LP Gas Exceptional Energy for Small Island Developing States

WLPGA

LPG
EXCEPTIONAL ENERGY

The World LP Gas Association

The World LP Gas Association was established in 1987 in Dublin, Ireland, under the initial name of The World LPG Forum.

The World LP Gas unites the broad interests of the vast worldwide LP Gas industry in one organisation. It was granted Category II Consultative Status with the United Nations Economic and Social Council in 1989.

The World LP Gas Association exists to provide representation of LP Gas use through leadership of the industry worldwide.

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LP Gas: Exceptional Energy for Small Island Developing States

A Report on behalf of the World LP Gas Association

Contents

Chapter One

Understanding the Energy Needs of SIDS

Energy is crucial to sustainable development in small island developing states (SIDS) and Liquefied Petroleum Gas (LP Gas) has a central role in achieving that goal. LP Gas is a truly exceptional form of energy – clean, convenient, practical, accessible and affordable – and is ideally suited to the special energy needs of SIDS, notably in complementing renewable energy sources. But policy makers need to act decisively to lower the barriers to the widespread deployment of LP Gas and realise the fuel's full potential.

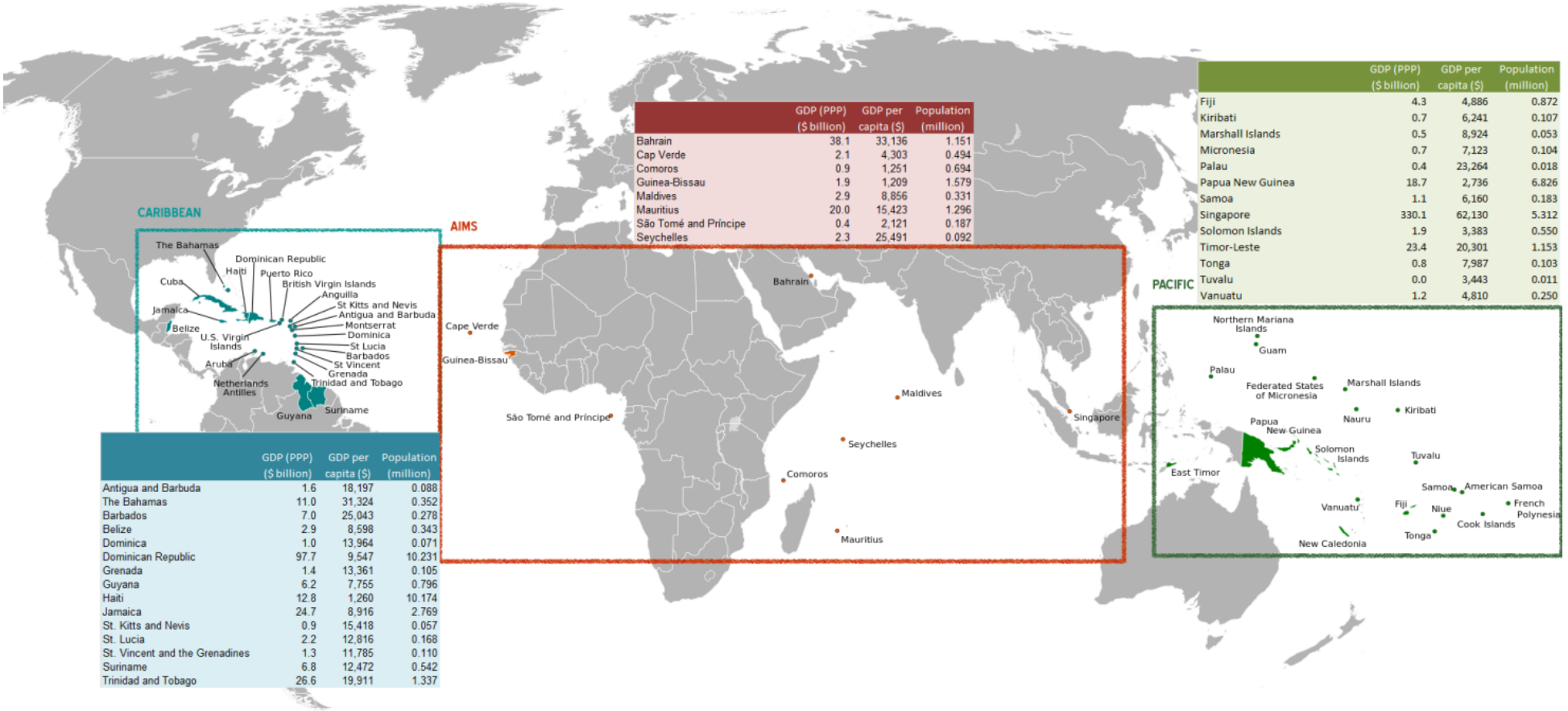
SIDS have special energy needs that call for a special form of energy. With their unique geographical characteristics, SIDS – low-lying coastal countries – face a similar set of social, economic and environmental challenges: small but growing populations, mountainous and archipelagic topography, limited natural resources, remoteness, rising susceptibility to natural disasters, vulnerability to external shocks, excessive dependence on international trade and fragile environments.

