S2G BioChem
SUSTAINABLE CHEMICAL SOLUTIONS

www.s2gbiochem.com

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.

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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

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S2G's Technology: Bio-glycols

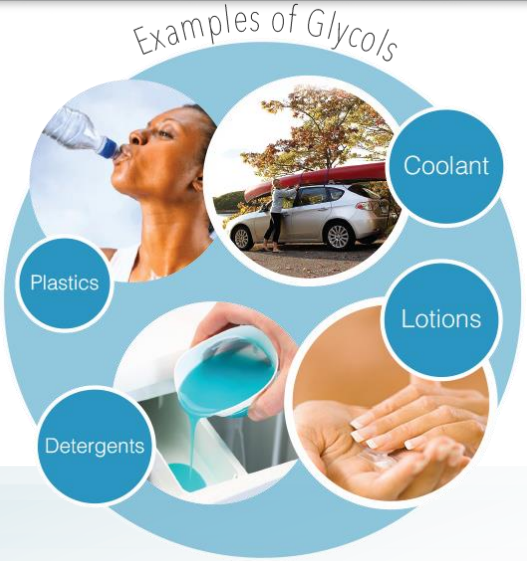
Ethylene & Propylene Glycol: a $30 billion market

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



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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

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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

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S2G History

2009

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

GBT Plant: 200,000 TPY

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

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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)

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Strategic Partners

"Haystack"	A Fortune 100 consumer products company
	Strategic interest in "F-100" product
	$10 MM invested to date to co-develop Haystack technology with S2G
Sacré-Davey Engineering	Mid-size engineering firm with industrial and cleantech expertise
	Investor and partner
"BlueBelle"	Experienced US chemical producer
	Host site and operating partner for 1st commercial project
	Investor and partner

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S2G Team
Management & Key Personnel

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

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

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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…

S2G BioChemicals Inc.
4250 Wesbrook Mall,
Vancouver, BC V5T 1W6
CANADA

1-604-259-9820
info@s2gbiochem.com
www.s2gbiochem.com

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Supplemental Information

LAB & PILOT CAPABILITIES

Pilot Plant

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Pilot Conditioning Equipment

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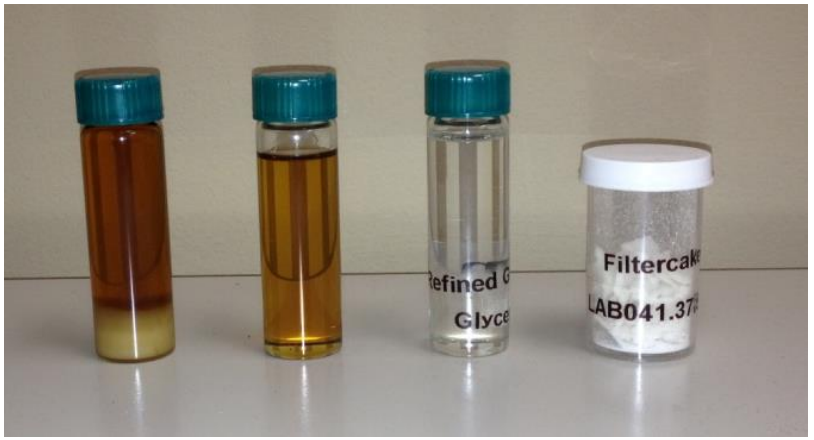
Feedstock Conditioning

Cellulosic Sugars



Crude Glycerol

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Pilot Hydrotreating

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Pilot Plant Status: Operating Since Nov. 14, 2012

