Study Prospectus

FACE-OFF

U.S. and Middle East Compete for the Asian LPG Market

Outlook for Supply, Demand, and Trade to 2020
Face-off: U.S. and Middle East Compete for the Asian LPG Market

Global trade of LPG, and more specifically propane, will change significantly over the next four years due to a supply surge and export infrastructure buildout in North America, a growing surplus in the Middle East, and growing demand in Asia. Infrastructure projects in the U.S. will boost export capacity, and although we see higher domestic demand over the forecast period, North America’s exportable surplus of LPG continues to increase. A snapshot of U.S. LPG export by destination highlights that until now increased exports have flowed predominantly to Asia, especially China. However, ESAI Energy argues in this new analysis that the era of “easy growth” for U.S. exports to Asia will come to an end.

In the period to 2020, Asian demand growth will eclipse modest gains in refinery and plant supply. As a result, ESAI Energy predicts that Asia’s LPG deficit will increase more than North America’s surplus export capacity. The study reviews the drivers of regional demand and refinery and plant LPG supply with an in-depth analysis of data for China, India, Indonesia, Japan, and South Korea. Our analysis reveals that there will be significant increases in China, India, and Indonesia’s imports.

A third variable, however, will limit North American exporters’ penetration of the Asian market. Over the forecast timeframe, the Middle East’s surplus will increase as well. Greater plant LPG supply in Saudi Arabia and Iran and higher refinery LPG supply are key developments underlying the anticipated increase in exports from the Middle East. This analysis of Middle East fundamentals highlights the sources of LPG supply growth and the prospects for the Middle East to significantly increase exports by 2020.

Oversupply in the Middle East and North America will have significant implications in global markets for these volatile commodities. Given that Asian demand will grow considerably over this same period, the issue remains whether the market is large enough to absorb that excess supply. Key questions to be answered by this analysis include:

- How much larger will the Asian market be in four years?
- Can the U.S. capture a sizeable share of the growing Asian market?
- How much competition will there be from Middle East?

In this new, in-depth study, ESAI Energy examines these questions and more in our analysis of the interaction between U.S., Middle East, and Asian LPG markets – in the medium term to 2020. Digging deeper into the details of country-level LPG supply and demand, we determine how much higher global balances will move, and how changing fundamentals will shape propane and butane prices. Our analysis helps guide decision-making to help your organization succeed in this changing environment.
FACE-OFF Table of Contents

Contents

I. Executive Summary

II. Asia Deficit
   A. Plant & Refinery Supply
   B. Olefins Investment
   C. Demand

III. Middle East Surplus
   A. Plant & Refinery Supply
   B. Olefins Investment
   C. Demand

IV. U.S. & Canada
   A. Plant & Refinery Supply
   B. Olefins Investment
   C. Demand
   D. Export Capacity & Utilization

V. Global Balances by Region
   A. Big 3 Regions
   B. Balances in the Rest of World
   C. Global Balance

VI. Trade & Market Share in Asia
   A. India & Indonesia
   B. China
   C. Japan & South Korea
   D. Seasonality of Trade

VII. Trade & Pricing
   A. Global Propane Pricing: Mt Belvieu & East of Suez
   B. Edmonton & the Asia Window
   C. Implications of Pricing for Trade
   D. Annual Price Forecasts to 2020

Appendix tables (delivered in Excel also)
   A. U.S. & Western Canada LPG Export Terminals & Capacities Allocated to LPG
   B. Asia Supply & Demand: China, India, Indonesia, Japan, S. Korea & Other Asia
   C. Middle East Supply & Demand: Iran, Qatar, S. Arabia, UAE & Other Middle East
   D. Global Supply & Demand: Africa, Europe, FSU/EE, Latin America, U.S. & Canada
   E. Price Forecast Table
**FACE-OFF List of Figures**

