 2017. The 2017 monthly average retail price was about \$1.6/kg. A 6 kilogram cylinder costs about \$26. No recent breakdown of the components of the retail gas price has been performed, but a 2013 breakdown concluded that margins accounted for nearly 32 percent and landed supply costs for a disproportionately high 62 percent (table 3). A current cost breakdown would likely show similar results, though with a lower global reference price than in 2013.

The consumer price of LPG has been deregulated since 1994. However, regulations that took effect in 2009 (based on the 2006 Energy Act) permit the retail price to be regulated, and a new Energy Bill, not yet enacted, provides for wholesale price regulation.

Uptake is presently measured as a percentage of consumers (individuals and households) using LPG, but this metric reflects neither the intensity nor the sustainability of LPG use. Nor does it account for the simultaneous use of multiple fuels, a practice known as fuel stacking. Therefore, the measure tells us little about reductions in the use of traditional cooking fuels.

**Figure 1.** Retail price of LPG by month, 2016 and 2017



Source: Kenya National Bureau of Statistics.

Note: US\$1 ≅ K Sh 100.

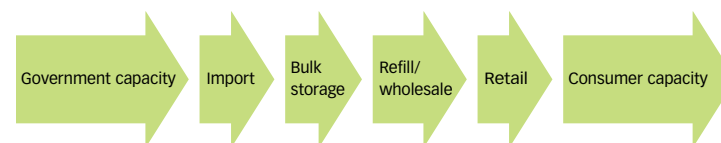
Under the principal decree of the LPG Exchange Pool regulation, resellers and dealers belonging to the pool must sell LPG in standardized cylinders fitted with uniform safety valves, which promote price competition by enabling consumers to have their cylinders refilled at any retail station. Retailers are required to return cylinders not bearing their own brand to a central depot, where they can exchange them for cylinders belonging to their own “fleet.” Each pool member is responsible for maintaining its licensed cylinder fleet (as before 2009).

### How has the strategy fared?

**Multiple challenges persist along the relatively long and complex LPG value chain—including inconsistent measures to track uptake, a high consumer price, ineffective regulation, and low popular awareness of LPG’s advantages**

Kenya’s LPG value chain is long and complex, extending from the government as strategist and planner through importation, bulk storage, wholesaling, and retailing before reaching the consumer (figure 2). Consumer receptivity hinges, of course, on their awareness of LPG’s advantages and willingness to alter longstanding cooking

**Figure 2.** The LPG value chain in Kenya



Source: Dalberg–GLPGP (2013), with author’s modifications.

and heating practices, but also (and critically) on their ability to afford both the fuel and the stoves that burn it.

Uptake is presently measured as a percentage of consumers (individuals and households) using LPG, but this metric reflects neither the intensity nor the sustainability of LPG use. Nor does it account for the simultaneous use of multiple fuels, a practice known as fuel stacking. Therefore, the measure tells us little about reductions in the use of traditional cooking fuels. Because data on quantities of LPG consumed (reported in table 1) include industrial use and are affected by irregularities in the refilling of cylinders, the apparent upward trend in consumption until 2017 is not reliable enough to justify a conclusion of sustainable adoption of LPG as cooking fuel. Indeed, the 2017 price and sales figures (reported in tables 1 and 2) suggest a contrary conclusion.

The price remains high in part because, as noted, Kenya has no properly functioning open tender system for bulk storage of LPG (as it does for other petroleum products). Bulk storage for imported volumes is limited, and handling in port is dominated by a single firm. Compounded by inadequate inland storage, the insufficient bulk storage capacity has resulted in the importation of shipments of uneconomic size. Together, these factors explain the high landed supply costs that raise prices to Kenyan consumers.

Uptake is further undercut by the weak enforcement ability of the relevant regulatory authority. Its enforcement power is weak because the legal status of the exchange pool is not clearly defined in the 2006 Energy Act and because of the absence of any system for tracking cylinders bearing various dealer brands, which makes it impossible to monitor compliance with the cylinder-exchange requirements upon which effective competition, as well as safety, depend. The threshold for becoming a member of the pool is just

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An audit is needed to understand the cost components behind the LPG retail price and to support the introduction of a regulatory pricing model. Once that is done, publication of indicative LPG pricing (and reasonable margins) will encourage price competition among brands and raise consumer awareness. If the implementation of an open tender system does not lower retail prices, price caps could be considered. Revisions to the LPG Exchange Pool Regulation should introduce a cylinder tracking system and raise the threshold for participation in the exchange pool to reduce irregularities in refilling.

