Biomass R&D
Technical Advisory Committee: Drop-in Fuels Panel

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This presentation should not be construed as a general solicitation.
Company and Products
Amyris Today

Emeryville, California
- headquarters
- 200+ people
- labs, pilot plant

Chicago, Illinois
- U.S. fuels distribution business
- 13 terminals in Southeast U.S.

Alabama
- sugar cane nursery for jet fuel

Campinas, Brazil
- labs, pilot plant, demo plant
- 80+ people
- commercial production in 2012

Europe
- Artemisinin partnership with sanofi-aventis
- R&D collaboration with Total

Alabama
- sugar cane nursery
- for jet fuel

Campinas, Brazil
- labs, pilot plant, demo plant
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Chicago, Illinois
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Producing High-Value Products Through Low-Cost Fermentation

FERMENTATION

PROPRIETARY BUILDING BLOCK

Farnesene

FINISHED PRODUCTS

Emollients

Surfactants

Diesel

Industrial Lubricants

Primary Product of Amyris IBR Project
2012 and Beyond: Partners and Customers in Place

AMYRIS BIOFENE® FINAL TESTING IN MAJOR P&G PRODUCT

AMYRIS BIOFENE® IN PET BOTTLES

AMYRIS DIESEL WINS INTERNATIONAL COMPETITION

AMYRIS JET FUEL SELECTED FOR TEST FLIGHT
Address Broader Product Portfolio as Costs Fall

- Squalane
- Industrial Lubes
- Specialty Polymers
- Surfactants
- Flavors and Fragrances
- Diesel
- Base Oils
- Auto Lubes
- Drilling Fluids

2011 Target

2014 Target

PRODUCTION EFFICIENCY

SALES
Process, Performance and Scale-up
Engineered Microbes Convert Sugar to Hydrocarbons

Phase-Contrast Micrograph of Amyris Engineered Microbes Producing Farnesene
Platform Delivers Multiple Products

Sugar Syrup → Yeast Cell → Artemisinic Acid

Mevalonate Pathway:
- p450
- CPR
- ADS

Artemisinic Acid → Anti-Malarial Drug

Diesel & Chemical Precursor:
- Farnesene Synthase
- GPPS
- IS
- PS

Farnesene

Jet / Gasoline Precursors:
- Isoprene
- Jet / Gasoline Precursors
Integrated Research Process

Iterative Screening Process Drives Continuous Innovation

Scope of the Amyris IBR Project in US

Feedback Loop Accelerates Progress
Track Record of Improving Process Performance

**Peak Farnesene Yield**
- Dec 2008: 6.3%
- Current: 16.8%

**Farnesene Titer (g/L)**
- Dec 2008: 11.7 g/L
- Current: 104.3 g/L

**Farnesene Productivity (g/L/d)**
- Dec 2008: 0.85 g/L/d
- Current: 16.9 g/L/d

**Farnesene Recovery (%)**
- Dec 2008: 40%
- Current: 95%
Low-Cost Performance Regardless of Scale

Scope of the Amyris IBR Project in US

- **High-Throughput Yeast Strain Design and Testing**
  - 2 LITER
  - Research, Emeryville, CA

- **Pilot Plant**
  - 300 LITER
  - Emeryville, CA

- **Pilot Plant**
  - 300 LITER
  - Campinas, Brazil

- **Demonstration Facility**
  - 5,000 LITER
  - Campinas, Brazil

- **Contract Manufacturing (Expanding)**
  - 60,000 – 200,000 LITER

- **Capital Light Production**
  - São Martinho JV (Online Target Q2 2012)
  - 600,000 LITER

Superior Performance Scaling Through
Process Scale-Up and Manufacturing

Brazil Demo Facility

U.S. Pilot Plant

São Martinho Site

Scaled to 60,000 Liter Fermentor

A. Simple Process

B. Scaling Up Successfully

C. 1st Commercial Plant on Track for Q2 2012

Also exploring production options in the U.S. for our renewable products
Feedstock and Geography Diversification: Strategy and Partners
Using the sugar mill as an evolving biorefinery

- Cane Growth and Logistics
- Milling
- Fermentation
- L/L Separation
- Anaerobic Digestion
- Flash Distillation
- Hydrogenation
- SMR
- Cogen

Using the sugar mill as an evolving biorefinery
Using the sugar mill as an evolving biorefinery

- Cane Growth and Logistics
- Milling
- Pretreatment & Saccharification
- Fermentation
- Anaerobic Digestion
- L/L Separation
- Flash Distillation
- Biogas Cleanup
- Hydrogenation
- SMR

Using the sugar mill as an evolving biorefinery
The Amyris DOE-funded IBR

Sweet Sorghum Logistics

Milling

Fermentation

L/L Separation

Anaerobic Digestion

Biogas Cleanup

SMR

Flash Distillation

Hydrogenation

Pretreatment & Saccharification

Actual and Virtual Integration at Expanded Emeryville Pilot Plant for Diesel and Chemical Scale-up
“Amyris, Inc. and M&G ... will work together to combine access to low cost sugars by integrating M&G's ProEsa lignocellulosic process with Amyris’s synthetic biology platform to produce renewable fuels and chemicals.”

Amyris: Process Strategy Lead for NABC FOS Team