Introduction to S2G

Commercial Biochemical Opportunity

Biochemicals  S2G Technology  S2G Background  Commercialization

October, 2015
Biochemicals – What They Are

Petrochemicals are made from oil & gas

- Multi-billion $ markets & high value
- 2% of a barrel of oil used for petrochemicals → 40% of revenue (DOE)

Biochemicals are made from sustainable feedstocks

- Starting point to help wean the world off dependence on oil & gas
- Experiencing rapid growth: 9% CAGR through 2020 (Clariant)
  - vs 3+% for overall chemical industry
- Strong pull from major users:
  - Coke, Pepsi, Ford, P&G, etc.
Biochemicals: Better Investment than Biofuels

- **Bio Ethylene Glycol (EG)**
  - Investments to date:
    - India Glycol
    - Liquid Light
    - Avantium

- **Bio Propylene Glycol (PG)**
  - Investments to date:
    - ADM
    - Global Bio-chem
    - DuPont – Tate & Lyle

- **Other bio-chemicals**
  - Investments to date:
    - BioAmber – succinic acid
    - Gevo – butanol
    - Genomatica – butanediol
    - OPX Bio – lactic acid

Higher value vs biofuels; No government subsidy required
→ Growing interest in biochemicals
S2G’s Technology: Bio-glycols

Ethylene & Propylene Glycol: a $30 billion market

S2G’s Founder: a pioneer in the bio-glycol space
- Experience back to 1990’s
- 1st generation technology commercialized in 2000’s in China

S2G: advancing the technology since 2009
- 2nd generation → non-food feedstocks
- Proven, robust, highly-efficient, scalable → suitable for commercial chemical production
- Novel co-production of high-value products → best margin and returns
Recent Novel Development: S2G’s “Haystack” Technology

Co-production of F-100 & Glycols from Cellulosic Sugars
- F-100: High value product with superior properties
- Use limited by current high cost to produce

S2G’s partner: Fortune 100 company & leading F-100 user
- F-100 is strategic: opportunity for sales growth and cost savings

$10 MM joint development program with S2G:
- Co-production of F-100 with glycols → significant cost savings opportunity

Game-changing for both bio-glycols and F-100
S2G Technology Features

- Catalytic conversion process
  - Continuous
  - Scalable
  - Durable
  - Rapid
  - High product yield

- Feedstock conditioning technology
  - Feedstock flexibility
  - 2nd Generation
  - Product mix

- Product separation & purification technology
  - High purity/ high value products
  - Drop-in replacement
  - ONLY viable process for cost-effective bio-EG

- Coproduction of F-100
  - Strategic interest
  - New markets
  - Increased margin
S2G History

2009
• Acquired technology & team of IPCI (USA)
• 1st Generation
• 20 yrs experience
• Commercialized in China

2009-11
• Lab work
  • 2nd generation sugars & glycerol
  • Improved, water tolerant catalyst
  • Sugar conditioning

2012-13
• Piloting / Engineering
  • Pulp liquors, crude beet sugars, cellulosic sugars
  • Process modelling / Pre-FEED engineering

2014-15
• Haystack Program
  • With Fortune 100 partner
  • Co-production F-100
  • Tech development & piloting
  • Product separations

2016
• BlueBelle
  • Full-scale commercial demonstration
  • Production

GBT Plant: 200,000 TPY
Capabilities:
Technology Development & Engineering

- $6 MM Pilot Plant
  Start-up Nov 2012
  24/7 operation

- Lab & Analytical
  Vancouver & Seattle

- Process Development & Modelling
  ASPEN

- Front-End Engineering Design (FEED)
## Strategic Partners

<table>
<thead>
<tr>
<th>“Haystack”</th>
<th>A Fortune 100 consumer products company</th>
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<tr>
<td></td>
<td>Strategic interest in “F-100” product</td>
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<td>$10 MM invested to date to co-develop Haystack technology with S2G</td>
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<tr>
<th>Sacré-Davey Engineering</th>
<th>Mid-size engineering firm with industrial and cleantech expertise</th>
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<td>Investor and partner</td>
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<tr>
<th>“BlueBelle”</th>
<th>Experienced US chemical producer</th>
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<td>Host site and operating partner for 1st commercial project</td>
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<td>Investor and partner</td>
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## S2G Team
### Management & Key Personnel