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5,000 cylinders. Given the low cylinder threshold for pool participation, combined with the relatively long household turnaround time, the current regulation has resulted in some illegal cross-filling of cylinders not bearing the brand of the firm that initially filled them.

The poorly regulated cylinder exchange system (with certain retailers slow to follow through with required exchanges) undermines the surveillance of cylinder maintenance and threatens the viability of dealers with small fleets of cylinders. Irregularities in refilling and poor cylinder maintenance have led to fatal accidents.

Because of the foregoing problems, LPG is perceived by many Kenyans as less safe than other fuels and more suitable for the wealthy. The data available to address safety-related perceptions are limited; meanwhile, LPG's high price relative to that of traditional fuels reinforces some of the negative price perceptions. The better educated (particularly women) are more favorably disposed toward LPG, but Kenya still lacks a critical mass of well-educated people.

### What is Kenya's government doing to meet these challenges?

#### **Projects are under way to improve the government's capacity to revise the legislative framework surrounding LPG, to lower the price of the fuel, to manage the LPG subsidy campaign, and to remedy deficiencies in the supply, distribution, and storage infrastructure**

In early 2015, the Ministry of Energy and Petroleum embarked on a six-year World Bank-funded technical assistance project (dubbed KEPTAP) to strengthen its capacity to manage the petroleum sector. Several reforms and capacity-building actions, including the development of an LPG distribution model and public awareness plan, are being pursued. An agency working group was established in 2016 and a review of regulations affecting LPG was scheduled for 2017. The 2017 electoral campaign delayed enactment of the new Energy Act and revision of the related regulations (including the LPG Exchange Pool decree) until 2018.

Kenya's entire supply of liquefied petroleum gas (LPG) has been imported since production at the Mombasa refinery, which had met half of domestic demand, was halted in 2013 so that the refinery could be renovated. Eight percent of Kenya's LPG is imported overland from neighboring Tanzania; the remaining 92 percent comes in through two terminals at the port of Mombasa, most of it through the privately owned terminal.

The private terminal has a bulk storage capacity of about 26,000 metric tons and a temporary floating facility of 14,000 metric tons. The closed Mombasa refinery and the publicly owned terminal are able to store just 3,000 metric tons. So far the government has not opted to create a national buffer stock, though doing so would enable it to stabilize prices—for example, in the case of unforeseen supply shortfalls.

Additional storage facilities (port and inland), a new jetty, and a supply pipeline are scheduled to be completed by 2019. Looking further out, the import storage capacity is slated for further expansion. In the meantime, overland Tanzanian imports equivalent to about 40,000 metric tons per year were suspended in mid-2017 to minimize illegal cross-border trade.

The VAT on LPG was cut from 16 percent to zero in mid-2016, but a 16 percent VAT and 25 percent import duty still apply to cylinders and accessories (gauges, valves, hoses). High-efficiency cook stoves are subject to a lower VAT than less-efficient models. To make kerosene less cost-competitive, a further increase from the current 15 percent VAT is being considered.

Since 2016, pilot projects have tested smaller sizes bottles, non-metal cylinder fabrics, and the use of mobile phone tokens for refills and down payments. Evaluations of these pilots are ongoing.

A government program—the Mwananchi gas project—to subsidize the cost of cylinders was launched in July 2017 (figure 3). Under the multi-year program, between 5 and 15 million cylinders (1.2 million cylinders per annum), each fitted with a cooking stove, are to be provided to low-income families.<sup>3</sup> The subsidy covers 60 percent of the price for the package. Implementation of the program has been entrusted to the National Oil Corporation of Kenya, but, in

<sup>3</sup> The current national fleet of cylinders numbers no more than four million. As many as fifteen million new cylinders may be needed to meet the 35 percent adoption target.