Their small size limits economies of scale, which – together with their remoteness – tends to push up energy costs, especially where it has to be imported, and make them highly vulnerable to energy-price shocks. Alongside high communication and transportation costs, logistical constraints and costly public administration and infrastructure, expensive energy holds back their economic growth and stunts development.

Who Are the SIDS?

SIDS were first recognised as a distinct group of developing countries with special developmental challenges at the United Nations Conference on Environment and Development in Rio de Janeiro in 1992. Currently, the United Nations lists 52 SIDS, grouped into three geographic regions (Figure 1): the Caribbean; the Pacific; and Africa, Indian Ocean, Mediterranean and South China Sea (AIMS).

The United Nations has designated 2014 the International Year of Small Island Developing States to celebrate the contributions that this group of countries – home to vibrant and distinct cultures, diversity and heritage – has made to the world and to raise awareness of the UN Conference on Small Island Developing States that will take place in September in Apia, Samoa, which will focus on building partnerships for sustainable development.



	GDP (PPP) ($ billion)	GDP per capita ($)	Population (million)
Antigua and Barbuda	1.6	18,197	0.088
The Bahamas	11.0	31,324	0.352
Barbados	7.0	25,043	0.278
Belize	2.9	8,598	0.343
Dominica	1.0	13,964	0.071
Dominican Republic	97.7	9,547	10.231
Grenada	1.4	13,361	0.105
Guyana	6.2	7,755	0.796
Haiti	12.8	1,260	10.174
Jamaica	24.7	8,916	2.769
St. Kitts and Nevis	0.9	15,418	0.057
St. Lucia	2.2	12,816	0.168
St. Vincent and the Grenadines	1.3	11,785	0.110
Suriname	6.8	12,472	0.542
Trinidad and Tobago	26.6	19,911	1.337

	GDP (PPP) ($ billion)	GDP per capita ($)	Population (million)
Bahrain	38.1	33,136	1.151
Cap Verde	2.1	4,303	0.494
Comoros	0.9	1,251	0.694
Guinea-Bissau	1.9	1,209	1.579
Maldives	2.9	8,856	0.331
Mauritius	20.0	15,423	1.296
São Tomé and Príncipe	0.4	2,121	0.187
Seychelles	2.3	25,491	0.092

	GDP (PPP) ($ billion)	GDP per capita ($)	Population (million)
Fiji	4.3	4,886	0.872
Kiribati	0.7	6,241	0.107
Marshall Islands	0.5	8,924	0.053
Micronesia	0.7	7,123	0.104
Palau	0.4	23,264	0.018
Papua New Guinea	18.7	2,736	6.826
Samoa	1.1	6,160	0.183
Singapore	330.1	62,130	5.312
Solomon Islands	1.9	3,383	0.550
Timor-Leste	23.4	20,301	1.153
Tonga	0.8	7,987	0.103
Tuvalu	0.0	3,443	0.011
Vanuatu	1.2	4,810	0.250

Note: Energy data is not available for all SIDS; for some countries, the data shown is for 2010 where 2011 data are unavailable. LP Gas is classified here as an oil product, even though it comes mainly from natural gas processing and is a gas at atmospheric pressure (no breakdown is available for most countries – see below).