<table>
<thead>
<tr>
<th>Name</th>
<th>Position</th>
<th>Background</th>
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<tbody>
<tr>
<td>Mark Kirby</td>
<td>Pres/CEO</td>
<td>Praxair, Questair, Ballard</td>
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<tr>
<td>Terry Brix</td>
<td>Founder/CTO</td>
<td>Battelle, IPCI, Brix-Berg</td>
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<tr>
<td>Himanshu Kamboj, CA</td>
<td>CFO</td>
<td>DMCL, M&amp;P</td>
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<tr>
<td>Jeff Plato</td>
<td>Director, BD &amp; Corp Dev</td>
<td>Paradigm, Hydrogenics, GE, HP</td>
</tr>
<tr>
<td>Kent Smith, PEng</td>
<td>Director, Projects</td>
<td>Pacific Coast Terminals, Vancouver Wharves</td>
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<tr>
<td>Norm Barmeier, PEng</td>
<td>Project Manager</td>
<td>Apotex, AECOM, KGS Group</td>
</tr>
<tr>
<td>Claudio Arato, BSc, PEng</td>
<td>Process Manager</td>
<td>Lignol, Millar Western, Sonora</td>
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<tr>
<td>Prof Bill McKean</td>
<td>Principal Scientist</td>
<td>Battelle, Weyerhaeuser, Univ. of Washington</td>
</tr>
<tr>
<td>Dr Lloyd Allen</td>
<td>Senior Scientist</td>
<td>Dow, Innovatek, Westinghouse, PNNL</td>
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<tr>
<td>Quak Foo Lee, MEng</td>
<td>Plant Mgr &amp; R&amp;D Eng</td>
<td>City Farm Biofuel, UBC</td>
</tr>
<tr>
<td>Dr Josh Davies</td>
<td>Senior Scientist</td>
<td>U of W</td>
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<tr>
<td>Bryan Gene, BASc</td>
<td>Process Eng</td>
<td>UBC</td>
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Commercialization

Q1 2016: Commercial-scale demonstration using existing equipment at a US chemical plant

End of 2016: Start of commercial PG production using refurbished equipment at above site

2017: Demonstration of Haystack process (EG, PG & F-100) at above site

2018: Start of commercial Haystack production

2018 → Rollout to other US and international locations
S2G BioChemicals Inc.

- Privately held

- Major shareholders:
  - IPCI
  - Sacre-Davey Engineering
  - Angel Investors &
  - Management

- Support from:
  - Sustainable Development Technologies Canada
  - National Research Council (IRAP)
  - BC Innovative Clean Energy

- Visit our pilot plant in Vancouver, BC
  - At the National Research Council Facility on the campus of the University of BC

- Contact us...

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LAB & PILOT CAPABILITIES
Pilot Plant
Pilot Conditioning Equipment
Feedstock Conditioning

Cellulosic Sugars

Crude Glycerol
Pilot Hydrotreating
Pilot Plant Status: Operating Since Nov. 14, 2012
Laboratory Hydrotreating Units

24-7 Operation

Catalyst & Catalyst Durability
Laboratory Distillation
Analytical
Opportunity

S2G BLUEBELLE PROJECT
Project Overview

Install commercial glycol production from glycerol and cellulosic sugars at a location in Memphis TN.

Full commercial-scale demonstration with existing equipment in Q1 2016

Install new equipment, upgrade existing equipment and start commercial production in 2016

Install additional equipment to increase production and capabilities in 2017
# Features & Benefits of BlueBelle Project

<table>
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<tr>
<th>Features</th>
<th>Benefits</th>
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<tr>
<td>Commercial-scale demonstration with existing equipment at site</td>
<td>De-risks process performance</td>
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<tr>
<td>Experienced chemical industry operating partner</td>
<td>De-risks build, commissioning, operation</td>
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<td>Existing equipment vended into project</td>
<td>Reduces capital by 50%</td>
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<td>Glut of biodiesel glycerol and producers looking for a “hedge”</td>
<td>Cost-effective &amp; secure raw material supply</td>
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<td>Cellulosic sugar to PG &amp; EG capabilities (platform for Haystack demonstration)</td>
<td>Strategic partner willing to invest and ensure completion</td>
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Value - Efficiency

Value Creation

- Refined Glycerol Royalty (35% of Value)
- Adjusted for Yield
- Variable Processing Costs
- Fixed Processing Costs
- S2G Royalty (3% of Value)
- Propylene Glycol Pricing

$/MT

Business Confidential
Opportunity for Glycerol Supplier

- Profitable application for glycerol
- Hedge for refined glycerol market
- Participate in large, growing glycol market
- Potential baseload for new glycerol refinery
Glycerol Requirement

Amount
- 2017: 10,000 MT
- 2018 and ongoing: 20,000 MT/yr

Quality
- Technical grade

Risk Management
- Security of supply
- Competitive pricing