Until the retail price of LPG has been brought down substantially, it is unlikely that lower-income Kenyans will sustainably switch to LPG even after receiving a subsidized cylinder. For now, therefore, upper- and middle-income consumers are the primary groups to target.

**Figure 3.** An advertisement for Kenya's new subsidized LPG program



Source: National Oil, <https://nationaloil.co.ke/gas-yetu-the-mwananchi-gas/>.

view of the company's small share of the LPG market (5 percent), its capacity will have to be expanded to execute the program. The cylinder subsidy project is expected to be financed from what remains of the former kerosene subsidy fund.

### What could the government do differently to accelerate sustainable LPG uptake?

**More-stringent regulation, a long-term economic view, annual targets using a single uptake metric, and expanding the market among higher-income groups are the places to start**

Kenya's government can put its lagging LPG adoption program back on track to achieve the country's clean cooking goal by 2030. To do so, it should consider some or all of the following recommendations.

**Take strong regulatory steps to bring down the retail price and minimize unlicensed LPG sales.** An audit is needed to understand the cost components behind the LPG retail price and to support the introduction of a regulatory pricing model. Once that is done, publication of indicative LPG pricing (and reasonable margins)

will encourage price competition among brands and raise consumer awareness. When the common import storage facility is completed, an open tender system will introduce competitiveness and may bring down the landed supply cost. If reduction in the landed cost does not decrease the retail price, retail price caps could be considered. Revisions to the Exchange Pool Regulation should introduce a cylinder tracking system and raise the threshold for participation in the exchange pool to reduce irregularities in refilling.

**Review the economics underpinning the intervention scheme.** The commercial viability of the infrastructure projects and the cylinder subsidy program, as well as the potential of the fiscal revenue stream along the value chain, need to be clarified. Various actions and conditions—notably the rollout of an open tender system for imports upon completion of the infrastructure projects and the distribution of 15 million subsidized cylinders—should be synchronized to optimize revenue and effectiveness.

**Promote demand for LPG among upper- and middle-income consumers.** Until the retail price of LPG has been brought down substantially, it is unlikely that lower-income Kenyans will sustainably switch to LPG even after receiving a subsidized cylinder. In the meantime, the 2015–16 National Household Budget Survey (released in March 2018) and an energy cost efficiency analysis of all cooking fuels should drive the methodology to make LPG attractive to as many consumers as possible.

**Develop annual targets and a clear metric to track progress in LPG uptake and to make possible timely changes to the implementation program.** The deepening of LPG use should be tracked in terms of consumption per capita. The 2019 census will verify actual population growth over the level assumed in 2013. On that basis, a target should be developed for yearly total demand to 2030. Integrating the per capita rates thus set with the country's national plans, beginning with the Third Medium-Term Plan (2018–22), will foster performance tracking and timely adaption of execution plans.

## MAKE FURTHER CONNECTIONS

Live Wire 2015/46. "Results-Based Financing to Promote Clean Stoves: Initial Lessons from Pilots in China and Indonesia," by Yabei Zhang and Norma Adams.

Live Wire 2016/62. "Toward Universal Access to Clean Cooking and Heating: Lessons from the East Asia and Pacific Clean Stove Initiative," by Yabei Zhang and Norma Adams.

Live Wire 2016/63. "The Lao Cook Stoves Experience: Redefining Health in the Lao Population through the Energy Sector Lens," by Rutu Dave and Rema N. Balasundaram.

Live Wire 2016/64. "Contextual Design and Promotion of Clean Biomass Stoves: The Case of the Indonesia Clean Stove Initiative," by Laurent Durix, Helene Carlsson Rex, and Veronica Mendizabal.

Live Wire 2017/74, "Increasing the Use of Liquefied Petroleum Gas in Cooking in Developing Countries," by Richenda Van Leeuwen, Alex Evans, and Besnik Hyseni.

Find these and the entire Live Wire archive at <https://openknowledge.worldbank.org/handle/10986/17135>.

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## Acknowledgments

*I would like to express my gratitude to the task team leaders of the Kenya Petroleum Technical Assistance Project, Alexander Huurdeman and David Reinstein, who provided me with their valuable support. Furthermore, I am thankful to Masami Kojima and Richard Hosier, senior energy specialists at the World Bank, who offered their expertise.*

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