



The Role of LP Gas in Meeting the Goals of Sustainable Development



An Executive Summary of the New Report

ENERGY AND SUSTAINABLE DEVELOPMENT

Finding ways to expand energy services to poor households in developing countries, while simultaneously addressing the environmental effects of energy production and use, is one of the most pressing challenges facing the world today.

Energy is implicated deeply in all three pillars of sustainable development - the economy, social welfare and the environment. Although there are no near-term resource limits to energy supply, today's global energy system is not compatible with economic, social and environmental sustainability in the long-term. A lack of access to reliable and affordable energy undermines economic development in many parts of the world. The detrimental environmental consequences of energy production and use around the world threaten the stability of ecosystems and the health and well being of current and future generations. In addition to creating local and regional pollution, rising fossil fuel use in all regions carries the long-term risk of disrupting climate as a result of emissions of greenhouse gases that trap heat in the earth's atmosphere.

Moreover, modern fuels are not universally available. An estimated two billion people in the world do not yet have access to modern fuels.

Around one-quarter of all energy consumed in developing countries is derived from the burning of wood, charcoal, crop residues and animal dung. In the poorest countries, households rely almost exclusively on such traditional fuels. People - most often women and children - can spend a long time gathering these fuels, reducing the time they can devote to productive agricultural activities and education and holding back economic and social development. This inequity has important moral and political implications. Finding ways to expand energy services to poor households in developing countries, while simultaneously addressing the environmental effects of energy production and use, is one of the most pressing challenges facing the world today.

THE CONTRIBUTION OF LP GAS TO SUSTAINABLE ENERGY DEVELOPMENT

LP Gas is already playing an important role in steering both industrialised and developing countries onto more sustainable energy development paths. It contributes to strengthening the three pillars of sustainable development: the economy, by boosting productivity; social welfare, by improving living standards and enhancing safety; and the environment, by reducing indoor and outdoor pollution.

Of all the modern fuels available today, LP Gas, which consists mostly of propane and butane, is particularly well suited to domestic cooking and heating uses because of its clean-burning attributes and practical advantages over traditional fuels and kerosene. In particular, it is more convenient, safer and cleaner. It is also highly portable and has a high calorific value by volume and mass. Households recognise these advantages and are usually prepared to pay a premium for LP Gas over other fuels, if their incomes are high enough.

Switching from traditional fuels, coal and kerosene to LP Gas is bringing considerable health and environmental benefits at the local, regional and global levels. Indoor pollution, which mainly affects women and children, is greatly reduced. Urban air pollution and emissions of climate-destabilising greenhouse gases from LP Gas, calculated on a fuel-cycle basis, are lower than from most other fossil fuels and traditional fuels used in an unsustainable way. By reducing demand for wood and charcoal, switching to LP Gas can also reduce deforestation and can free up supplies of dung for use as a fertiliser and a soil enhancer, enhancing agricultural productivity. LP Gas is also safer than most other fuels, especially kerosene. Switching from conventional transport fuels to LP Gas (autogas) can also make a major contribution to reducing airborne emissions in both developing and developed countries.

Efficiencies and Airborne Emissions for Household Cooking Stoves, India

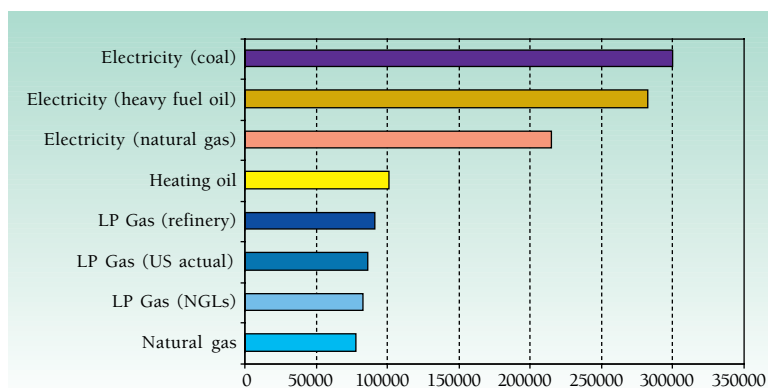
Fuel	Overall stove efficiency (%)	Emissions (g/MJ delivered energy)				
		CO ₂	CO	Methane	TNMOC*	N ₂ O
LP Gas	53.6	126	0.61	Neg.	0.19	0.002
Biogas	57.4	144	0.19	0.10	0.06	0.002
Kerosene	49.5	138	1.9	0.03	0.79	0.002
Woodfuel	22.8	305	11.4	1.47	3.13	0.018
Crop residues	14.6	565	36.1	4.13	8.99	0.028
Charcoal	14.1	710	64.0	2.37	5.60	0.018
Dung cake	10.0	876	38.9	7.30	21.80	0.022

