Monetize your Stranded Gas & NGLs: The STG+™ Solution

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Chief Commercial Officer

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Chief Commercial Officer
Stranded Gas
Not Reaching Market

- Major problem in the oil & gas industry
- No pipeline infrastructure
- Companies are forced to shut in gas wells
- Cannot get gas to market

Stranded Natural Gas Worldwide (Trillion Cubic Feet)

- Europe & CIS 2199 Tcf
- North America 256 Tcf
- Middle East 2531 Tcf
- S. & C. America 253 Tcf
- Africa 486 Tcf
- Asia Pacific 475 Tcf

Source: BP Statistical Review and IEA
Gas Monetization Options

Capital Intensive

- Pipeline
- LNG - traditional
- GTL - traditional

Low Capital Cost – economical at small scales

- CNG - small scale
- LNG – small scale
- GTL – small to large scale STG+™
Traditional Large-Scale GTL Plants

Shell/Qatar Pearl GTL Plant
Cost: $19 billion
Feed gas: 1,600 MMCFD
Output: 140,000 bpd

Chevron Escravos, Nigeria
Cost: $10 billion
Feed gas: 325 MMCFD
Output: 34,000 bpd
Small-Scale GTL Technology

- 500-6,000+ bpd capacity
- Profitable in both upstream & midstream facilities
- STG+™: only commercial GTL technology profitable at 500+ bpd
**STG+™ Gas-to-Liquids Solution**

**Feed Gas**
- natural gas
- NGLs
- syngas

**STG+™ Gas-to-Liquids System**

**Single Ready-to-Use Liquid**
- gasoline
- methanol
- diluent

- Only one product stream
- 100% standard components
- Accepts CO₂ in feed gas, up to 25%
- Long catalyst lifetime
- Wide variety of feed gas compositions accepted from wellhead through midstream
- Products require no additional refining
- No wastewater
Gasoline Process in Detail

- Continuous gas-phase, no intermediate condensation steps
- Standard fixed-bed catalytic reactors
- Process is steam self sufficient
- Standard Catalysts with long lifetimes
- R4 not needed when liquid product will be mixed with crude
- Primus’ proprietary patented system
Methanol Process in Detail

- Unique multi-stage reactor design delivers high conversion with single pass
- Syngas generated with widely used steam reforming technology
- Process is steam self sufficient
- Standard catalysts with long lifetime
- Low piece count optimized for smaller scale production
- Primus’ proprietary patented system
## High Quality Methanol

<table>
<thead>
<tr>
<th>Property</th>
<th>IMPCA Methanol Spec</th>
<th>Primus Methanol</th>
<th>Meets Spec</th>
</tr>
</thead>
<tbody>
<tr>
<td>Purity (% WT dry basis)</td>
<td>≥ 99.85</td>
<td>≥ 99.85</td>
<td>✓</td>
</tr>
<tr>
<td>Acetone (mg/kg)</td>
<td>≤ 30</td>
<td>≤ 30</td>
<td>✓</td>
</tr>
<tr>
<td>Water (% W/W)</td>
<td>≤ 0.1</td>
<td>≤ 0.1</td>
<td>✓</td>
</tr>
<tr>
<td>Specific Gravity (20°/20°)</td>
<td>0.791-0.793</td>
<td>0.791-0.793</td>
<td>✓</td>
</tr>
<tr>
<td>Potassium Permanganate Time Test at 15°C (minutes)</td>
<td>≥ 60</td>
<td>≥ 60</td>
<td>✓</td>
</tr>
<tr>
<td>Ethanol (mg/kg)</td>
<td>≤ 50</td>
<td>0</td>
<td>✓</td>
</tr>
<tr>
<td>Chloride as Cl⁻ (mg/kg)</td>
<td>≤ 0.5</td>
<td>0</td>
<td>✓</td>
</tr>
<tr>
<td>Hydrocarbons (ASTM D1722-04)</td>
<td>pass</td>
<td>Pass</td>
<td>✓</td>
</tr>
<tr>
<td>Carbonisable Substances (Pt-CO Scale)</td>
<td>≤ 30</td>
<td>≤ 30</td>
<td>✓</td>
</tr>
<tr>
<td>Acidity as Acetic Acid (mg/kg)</td>
<td>≤ 30</td>
<td>≤ 30</td>
<td>✓</td>
</tr>
<tr>
<td>Total Iron (mg/kg)</td>
<td>≤ 0.1</td>
<td>0</td>
<td>✓</td>
</tr>
<tr>
<td>Non Volatile Matter (mg/1000 mL)</td>
<td>≤ 8</td>
<td>0</td>
<td>✓</td>
</tr>
<tr>
<td>Sulfur (mg/kg)</td>
<td>≤ 0.5</td>
<td>0</td>
<td>✓</td>
</tr>
</tbody>
</table>

**Primus Methanol meets standard specifications**
Case One: Local Gasoline Demand

- 500 BPD STG+™ plant can supply gasoline for city of 75,000
- Local STG+™ gasoline plant saves $0.06/gallon transportation costs
- Lower greenhouse gas emissions in production and transportation
Ideal STG+™ Site: Gas Processing Plant

- Flexible feed gas
  - NGLs (C2-C5)
  - Residue gas
  - Gas w/CO$_2$ up to 25%

- Onsite utilities & infrastructure reduce capex

- Operate on tolling basis
  - Convert gas into gasoline or methanol for fee
Case Two: Regional Methanol Demand

U.S. Methanol Demand by Region
(Million Tons Per Year)