Laboratory Hydrotreating Units

24-7 Operation

Catalyst &
Catalyst Durability

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Laboratory Distillation

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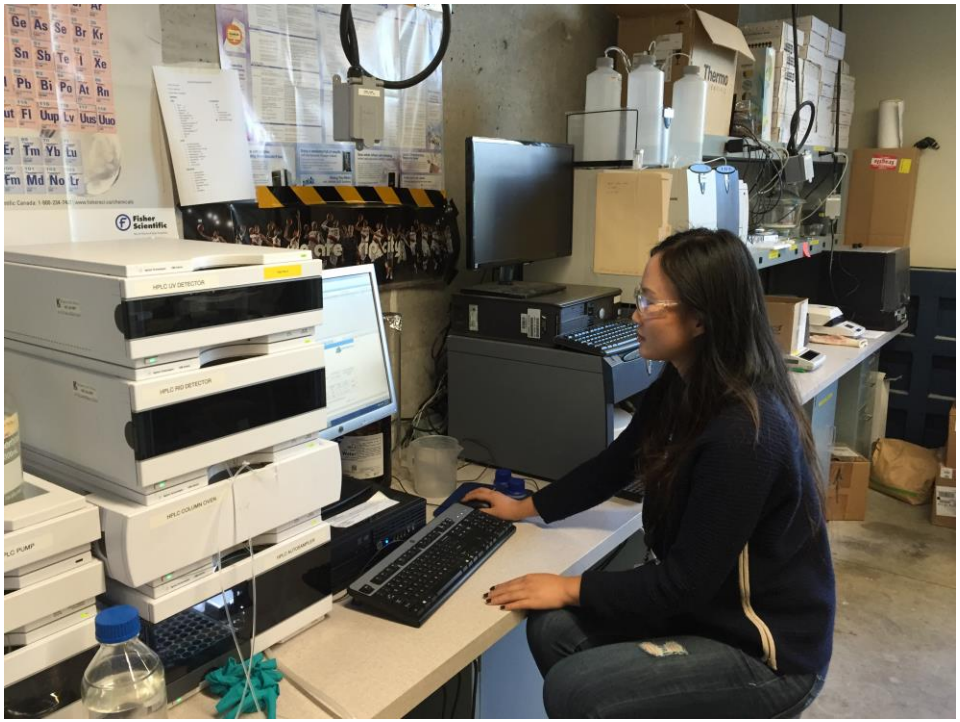
Analytical



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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

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Features & Benefits of BlueBelle Project

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

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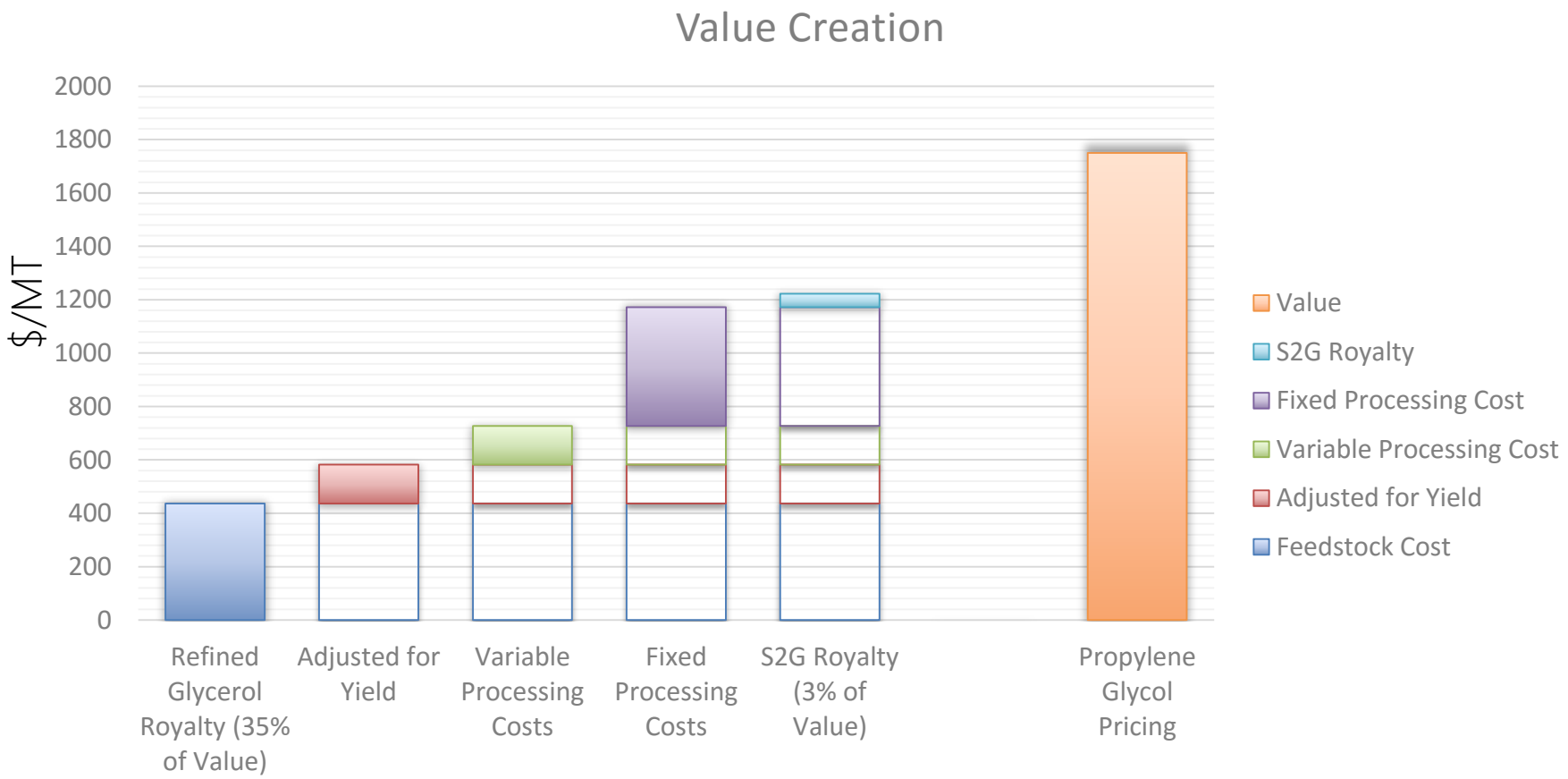
Value - Efficiency