Source: Menecon Consulting analysis based on EIA online data (available at: http://www.eia.gov/countries/).

Figure 1: Economic indicators of SIDS, 2012

Figure 2: Fuel shares in primary energy use in SIDS by country, 2011

Note: Energy data is not available for all SIDS; for some countries, the data shown is for 2010 where 2011 data are unavailable. LP Gas is classified here as an oil product, even though it comes mainly from natural gas processing and is a gas at atmospheric pressure (no breakdown is available for most countries – see below).

Source: Menecon Consulting analysis based on EIA online data (available at: http://www.eia.gov/countries/).

For all their shared characteristics, SIDS differ markedly in some respects, particularly with regard to the size of the population and economy, stage of economic development and average incomes. All these factors contribute to differences in both the level and patterns of energy use (Figure 2). Singapore is by far the richest and biggest energy consumer on a per-capita basis; Comoros and Haiti are the poorest and the smallest energy consumers. With the notable exceptions of Trinidad and Tobago and Bahrain, which are producers of natural gas and oil, incomes and energy consumption are generally highest among the Pacific SIDS.

Most SIDS import the bulk, if not all, of their energy. Many of them rely heavily on petroleum products, largely for transport and electricity generation. This causes pollution, contributes to climate change and imposes a heavy financial burden on the economy. Some SIDS, mainly the poorest among them, make use of significant amounts of indigenous biomass for cooking and crop drying (though this is not always reflected as yet in official data on energy use).1 This also carries an environmental cost – a problem that is aggravated by the generally low efficiency of energy use and the poor quality of the fuels used. Patterns of energy use are remarkably similar across the three SIDS regions: the majority of countries in each region rely solely on oil products and renewable energy sources, with only a few countries using coal or natural gas (typically countries with indigenous production).

1 As part of the UN Sustainable Energy for All initiative, the World Bank and the International Energy Agency have developed a Global Tracking Framework – an initial system for regular global reporting of energy use and access to modern energy services in developing countries (available at http://www-wds.worldbank.org/external/default/WDSContentServer/WDSP/IB/2013/05/23/000442464_20130523110507/Rendered/PDF/778890WP0v10EN0y0Box377317B00OUO090.pdf)

Chapter Two

Why LP Gas is the Fuel of Choice

A co-product of natural gas and crude oil production, LP Gas has unique properties that make it a versatile energy source which can be used in a wide range of applications, from water and space heating, to cooking and to use as an alternative transport fuel. It is already helping to improve the lives of hundreds of millions of citizens worldwide and underpinning efforts to spur social and economic development.

LP Gas has a number of unique properties, which make it an extremely attractive fuel option in SIDS:

2.1 Portable

LP Gas can be transported by sea, rail and road, and stored and used virtually anywhere in the world, including in the remotest most difficult to access SIDS and the communities on them. It does not require a fixed network or massive investment in supply infrastructure. As relatively few rural or remote areas can benefit from piped natural gas, LP Gas is the ideal fuel to generate power for these areas, either as a primary source or in combination with renewable fuels. It can be easily shipped to island communities and, in times of emergency or national disaster, can be crucial to survival.

2.2 Versatile

LP Gas is a multi-purpose fuel. There are more than a thousand applications, from cooking, heating, air conditioning and road transport, to cigarette lighters and outboard motors. LP Gas is well-suited for use in central heating systems, condensing boilers, water-heaters and micro-cogeneration units. It can be made available in a wide variety of packaging and storage options ranging from refillable cylinders to underground tanks.

2.3 Convenient

LP Gas has indefinite shelf life. Unlike some other liquid fuels that gel, stratify or evaporate, it does not deteriorate physically over time – a critical feature for end users in SIDS, where energy deliveries can be infrequent. Traditional fuels can have a short shelf life and must be protected from the weather to prevent deterioration. What's more, LP Gas has ten times the energy content of traditional fuels for the same weight, so storing it takes up much less space.

