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# Domestic LPG interventions in South Africa: Challenges and lessons

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## HIGHLIGHTS

- LPG has replaced earlier combustion fuels as preferred energy for cooking.
- Fast cooking, cleanliness and saving on electricity bills are the key benefits.
- The demand for LPG has stimulated economic models for supply and delivery.
- Periodic shortages and non-adherence to price caps deter market expansion.

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## ABSTRACT

A majority of grid-connected households in South Africa use electricity for cooking and heating tasks. This thermal intensive use of electricity has a high load factor and is a contributory factor of electricity demand outstripping supply at peak demand periods. The government has promoted liquefied petroleum gas (LPG) as an alternative thermal energy source for household cooking and heating. This study evaluates the long-term successes, challenges and social impacts of an LPG intervention project that was piloted in Atteridgeville Township, a typical low-income suburb. The data was gathered through one-on-one household interviews with a sample of the beneficiaries. The results indicate that seven years after the LPG intervention, about 70% of the beneficiaries continue to use LPG and report that the intervention has improved their welfare. Fast cooking is cited as the key tangible benefit of LPG technology in households, followed by saving on electricity bills. The project would have achieved more success through better community engagement, including strict beneficiary selection criteria; a long-term LPG distribution and maintenance plan; and inclusion of recurring monthly LPG subsidies for indigent households. The study discusses the subset of factors necessary for successful rollouts of similar energy projects.



## 1. Introduction

### 1.1. Background to the study

A majority of grid-connected households in South Africa use electrical power for nearly all of their domestic energy requirements. Although electricity is a clean energy carrier at the point of use, in South Africa electricity generation is primarily from coal power stations and thus has a high carbon footprint (Alton et al., 2014). Furthermore, the use of electricity for cooking and heating has a high power factor and tends to strain local power grids at peak periods (evenings). Recent grid-power shortages necessitate the application of the available electricity supply to sectors that will contribute the most to socio-economic growth, such as powering industries and commercial ventures, or household lighting and media power. Liquefied petroleum gas (LPG) is a feasible alternative for clean household cooking and heating that could reduce the dependence on electricity for these tasks.

National energy access surveys in South Africa show transitions away from solid fuels and paraffin, the “dirty” fuels being substituted with electricity (Department of Energy [DOE], 2012a; Statistics South Africa, 2011). These trends are attributed to high electrification rates of townships (low-income suburbs) following the 1994 democratic transition, and rising incomes. However, alternative clean fuels such as LPG and liquid biofuels are yet to achieve widespread adoption as substitute energy carriers for domestic cooking and heating purposes. It is now apparent to policy makers that electrification alone will not solve all

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residential energy needs, thus the necessity for alternative energy for thermal applications. The demand for LPG in South Africa, as an alternative domestic energy carrier, is set to increase due to vigorous promotion, rising electricity tariffs and the now frequent electrical load shedding schedules.

In view of the above, the South African Government has initiated discussions and trial projects that promote LPG uptake through tackling affordability, supply inadequacies and user misconceptions concerning the safety of gaseous fuels. The biggest motivation for fast tracking the switch to LPG for household cooking and heating has been the rolling blackouts that started in 2005. Consequently, LPG intervention projects were pioneered by the Department of Energy (DOE) and Eskom in Western Cape and Gauteng provinces (Mohlakoana and Annecke, 2009), mainly as a demand management measure. The projects have achieved differing measures of success. The scaling up and mainstreaming of LPG interventions is necessary but should be based on research evidence in order to avoid pitfalls, realise maximum value of subsidy funds, and achieve the set objectives.

The LPG intervention projects implemented to date involved giving out free LPG kits (refilled 6 kg gas cylinder, a stove and a heater) in selected townships. The government introduced regulations in 2010 to control the maximum retail price for LPG supplied to residential consumers (DOE, 2013) in order to ensure affordability. These measures were meant to improve the uptake of LPG as a household fuel for cooking and heating. What was not addressed adequately are frequent LPG shortages, especially during winter. The government is considering an LPG expansion strategy that aims to translate 1.2 million households (~8% of the population) from all income groups to use of LPG technology over a period of five years (DOE, 2013). The planned LPG rollout is enshrined in the National LPG Strategy, which is a key component of the South African department of Energy's Strategic Plan (DOE, 2011). The stated main objectives of the LPG Strategy are 'to provide access to safe, cleaner, efficient, portable, environmentally friendly and affordable thermal fuel for all households, and to switch low-income households away from the use of coal, paraffin and biomass to LPG' (DOE, 2011).

