

THE GLOBAL LPG PARTNERSHIP

LPG FOR DISTRIBUTED ENERGY

Mr. Kimball Chen

Chairman of the Global LPG Partnership

Stanford Natural Gas Initiative Industrial Affiliates Meeting
18-19 October 2018



1. What is Distributed Energy?

Distributed Energy Resources (DER) are a broad category of resources that includes distributed generation, energy storage technologies, combined heat and power systems, and microgrids. A DER is generally customer-sited to serve the customer's power needs, but may, in some instances, sell excess capability to the grid. (Source: New York ISO)



2. Why distributed energy?

- 2.1 Eliminate delay and cost of building large-scale transmission systems
- 2.2 Reduce vulnerability to system-wide failure on a national grid
- 2.3 Localize problems
- 2.4 Reduce size of financing needed
- 2.5 Deal with logistics and politics at smaller scale/ load level
- 2.6 Tailor business model to load characteristics



3. Key characteristics of distributed energy solutions

- 3.1 Small-scale units of local generation
- 3.2 Decentralized, community-generated energy
- 3.3 Separately metered from the grid
- 3.4 May be connected to the grid at distribution level
- 3.5 May comprise new technology, like smart meters
- 3.6 Need for back-up, redundancy



4. Key characteristics of LPG and how they map to the key characteristics of effective distributed energy systems
 - 4.1 Portable and distributable in small-scale units (cylinders)
 - 4.2 Not dependent on the grid (unlike piped natural gas or electricity)
 - 4.3 However, availability still depends on a functioning physical supply chain
 - 4.4 Smart meter technology can be applied to LPG cylinders to monitor gas usage
 - 4.5 Satisfies high energy transfer need, lowers electricity requirement
 - **Complements electricity**
 - 4.6 Solar companies are actively exploring sale of LPG for cooking



5. The investment time horizon for transition strategies

5.1 Can payback occur in 10 years?

5.2 Can affordability be balanced with required rates of return for finance in that market?



6. SDG 7 and the interim 2030 goals

UN Sustainable Development Goal 7:

Ensure access to affordable, reliable, sustainable and modern energy for all

Goal 7.1: By 2030, ensure universal access to affordable, reliable and modern energy services

Goal 7.2: By 2030, increase substantially the share of renewable energy in the global energy mix

Goal 7.3: By 2030, double the global rate of improvement in energy efficiency



7. The circular economy potential of LPG

- 7.1 BioLPG is made from renewable feedstocks such as wastes, residues, animal fats and vegetable oils
- 7.2 BioLPG handling and logistics are exactly the same as conventional LPG
- 7.3 No modification is needed to existing LPG infrastructure or appliances to use BioLPG
- 7.4 BioLPG is identical to LPG produced from oil and gas production and refining, but reduces carbon emissions by 50-80% (depending on input feedstock)



8. Implementation advantages of LPG

8.1 Rapidity

8.2 Scalability



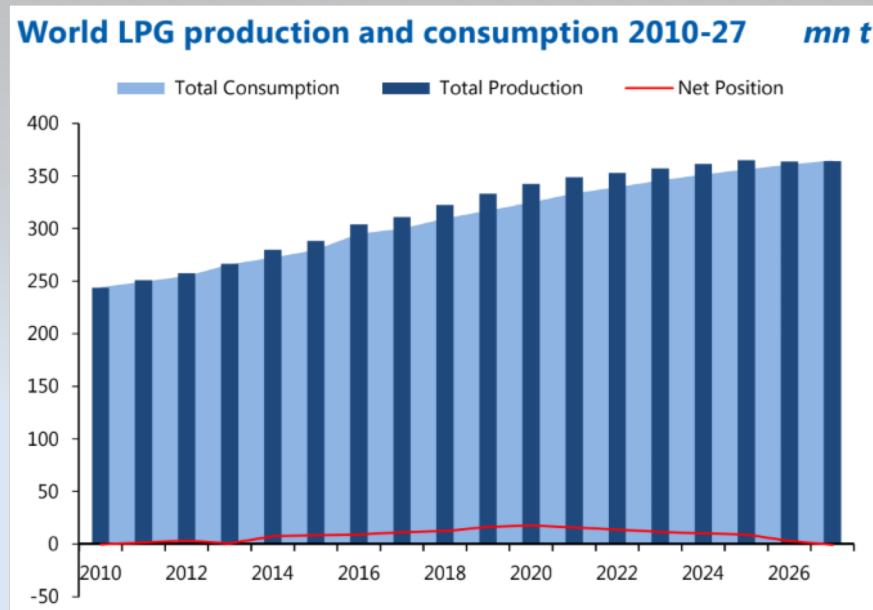
9. Developing country desire and proactivity in regard to large-scale increase in their LPG sectors

- 9.1 The Economic Community of West African States (ECOWAS) has called for its 15 member states, including Ghana, Senegal, Nigeria etc. to develop national policies for LPG to increase access to modern energy in the region
- 9.2 Cameroon's national LPG Master Plan aims to increase LPG penetration from under 20% to 58% by 2030
- 9.3 Kenya aims to increase LPG penetration from 10% in 2017 to 70% in 2020.
- 9.4 Rwanda aims to expand LPG access to 40% of its population by 2024.
- 9.5 India in 2016 launched an ambitious program to expand LPG use to 100% of the population—more than 1.3 billion people—by 2020
- 9.6 Myanmar targets to give LPG access to 2 million households by 2020



10. Global market capacity to satisfy potential LPG demand

- 10.1 Global LPG production is widely developed and assured over the next decade, rising from around 306mn t in 2016 to 357mn t by 2027
- 10.2 Oversupply is projected to peak at 12mn t in 2020, then ease and turn into a small 1.1mn t shortage by 2027



Source: WLPGA/Argus 2017



11. Energy subsidies, cross-subsidies and euphemistically entitled “sector development facilities”

- 11.1 Developing countries spend large amounts on energy subsidies
- 11.2 Development experts advise transitioning down on subsidies by targeting better and by proper pricing structures
- 11.3 Proper enabling policies, regulations and market structures (competition, economies of scale) are needed as much as demand-side consumption support
- 11.4 Matching supply and demand is complicated



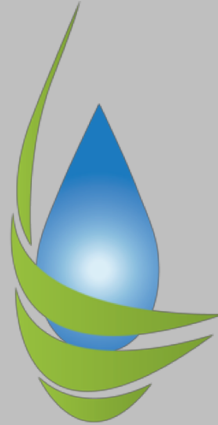
12. Possible schedule for large-scale LPG sector development to support a distributed energy strategy

- 12.1 12-18 months for national LPG sector planning and enabling legislation or executive orders
- 12.2 12 months to tender and finance key supply side infrastructure
- 12.3 12 months to build or purchase
- 12.4 Need to coordinate with the electricity side?



13. Examples of LPG for generation

- 13.1 Ghana: Tema project 400 MW
- 13.2 Bangladesh: announced by Beximco Group and General Electric in 2017
- 13.3 Turbine vendors include GE, Wärtsilä, Mitsubishi



THE GLOBAL LPG PARTNERSHIP

For more information contact: *info@glpgp.org*

Follow us on Twitter: *@globalLPG*