West Coast
2014 2020

Midwest
2014 2020

East Coast
2014 2020

Gulf Coast
2014 2020

Source: U.S. Census data on chemicals; ADI Analytics
Methanol Shipment Costs

Major proposed methanol and ammonia-based fertilizer plants, 2015-18

Source: U.S. Energy Information Administration based on Bentek Energy and industry reports.
Where Small Scale Methanol Works

Local Cost Advantage Feedstock
- Stranded NG
- Stranded NGLs
- Associated gas

Local Methanol Demand
- High transport cost
- Captive customers

Primus Unit
Feed Gas & Offtake Optimization
Monetize your Stranded Gas & NGLs: The STG+™ Solution

Adam Apter
Owner Acacia Energy Ltd
About ACACIA energy

• Adam Apter – 30 years’ oil industry experience (10 years in multinationals, 10 years in international trading houses, 10 years independent)

• Based in London, Acacia is involved in a wide range of commercial activities within the Oil and Energy sector.

• Trade niche components as Principal, and act as broker or partner with other traders for larger trading projects.

• Involved in oil and energy projects covering upstream, mid-stream and downstream in the Americas, Mediterranean/Middle East and Africa

• Offer Consulting in product sourcing and placement, project development and project finance.
Acacia’s Role in Gas Supply & Offtake for Primus STG+ Plants

• Together Acacia and Primus provide a turn-key solution assisting STG+™ plant owners with feed gas supply and liquid product offtake contract arrangements

• Post streaming, can offer ongoing management of sales and purchase flows, including risk management
Economic Drivers

• Minimise capex, opex, financing costs
• Maximise revenue:
  • Enhanced value of gasoline
    • Location
    • Quality
  • Reduced feedstock cost
    • Stranded (flare?) gas
    • Surplus syngas/unused SMR capacity
• The best projects hit one or more sweet spot
High Quality Gasoline

- High quality gasoline, no refining needed
- Zero sulfur, zero benzene
Primus Gasoline Specifications

- Primus Gasoline meets (and often exceeds) standard specifications (RBOB, CBOB)
- “Excess” quality may be monetized via higher sales prices

<table>
<thead>
<tr>
<th>Property</th>
<th>Primus Gasoline</th>
<th>Meets Spec?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Octane Number RON</td>
<td>87 - 92</td>
<td>✓</td>
</tr>
<tr>
<td>Octane Number MON</td>
<td>83 - 88</td>
<td>✓</td>
</tr>
<tr>
<td>RVP (psi)</td>
<td>5 - 9</td>
<td>✓</td>
</tr>
<tr>
<td>E200 (vol %)</td>
<td>50.0</td>
<td>✓</td>
</tr>
<tr>
<td>E300 (vol %)</td>
<td>78.0</td>
<td>✓</td>
</tr>
<tr>
<td>Olefins (vol %)</td>
<td>1.0</td>
<td>✓</td>
</tr>
<tr>
<td>Aromatics (vol %)</td>
<td>24.0</td>
<td>✓</td>
</tr>
<tr>
<td>Benzene (vol %)</td>
<td>&lt; 0.1</td>
<td>✓</td>
</tr>
<tr>
<td>Corrosion (D130)</td>
<td>1a</td>
<td>✓</td>
</tr>
<tr>
<td>Stability (minutes, D525)</td>
<td>&gt; 240</td>
<td>✓</td>
</tr>
<tr>
<td>Sulfur (ppmwt)</td>
<td>-</td>
<td>✓</td>
</tr>
</tbody>
</table>

(1) Colonial Pipeline RBOB Specification
Feed Gas Supply Options

• Natural Gas
  • Pipeline supply
    • Long-term, fixed price contracts for hub supply, transportation, distribution
    • Bankable (but may be counterparty credit considerations)
    • Reduce price via possible (limited) interruptibility etc

• Wellhead (stranded/flare gas)
  • Amortize capex required to deliver consistent flow of gas (multi-well amalgamation etc)

• Syngas (from existing reformer)
Primus Gasoline Offtake Options

- Offtaker profile
  - Refiner/blender (large markets)
    - Positive driver - Capture quality value
    - Negative driver – less location uplift
  - Drop-in to car (small, more isolated or niche market)...drivers are reversed, blending at truck rack for local regulations
  - Mix in with crude

- Key contract features
  - Variable price, linked to published benchmarks (eg Platts)
  - Adjustments versus benchmarks for quality, location
    - Need pre-analysis, negotiation...may be seasonal

- Risk Management
  - Predictable cashflows - to satisfy financiers
  - Locking in forward prices may be (strongly) beneficial to project economics
  - Limited forward liquidity means ongoing RM probably required
  - Limited instruments mean “basis risks” have to be assessed and managed
Project Delivery
Monetize your Stranded Gas & NGLs: The STG+™ Solution

George Boyajian
Chief Commercial Officer, Primus Green Energy
First Rate Project Delivery Team

- Project management
- Project delivery
- Process design expertise

Core relationships with:
- Fabricators
- Leading eng. partners - detailed design & procurement

Capabilities:
- Perform FEED
- Design & supply modular systems
- Produce detailed license packages
About Jereh

- International O&G services, equipment, EPC company
- 5400 employees, 1200 engineers, 20 branches worldwide
- World-class expertise in modular O&G equipment fabrication
Jereh is Well Recognized Throughout the World

- Jereh serves over 30 countries and regions
- The Americas, Russia, Eastern Europe, Middle East, Africa, Central Asia, West Asia and Southeast Asia
Lump Sum GTL Solution

- Strong presence in O&G industry
- Single vendor EPC-based solution
- Best in class GTL technology
- Standard modular plants Expedited delivery time
- Worldwide onsite support
- Guaranteed capex & performance
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