The transition to LPG, which holds a vast potential as an alternate clean cooking solution, can be catalysed and sustained by policies and programmes aimed at addressing affordability and accessibility (WLPGA, 2013). Issuing free LPG equipment and, where possible, subsidizing monthly refills can raise LPG consumption, and lead to lower health bills, timesaving and better household economics. Cross-subsidies between high and low-income groups have been suggested as one way of supporting LPG market expansion (D'Sa and Murphy, 2004). Subsidies have been applied effectively to expand residential LPG market in India, Brazil and Indonesia (Jannuzzi and Sanga, 2004; Lucon et al., 2004; Andadari et al., 2014). Government expenditure on LPG should be seen as a social investment, and be smartly targeted to poor households in order to realise the intended health and social benefits (Tripathi et al., 2015). In addition, the user needs and context should be well understood so as to ensure the delivery of intended benefits and meet sponsors objectives (Bellanca and Garside, 2013).

The net cost of providing LPG to half of the world population without access to clean cooking fuels is estimated at only USD 13 billion compared to total economic benefit of USD 91 billion per year (WHO, 2006). This implies that switching to LPG cooking has an impressive benefit-cost ratio of 6.9. Public funds spent in LPG interventions accrue even higher benefits among the poorest communities, where benefit-cost ratios are about 7.8. The benefits emanate largely from savings on health expenditure and, to a lesser extent, on time, environmental and real fuel costs. Furthermore, the fire-safety and indoor air pollution problems associated with LPG use are estimated to be only a tenth of those related to kerosene (paraffin) (WLPGA, 2013). The WHO analysis is based on estimated world population at the end of 2015 with the data disaggregated to rural and urban households (Hutton et al., 2006).

This study evaluates the impacts of subsidised LPG intervention in Atteridgeville Township, City of Tshwane metropolis, Gauteng Province, South Africa. The project was implemented amongst households situated in socioeconomic bands *LSM 2-4* (Living Standards Measure), the lower end of the income range. The study interrogates the following issues through quantitative household interviews: How the beneficiaries received the project? How many households out of the initial beneficiaries have adopted and retained the intervention? Why and why not? What barriers exist that inhibit widespread adoption of LPG in the study area? Whether the intervention has reduced household energy burden and improved on safety? What are preferences of residents on future household energy choices and distribution models? The data allows for cross comparisons between fuel and technology choices and socioeconomic variables, such as the respondents' level of education and income. The issues explored will generate useful information that could be used to improve future energy access programmes.

### 1.2. Residential energy policies for indigent support

There are two policy instruments in South Africa to support energy provision for indigent households. These are the *Free Basic Electricity* (FBE) and the *Free Basic Alternative Energy* (FBAE) schemes, anchored in the Energy Policy White Paper of 1998. The indigent policy instruments were enacted in 2003 as a means to redress the inequities of apartheid-era energy provisions (DME, 2003; Winkler, 2006). The indigent policy aims at providing a quantum of free basic energy for indigent households, not necessarily on clean energy carriers. The National Treasury transfers funds to local municipalities as implementing agents, who allocate expenditure through a mechanism known as the *Local Government Equitable Share* system. The indigent policies have been entrenched in the National Development Plan '*Vision 2030*', which entails an energy sector that promotes social equity through expanded access to energy services with affordable tariffs and targeted subsidies for poor households (National Planning Commission, 2011).

In terms of Section 227 of the South African Constitution (Act No. 108 of 1996), local governments are entitled to an equitable share of nationally raised revenue (Fanoe, 2013). The LGES funds are proportional to the number of identified indigent residents in the municipality. LGES funds are intended to support the provision of free basic services to indigent households, defined as households earning less than ZAR2 300 (2011 prices) per month (Fanoe, 2013). The income threshold is based on the combined value of two state old age pensions. About 60% of South African households fall into below this threshold. The basic subsidy per month for each household is ZAR275, apportioned as water–ZAR86; sanitation–ZAR72; *energy*–ZAR56 and refuse removal–ZAR60. Indigent households situated in some wealthier municipalities receive an extra ZAR50 to cover electricity expenses.

The number of households receiving FBE has been declining mainly due to better targeting as municipalities reduce the number of non-poor households receiving FBE (Fanoe, 2013). In 2011, 2.5 million households were recorded on the FBE registers and 160,000 were recorded as Free Basic Alternative Energy (FBAE) beneficiaries. FBE subsidises electricity consumption only while FBAE assists off-grid households with alternative energy sources such as LPG.