* Total non-methane organic compounds.

Source: US Environmental Protection Agency data cited in Smith et al (1998).

The environmental benefits of switching to LP Gas from traditional fuels and most other fossil fuels can be considerable. It produces virtually no soot (particulate matter, PM) and, relative to most other non-renewable fuels, low emissions of carbon monoxide (CO), unburned hydrocarbons (HC) and oxides of nitrogen (NO_x) - the principal precursors of ozone, which produces smog. There are negligible emissions of toxic gases that can cause serious health problems if breathed in close to the point of combustion, which makes LP Gas highly suitable as a household cooking fuel. Fuel-cycle emissions of CO₂, a greenhouse gas and the primary source of global warming potential, are also lower than most other fossil fuels and traditional fuels used in unsustainable ways.

Fuel-Cycle CO₂-Equivalent Emissions for Space and Water Heating (g/Mbtu of useful heat)



Note: CO₂-equivalent emissions include methane, N₂O, TNMOCs, CO, NO₂ and particulate matter, and are calculated using their global warming potentials. Source: Delucci (1999).

THE TRANSITION TO MODERN FUELS

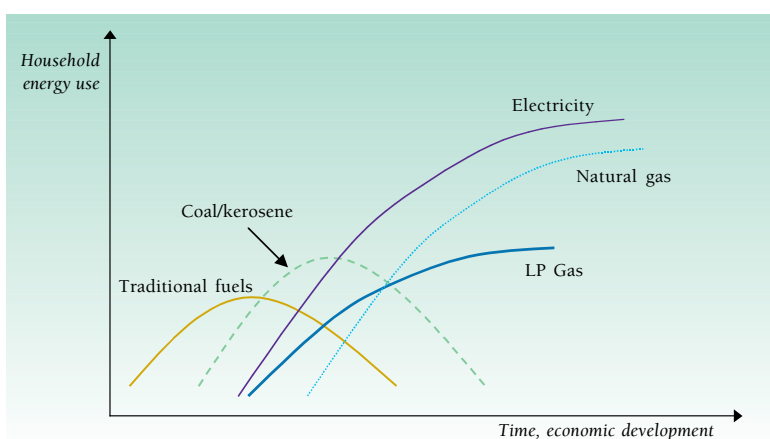
In the absence of strong government measures to increase the availability and affordability of modern fuels, an increase in their use depends largely on rising household incomes. Initially, there is a shift from woodfuel, straw and dung to charcoal and intermediate modern fuels such as kerosene and coal. As incomes rise further, the use of advanced modern fuels such as LP Gas, natural gas (where available in urban areas) and electricity expands.

In the typical household, LP Gas represents a phase in the transition to advanced modern fuels, replacing traditional fuels and kerosene. In most countries, this transition is virtually complete at per capita household incomes of more than US\$2 000. Where natural gas becomes available through the establishment of local distribution networks as the economy matures, LP Gas is itself usually displaced to a large degree by natural gas. However, LP Gas often remains the main fuel for residential/commercial heating and cooking in areas remote from the natural gas grid. In most developing countries, the distribution of natural gas to residential customers is unlikely to become widespread for many years, if ever.