2.4 Practical

LP Gas is an extremely practical fuel for many applications, notably water heating and cooking, where it is widely regarded as the best fuel regardless of cost. Cooking with LP Gas allows total control, with instant heat and instant 'on/off' controllability.

2.5 Clean

LP Gas is very clean-burning and emits less greenhouse gas, black carbon and other airborne pollutants than any other fossil fuel when measured on a well-to-wheels basis. In particular, it produces substantially less particulate matter and nitrous oxides – a precursor of smog – than diesel, heating oil, kerosene, wood or coal. It is non-toxic and does not contaminate soil or aquifers if accidentally leaked. These characteristics make it particularly effective in reducing household air pollution (HAP) from cooking fires that is responsible for the premature deaths of some 4.3 million people annually according to the World Health Organization (WHO).

2.6 Efficient

LP Gas is a highly efficient fuel, since a high proportion of its energy content is converted into heat in use. LP Gas can be up to five times more efficient than traditional fuels, resulting in less energy wastage, less pollution and better use of our planet's resources.

2.7 Affordable

LP Gas prices have risen with oil prices in recent years, but at a significantly slower rate. The result is that it has become more affordable. It is a cheaper fuel for cooking than electricity and, when the higher efficiency is taken into account, is often a more affordable fuel for heating and cooking than some types of commercial biomass, such as charcoal, and kerosene – the most widely used commercial cooking fuel in poor households in many SIDS. Due to a large amount of product coming to the global market prices are likely to remain relatively attractive as there are enough reserves to last many decades.

Chapter Three

LP Gas is at the Top of the Energy Ladder

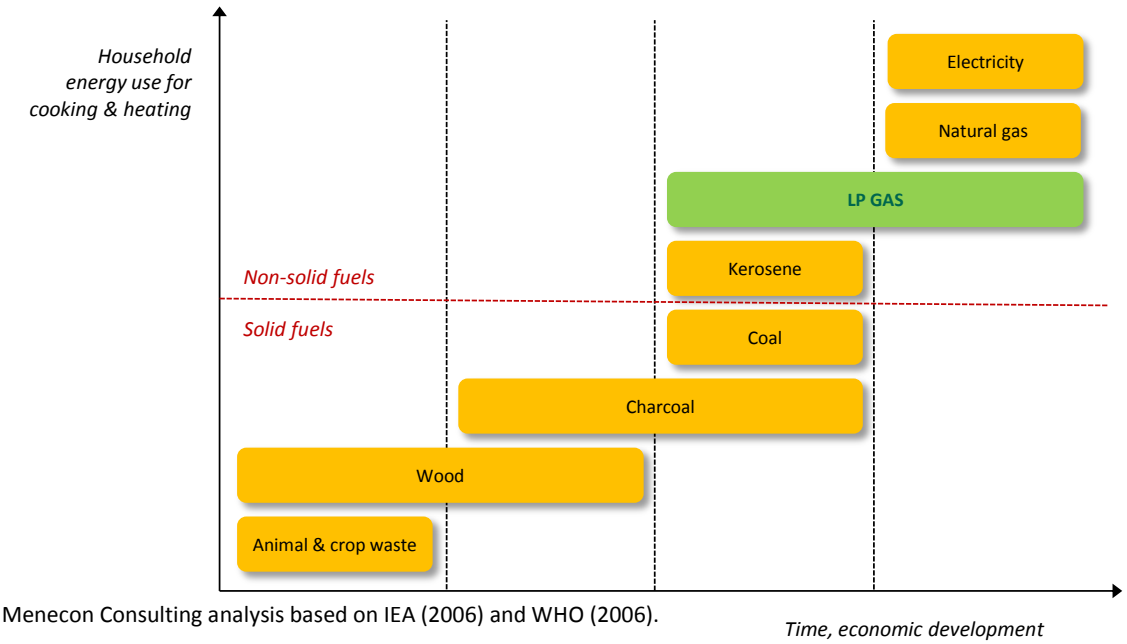
Of vital importance to many of the least developed SIDS is the pressing need to switch away from inefficient and highly polluting fuels. Many people in those countries still rely heavily on traditional biomass – wood, charcoal, agricultural residues or animal waste – and kerosene for cooking on primitive stoves or open fires. The socioeconomic cost is enormous: worldwide, exposure to indoor air pollution from cooking this way causes the premature deaths of an estimated four million people annually from lung cancer, cardiovascular disease, pneumonia and chronic obstructive pulmonary disease, as well as ill-health and the loss of productivity among millions more.