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

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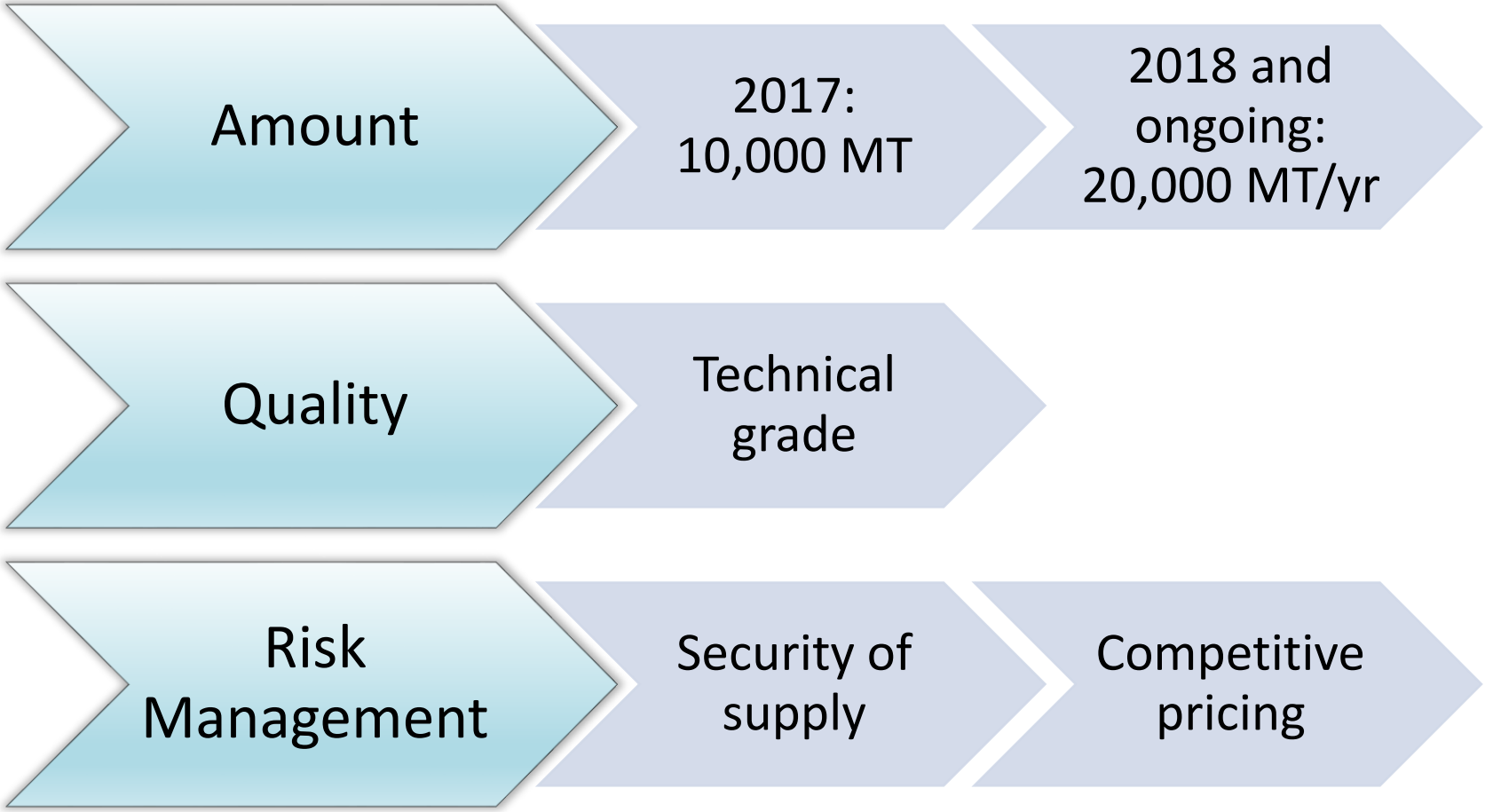
Glycerol Requirement



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