**Figures**

Figure 1. U.S. LPG Exports by Destination  
Figure 2. Asia LPG Deficit  
Figure 3. Asia Plant & Refinery LPG Supply  
Figure 4. Asia Olefins Investment Projects, 2015-2020  
Figure 5. Olefins Investment by Feedstock, 2020/2014  
Figure 6. Asia LPG Demand  
Figure 7. Middle East LPG Balances  
Figure 8. Middle East Plant & Refinery LPG Supply  
Figure 9. Middle East Olefins Investment Projects, 2015-2020  
Figure 10. Middle East Olefins Investment by Feedstock, 2020/2014  
Figure 11. Middle East LPG Demand  
Figure 12. U.S. & Canada LPG Balances  
Figure 13. U.S./Canada Plant & Refinery LPG Supply  
Figure 14. U.S./Canada Olefins Investment Projects, 2015-2020  
Figure 15. U.S./Canada Olefins Investment by Feedstock, 2020/2014  
Figure 16. U.S./Canada LPG Demand  
Figure 17. U.S. LPG Exports & Export Capacity, Qtrly 2013-2016  
Figure 18. U.S. Seaborne LPG Export Capacity, 2012-2020  
Figure 19. PADD 1 LPG Exports & Capacity, 2013-2020  
Figure 20. PADD 5 & W. Canada LPG Capacity & Exports, 2013-2020  
Figure 21. PADD 3 LPG Capacity & Exports, 2013-2020  
Figure 22. U.S. Capacity & Exports, 2013-2020  
Figure 23. Big 3 LPG Balances  
Figure 24. Other Atlantic Basin LPG Balances  
Figure 25. Global LPG Balances  
Figure 26. East of Suez Map  
Figure 27. China Implied LPG Demand and Supply from Key Sources, 2020 Projection  
Figure 28. Japan & S. Korea LPG Deficits & Gross Imports by Source, 2020 Projection  
Figure 29. Asia’s Big 3 Importers, 5-yr Average of Monthly LPG Imports  
Figure 30. East of Suez & Mt Belvieu Propane Prices  
Figure 31. Map of North America Hubs & Transport Costs  
Figure 32. Edmonton, Mt Belvieu & Asia Propane Prices  
Figure 33. Annual Forecast of Asia Naphtha & Selected Propane Prices
ESAI Energy Price Forecast Table

The Appendix Tables are also included in Excel format. Below is an example of an appendix data table provided as part of this study.

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Naphtha, $/bbl</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Singapore</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Propane, $/bbl</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>NW Europe, CIF ARA</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Saudi Contract Price</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Asia Spot, CFR Japan</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mt Belvieu, TX</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Conway, KS</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Edmonton, AB</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sarnia, ON</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Butane, $/bbl</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>NW Europe, CIF ARA</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Saudi Contract Price</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Asia Spot, CFR Japan</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mt Belvieu</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Conway, KS</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Edmonton, AB</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sarnia, ON</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
About ESAI Energy LLC

ESAI Energy, LLC is an energy research and forecasting firm that focuses on global petroleum, alternative fuels and natural gas markets. The firm is an affiliate of Energy Security Analysis, Inc, which has conducted energy market analysis and price forecasting since the mid-1980s.

ESAI Energy’s petroleum, alternative fuel and natural gas analysis and forecasting is based on a data-heavy methodology that is designed to integrate available data with the expert judgment of regional specialists to determine supply and demand trends by product and country. Using actual data and estimates where data are unavailable, ESAI Energy’s regional analysts maintain historical databases for a variety of industry attributes: consumption, production, quality and inventories for crude oil and each of the main petroleum products, refinery capacity and throughput, alternative fuels supply and demand, and petrochemical and midstream blending inputs. Using these data, information and understanding of language and political economy in each region, analysts forecast developments in these markets from one week to 25 years.

The quantitative supply/demand analysis is complemented by detailed political, regulatory, and industrial analysis. ESAI Energy maintains a database of environmental specifications, taxes, tariffs and subsidies, and combines that information with ongoing political, financial, and regulatory research to determine future market trends in countries and regions. In addition, we study and interpret key geopolitical developments that impact the global energy markets.

ESAI Energy produces multi-client studies like Face-Off several times per year. In addition, we provide our retainer clients, who include energy companies and national governments all over the world, with ongoing market analysis and forecasting.

3 Ways to Order:

- Fax: Complete this order form and send to +1.781.245.8706
- Email: Send form to esaenergy@esai.com
- Credit Card Orders: Call +1-781-245-2036 and ask for Kathy Cooper

Deliverables:

- PDF copy via email
- Direct access to ESAI Energy analysts for questions pertaining to the study
- Appendix Data Tables delivered in Excel
- Printed copy (upon request)
- 3 Quarterly update webinars for study buyers

Invoice To:

Name:
Company:
Title:
Address:
Address 2:
City: State: Country: Postal Code:
Phone: Fax:
Email:
Pricing Options:

☐ ESAI Advisory Clients $1500
☐ Non ESAI Advisory Client $2000

Face-Off:

U.S and Middle East Compete for the Asian LPG Market

3 Ways to Order:

- Fax: Complete this order form and send to +1.781.245.8706
- Email: Send form to esaenergy@esai.com
- Credit Card Orders: Call +1-781-245-2036 and ask for Kathy Cooper

Deliverables:

- PDF copy via email
- Direct access to ESAI Energy analysts for questions pertaining to the study
- Appendix Data Tables delivered in Excel
- Printed copy (upon request)
- 3 Quarterly update webinars for study buyers

Invoice To:

Name:
Company:
Title:
Address:
Address 2:
City: State: Country: Postal Code:
Phone: Fax:
Email:
Pricing Options:

☐ ESAI Advisory Clients $1500
☐ Non ESAI Advisory Client $2000