Reliance on traditional fuels also entails a waste of productive time and energy, as traditional fuels usually have to be collected and transported to the home; cooking with biomass is also very slow. And the use of such fuels can also degrade the local environment, as the demand for biomass causes deforestation, the use of animal waste degrades soil quality and burning biomass contributes to local and regional air pollution negatively impacting human health and, to the extent that biomass is used unsustainably, to global warming.

LP Gas and other gaseous fuels, such as natural gas, lie near the top of what has been called the household "energy ladder" or life-cycle (Figure 3). The first step is traditional fuels, followed by wood, charcoal coal or kerosene – both highly polluting and dangerous fuels for cooking and lighting. The final stage is a switch to electricity as well as natural gas and LP Gas, primarily for cooking and heating.

In most parts of the world, there is a strong link between the type of household fuel used and the income level or development status. In poor SIDS, many people cannot afford modern fuels, such as electricity or LP Gas, and still rely on biomass fuels at the lower end of the energy ladder that they can harvest themselves or buy cheaply. Generally, when incomes increase, populations shift up the ladder to liquid fuels (such as kerosene) and eventually to gaseous fuels and, in some cases, electricity for household cooking and heating. Causality works in both directions: rising incomes increase access to LP Gas, but increased use of LP Gas also boosts economic growth and development.

Figure 3: Household Energy Ladder



Source: Menecon Consulting analysis based on IEA (2006) and WHO (2006).

Chapter Four

LP Gas and the Transition to Environmentally Sustainable Energy

LP Gas is a fossil fuel, so burning it emits carbon dioxide (CO_2). Yet it still has a role to play in fighting climate change. That is because LP Gas has a smaller carbon footprint than virtually all the other fossil fuels, whether used for cooking, heating, in industrial uses or as a transport fuel. CO_2 emissions from LP Gas are one-fifth lower than from fuel oil and 50% lower than from coal. LP Gas also generates fewer emissions than gasoline and broadly equivalent emissions to diesel. Switching to LP Gas also helps to reduce black-carbon emissions, which are the second-biggest contributor to global warming and which can cause serious health problems.

Tackling climate changes will probably require all countries – including SIDs – to shift eventually to using predominantly renewable energy, such as wind, solar, geothermal, and ocean energy. Indeed, many SIDS are particularly suited to these options because of their geographical location. But this transition will take time and a lot of investment: For now, these energy sources are, in most cases, far from being competitive with conventional fuels, especially for cooking and heating. In addition, their supply is intermittent: The sun does not always shine and the wind does not always blow. So, in practice, there will be a need for back-up fuels.

LP Gas, which can be used for direct heating and cooking or as a fuel for power generation in small, highly efficient combined heat and power plants, is particularly well-placed to complement emerging renewable technologies. One way in which LP Gas can contribute to the renewable-energy transition is via hybrid technologies, which integrate alternative and fossil fuels, thereby reducing greenhouse-gas emissions and costs. Appliance developers are already investing heavily in developing LP Gas hybrids, especially for applications located off the gas-grid, in heating, cooling and power generation.

Case Study: LP Gas the Obvious Fuel Choice in the Maldives

Like most SIDS, the Republic of the Maldives – a group of 1,190 small, low-lying islands in the Indian Ocean– depends overwhelmingly on petroleum imports for its electricity production and, to a lesser degree, heating and cooking. Most urban households now use LP Gas for cooking, though some poorer households still rely on kerosene. In the outer islands, the main source of energy for domestic cooking is firewood – mostly dried branches, shrubs and coconut husks – though the use of LP Gas there is growing as the distribution network expands.