The initial stage of switching from traditional fuels or kerosene to LP Gas in developing countries typically involves the use of a cylinder attached to a simple burner. As familiarity with LP Gas grows and incomes rise,

the user may install a modern cooker inside the home, possibly with the gas supplied by rubber pipe from a cylinder placed outdoors or in a separate room. Later, hot water and/or a refrigeration system may be added. In remote rural communities, LP Gas can also be used to power electric generators, although diesel is generally a more economic option. LP Gas can also be used in conjunction with renewable technologies for decentralised power generation, to meet loads that may be beyond the capacity of the renewable system or as back-up fuel where intermittence may be a problem.

Household Energy-Use Life Cycle



Source: Menecon Consulting analysis.

PROSPECTS FOR LP GAS

The role of LP Gas in meeting sustainable development goals should continue to grow in the future. There is considerable potential for expanding LP gas supply. Global output is expected to rise steadily in the coming years. Production of LP Gas will probably outstrip that of most other oil products, since natural gas processing - now the largest source of LP Gas - is expanding more rapidly than crude oil processing. Reduced flaring of gas will also add to the amount of gas that is processed, boosting the supply of propane and butane.

The residential and commercial sectors in developing countries could absorb a large proportion of this incremental supply. Economic and population growth will most likely continue to drive rapid expansion in this market segment for at least the next decade or two, particularly in urban and peri-urban areas. But the rate of growth in different countries and regions will depend on a number of factors influencing both the availability of and demand for LP Gas. Market conditions and regulatory frameworks will have to be conducive to investment in expanding distribution networks and services to the households sector, particularly in rural areas where LP Gas is not yet available. Demand is mainly driven by its competitiveness against other fuels and its affordability, in turn a function of household incomes and the price of the fuel.

RECOMMENDATIONS TO POLICYMAKERS

Government policies and measures can strongly influence LP Gas market development. There is a good case for government support to the LP Gas sector in developing countries based on the positive contribution the fuel can make to more sustainable energy use. Active government support can catalyse LP Gas market take-off and establish a virtuous circle of growing market potential, increased investment and expanded availability.

- **The provision of energy services should be competitive:** Competition allows consumers to choose between fuels and between suppliers. It promotes service quality and drives down costs.
- **Prices should be set by the market:** All controls over pricing should be removed once competition is established. For as long as the state retains control over pricing, it should adopt import-parity pricing.
- **Taxes should not undermine consumption nor distort the market inadvertently:** Any differentials in tax rates between different household fuels should be justified by legitimate social or environmental arguments. Given the benefits of LP Gas over traditional fuels and kerosene, taxes on LP Gas should be kept to a minimum so as not to harm its competitiveness and discourage its use.
- **Subsidies should be targeted, transparent, practical and temporary:** Where justified, subsidies should be aimed at rural households and the urban poor who would otherwise not use modern fuels. Subsidy programmes should not be unduly costly, taking account of the resources required to administer them and to monitor, prevent and deal with abuse. The financial costs and the channels through which cash payments are made must be fully transparent. On-budget costs should be properly accounted for and the results made available to the public. Subsidies should normally be regarded as a temporary measure to support switching from traditional fuels and should not be kept in place indefinitely.
- **Barriers to market entry should be removed:** Laws and regulations that impede trade and investment, including restrictions on repatriation of profits, should be removed. State-owned enterprises should compete on an equal footing with private companies. Privatisation or private-public partnerships should be considered as a way of attracting private capital.
- **Barriers to switching to modern fuels should be addressed:** Emphasis should be given to subsidising the initial cost of service, where this is a barrier to fuel switching. Subsidies can be used to lower the cost of the cylinder deposit and stove. Support should also be given to micro-credit organisations that help consumers overcome such barriers. At a minimum, financing and banking laws should not erect unnecessary barriers to the development of micro-credit financing arrangements targeted at the poor.
- **Awareness about comparative fuel costs and attributes should be promoted:** Governments should disseminate information and raise awareness among households about the costs and practical benefits of modern fuels compared with traditional fuels.

Contacts for information:

Mourad Belguedj, Lead Energy Specialist, World Bank
mbelguedj@worldbank.org

Emmanuel Chantelot, Managing Director, WLPGA
echantelot@worldlpgas.com

www.worldbank.org

www.worldlpgas.com/sustdev

To order copies of this publication:
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