Unsurprisingly, the Maldives is a firm supporter of clean energy technologies. It is one of the most vulnerable countries in the world to the effects of climate change: 80% of the islands are less than 1.2 metres above sea level, so rising sea levels threaten their very existence. In 2012, the government announced plans to begin development of a $138 million renewable energy project, which will provide 26 MW of electricity form wind and solar power to the archipelago – much of it in the Male region, which is home to 30% of the population. Demand for electricity, currently generated almost exclusively using diesel, is growing rapidly. LP Gas, which has already successfully established itself as a household fuel, could play a key role in providing additional services, such as backing-up the solar and wind power plants that are being installed, as well as in replacing the small amounts of highly polluting and inefficient kerosene and biomass that are still used for domestic and commercial cooking and hot water.

Chapter Five

Realising the Potential

There is enormous potential to increase the use of LP Gas in SIDS. In those countries for which data on LP Gas consumption is available for 2011, the total use of LP Gas amounted to less than a tenth that of oil products calculated on an energy-equivalent basis[2] (Table 1). For example, in Cuba, the country's use of oil products is fifteen times higher than that of LP Gas, while in Haiti, it is almost one hundred times higher.

Table 1: Fuel Shares in Energy Consumption in Selected SIDS

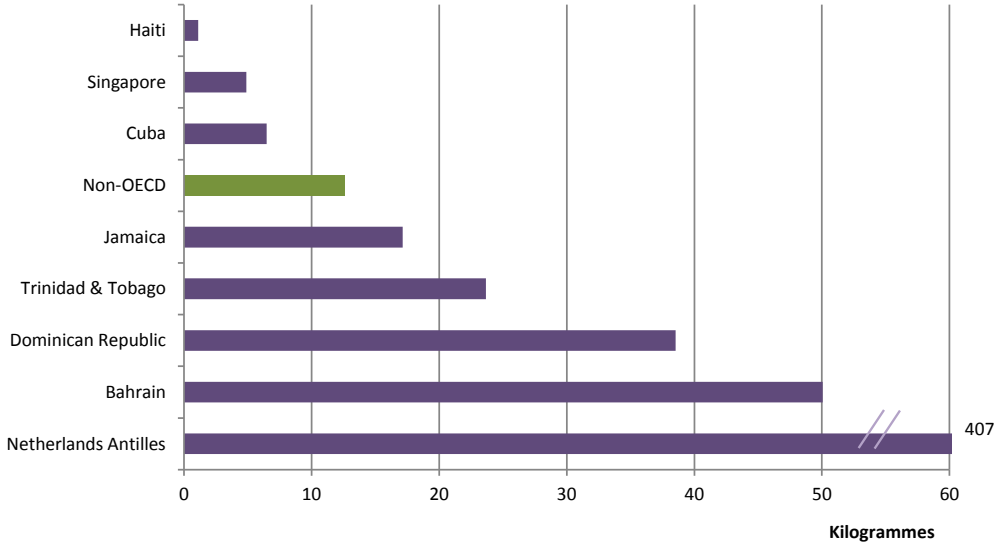
	Residential energy use			Total final energy use		
	Oil	LP Gas	Other	Oil	LP Gas	Other
Bahrain	4%	10%	86%	21%	1%	78%
Cuba	9%	7%	84%	29%	2%	69%
Dominican Republic	27%	27%	46%	48%	20%	32%
Haiti	3%	1%	97%	21%	<1%	79%
Jamaica	14%	13%	74%	64%	4%	32%
Netherlands Antilles	0%	100%	0%	84%	8%	8%
Singapore	0%	4%	96%	80%	<1%	20%
Trinidad & Tobago	8%	8%	83%	8%	<1%	92%

Note: Oil excludes LP Gas. Source: Menecon Consulting analysis; IEA online databases (http://data.iea.org/ieastore/default.asp).

In the residential sector, the use of LP Gas is generally higher, but it meets more than 10% of energy needs in only two SIDS: the Netherlands Antilles and the Dominican Republic. In particular, there is considerable scope for switching from kerosene to LP Gas. In Haiti, for example, kerosene use is three times higher than that of LP Gas. Only in Bahrain, Singapore and Trinidad and Tobago – three of the richest SIDS – is the household use of LP Gas greater than that of kerosene. Per-capita LP Gas use is also low in some of the eight SIDS for which data is available (Figure 4).

[2] Calculated using International Energy Agency data. Not treating LP Gas as an oil product.

Figure 4: Per-capita LP Gas use in selected SIDS, 2011



Source: Menecon Consulting analysis; IEA online databases (http://data.iea.org/ieastore/default.asp).

The economic, social and environmental benefits of switching from oil products and traditional fuels to LP Gas are obvious. So why is it not happening? There are three main reasons why LP Gas has not made a bigger contribution to meeting the energy of SIDS to date:

5.1 Inadequate Supply

LP Gas is easily transported and stored, but some upfront investment in infrastructure – the import terminal, storage tanks, bottling plants, cylinders and road trucks – is necessary. Purchasing the cylinders is often the largest single category of investment across the entire LP Gas supply chain, especially for markets in the early stage of take-off. LP Gas importers and distributors need to be confident that they will be able to recoup their investment in infrastructure. That calls for a favourable business environment, policy stability and LP Gas markets – conditions that are not always in place in SIDS.

5.2 Cost

The principal barrier to more widespread use of LP Gas in SIDS is cost – both of the fuel itself and the equipment needed to use it. Poorer households often simply cannot afford to switch, even though the price of LP Gas is often competitive with other fuels when the higher efficiency is taken into account. LP Gas cooking equipment is more sophisticated and therefore more expensive than a cheap kerosene stove or basic wood stove. Poor households may not be able to afford this upfront cost, even though it may represent a small share of the annual cost of the fuel. And richer households and businesses may prefer to stick with other fuels, such as electricity, kerosene and heating oil, where they are subsidised – a common feature of SIDS.

5.3 Awareness

In many cases, potential end users – and policy makers – are simply not aware of the benefits that LP Gas could bring. Households, especially those in the poorest and most remote, hardest to reach, rural areas of SIDS, often cling to tradition, slowing the adoption of new technologies and modern living practices. Government officials, entrepreneurs, women's groups and others who influence switching rural households to LP Gas can be unequally ill-informed. Awareness and education about the benefits is a precondition for any desire to switch to LP Gas. Linked to this is the need to inform and instruct users, particularly those who have just switched, about the importance of safety.

Chapter Six

How Government Policy can Drive Change

A concerted effort on the part of all private stakeholders – industry, consumer groups and non-governmental organisations – is needed to overcome these hurdles to market development. But these efforts will come to naught without solid and consistent policy support from government.

Active government support is critical in catalysing LP Gas market take-off and establishing a virtuous circle of rising demand, increased investment and expanded availability. Support can take various forms, including measures to make the general regulatory and business environment more favourable to investment in distribution infrastructure, "smart" subsidies to the equipment needed to use LP Gas to make it more affordable while not encouraging waste or corruption, and assistance in setting up micro-credit or micro-finance programmes. Where prices and supplies are regulated, a formal government programme to promote switching, such as the kerosene-to-LP Gas programme that was successfully launched in Indonesia in 2007, may prove necessary. LP Gas policies need to be compatible with other policies, including structural and regulatory reforms and policies on health, education, infrastructure and financing.

Appropriate laws and regulations, adequately enforced, are the single most critical factor in expanding the supply of LP Gas to SIDS in the early stages of market development. The distribution model for LP Gas in cylinders must be defined, in cooperation with other stakeholders, in national laws and regulations, enforced effectively, to enable a commercially viable industry to develop in a sustainable way over the long term. The aim must be to create a set of sustainable conditions that give the private sector enough confidence to invest in additional LP Gas cylinders and the facilities to fill them and distribute them.

In some SIDS, private investment is impeded by the dominance of state-owned enterprises, often benefiting from monopoly rights. In many cases, the financial performance of these companies and, therefore, their ability to invest are very poor. Privatisation, the setting-up of private-public partnerships with foreign and private investors and the introduction of a modern regulatory regime may be needed to boost private investment in the LP Gas sector. In addition, liberalisation of LP Gas importing, wholesaling and retailing, involving the removal of exclusive rights and controls over prices or margins, can provide a powerful stimulus to the market. In many emerging economies, the opening up of the LP Gas sector to private participation and competing suppliers has had a tremendous impact on expanding LP Gas supply, in particular to the household sector. Where conditions are not conducive to attracting private investment, public-private partnerships may offer an alternative and more politically acceptable source of funding.

Improving energy policy and regulatory conditions in SIDS can be a daunting task: Often there is a lack of financial resources and limited capacity to develop and implement effective policies. But intergovernmental organisations – notably the World Bank and UN bodies – are able to provide support, which can provide leverage for industry negotiations with local and national governments to establish acceptable conditions and rational energy markets, particularly in under-served, poor rural communities.

Political instability, an absence of institutional structures and a stable legal system, corruption and ad hoc political interventions are powerful deterrents to private investment. But this is not an insurmountable problem: some advanced countries have developed bilateral insurance schemes to address problems of political risk, while the Multilateral Investment Guarantee Agency, part of the World Bank Group, provides long-term investment guarantees against political risks.

Case Study: Enormous Potential for Increased LP Gas Use in Jamaica

Like several of the poorer SIDS, Jamaica suffers from poor energy infrastructure and high costs: Aaccording to a recent report by the World Economic Forum, Jamaica ranks next to Haiti or 112th globally for energy supply, with poor reliability, heavy dependence on imported oil and, consequently, extremely high prices (WEF, 2014). Low LP Gas use both reflects and contributes to the vicious circle of poor energy supply and economic under-development. Consumption rose strongly in the early 2000s, but levelled off by around the middle of the decade; it has since fluctuated between 75,000 and 80,000 tonnes per year. Residential use of LP Gas has similarly stagnated for several years, accounting for just 13% of total energy use in that sector.

There is an urgent need for Jamaica to diversify its energy mix, improve energy efficiency and lower its carbon intensity in the context of efforts to promote socio-economic development. Boosting the use of gaseous fuels could play an important role in the country's energy transition alongside the development of indigenous renewable energy sources, including solar, wind, marine and geothermal power. There are already plans to import liquefied natural gas, but it will be used exclusively for centralized centralised power generation. In rural areas, LP Gas is much better placed to fuel small power plants, which can be quickly fired up and down in response to fluctuations in solar and wind generation, as well as to meet residential and commercial energy needs .

In practice, the SIDS energy challenge is about identifying new ways of overcoming long-standing barriers to the more widespread use of modern fuels and technologies, including LP Gas. This calls for industry and government to work together to address all aspects of the SIDS energy challenge, including developing local resources, financing, building capacity in local energy entrepreneurs, changing policy and regulations, and increasing public awareness and education about the dangers of household air pollution and the benefits of switching to a cleaner alternative.

Experience shows that, when industry comes together with government and local communities in a project partnership, all parties can draw on their combined strengths and take collective action to deliver results more effectively than each party working independently. This can bring benefits to LP Gas businesses, by creating viable new markets for LP Gas products and services, as well as bringing improvements to the lives of people currently deprived of efficient, modern fuels.

The LP Gas industry has an impressive track record in providing clean, reliable and affordable energy services for millions of people living in remote rural areas in the prosperous developed regions around the world. With the right government support, it can play a central role in stimulating economic development and making poverty history in SIDS.

Appendix One

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Appendix Two

Useful Websites

ESMAP: https://www.esmap.org/node/3033

Exceptional Energy: http://www.exceptionalenergy.com/

IEA – World Energy Outlook/Modern Energy for All:
http://www.worldenergyoutlook.org/resources/energydevelopment/

UNDP: http://sustainabledevelopment.un.org/index.php?page=view&type=1006&menu=1348&nr=1608

SIDS-DOCK: http://sidsdock.org/

SIDSnet: http://www.sidsnet.org/energy-resources

SIDS Energy For All: http://www.sidsenergyforall.org/

WLPGA: http://www.worldlpgas.com/

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