PROESA® TECHNOLOGY

Advanced Bio-Fuels and Renewable Chemicals from Cellulosic Biomass

BIO, Montreal Canada
June 17th 2013
Proesa®: We Are Ready

Commercial Scale
Solid Economics = Profitable
Performance Guarantees
Group Overview: focus on Chemtex and Beta Renewables

The Proesa® Technology

CRESCEINTINO: World’s 1st Commercial Cellulosic Ethanol Plant

Our Business Model and Partners
1. Group Overview: focus on Chemtex and Beta Renewables

2. The Proesa® Technology

3. CRESCENTINO: World’s 1st Commercial Cellulosic Ethanol Plant

4. Our Business Model and Partners
Polymers
One of the top 3 producers worldwide

Engineering and R&D
60 years of excellence in process development and commercialization of plants

Sustainable Chemistry
Proesa®: technology leader in biofuels and chemical intermediates from non-food biomass
Our R&D Centers

Rivalta, Italy

4500 m² dedicated to renewable resources biochemistry and technology

Chemtex also operates in R&D centers focused on cellulosic sugar chemistry and engineering research

- Sharon Center (Ohio)
- Bari (Italy)
Beta Renewables: Sustainable Chemistry

Beta Renewables is a joint venture, created in October 2011, between Chemtex and the investment firm TPG (Texas Pacific Group).

Novozymes, Denmark-based world-class biotech company acquired 10% share of Beta Renewables in October 2012.

Beta Renewables owns and licenses the Proesa® technology.

1st commercial-scale 2GE biofuels plant in Crescentino (Italy).

Our Partners:
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Our Business Model and Partners
Technology: A Snapshot

More than USD 200M investment into R&D since 2006

Extensive agronomic studies and supply chain logistics investigation

Intellectual Property
14 patent family applications filed, 4 are public

1st Focus: bioethanol

Then: bio-based chemicals
**Development Timeline**

- **2006-2008**
  - Scouting of Technologies
  - Generation of key inventions
  - Proof of UNIT OPERATION in the labs

- **2009-2010**
  - Pilot plant (1 ton/day) construction & start up (June 2009)
  - Pilot Plant operation and data gathering
  - Test of Plant flexibility using multiple biomasses

- **2011-2012**
  - Crescentino Plant
  - Collaboration Agreements with leading synthetic biology companies
  - License Agreements
  - Formation of Beta Renewables

- **Q1-2013**
  - Crescentino Plant (60000 ton/y)
  - Start-up
The Proesa® Process

PROESA® Technology benefits:

- Feedstock flexibility
- Fully integrated process design using continuous equipment to enable large scale plants
- Continuous process, no chemical addition, optimal sugar extraction and low enzyme dosage
- Best in class technology with lowest capex and opex backed with performance guarantees
Our Approach to a Local Biomass Supply Chain

The flexibility of the Proesa® Pretreatment enables a locally sourced and flexible supply chain, based on a mix of available agricultural wastes and energy crops.

Chemtex Agro was established to develop the supply chain for Crescentino.

Through Beta Renewables Chemtex Agro supports the analysis and development of supply chain for Proesa® licensees.

This approach guarantees year-round security of supply.
A Platform for Sustainability

PROESA® Cellulosic Sugar Technology

Pre-Treatment Section

Enzymatic Hydrolysis Section

BIOFUELS

Ethanol
Bio-Jet
Butanol

BIOCHEMICALS

Fatty Alcohols
1,4 Butanediol
Farnasene
Acrylic Acid
Succinic Acid
Others

LIGNIN CHEMICALS

Phenols
Xylene
Terephthalic Acid
Proesa®: Key Advantages

Financial

Lower capital: simpler process and equipment
Cash cost of fermentable sugars at ~10¢/lb
Cash cost of ethanol of <$1.50/USG ($0.40/L)
Cost-effective at modest scale
Lignin provides power for plant

Flexibility

Feedstock-independent: energy crops, agricultural wastes, woody biomass, bagasse
Deployable worldwide

Competitive and attractive economics without subsidies
Topics

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2. The Proesa® Technology
3. CRESCENTINO: World’s 1st Commercial Cellulosic Ethanol Plant
4. Our Business Model and Partners
Crescentino Commercial Plant

Ribbon Cutting – April 2011
Energy block commissioned – October 2012
Biofuel production commissioned – January 2013
Crescentino Commercial Plant

Commercial Scale

Solid Economics = Profitable

Performance Guarantees
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Our Business Model

- Owns the Proesa® technology
- Licenses the technology worldwide
- Provides performance guarantees
- Supports licensees on biomass supply chain, off-take, financing

Exclusive engineering partner

- Supplies, at a minimum, a basic engineering and key equipment package
- Provides mechanical guarantees
- Qualifies EPC contractors
Novozymes and Beta Renewables
A Strategic Partnership

Partnership of two industry leaders boosts confidence in the technology

Guarantees on enzyme performance and cost incidence de-risks the technology

Ensuring secure and most competitive enzyme supply to our customers

To Jointly Market PROESA® and CTEC®
Our Joint Value Proposition

The goal of this agreement is to further de-risk the technology, enabling profitable deployment and bankable projects.

Cellulosic Ethanol Licensee

- **Proesa® Licensee**
  - Process guarantees

- **Basic Engineering & Key Equipment**
  - Mechanical Guarantees

- **Enzyme Supply**
  - Enzyme Specifications

Results in a BR / NZ Joint Hydrolysis Cost Guarantee

= a guarantee on the $ enzyme purchases / gal (or ton) of EtOH produced
Supporting your 2G Project from Idea to Realization

Enable
- Project feasibility study and investment estimates
- Qualify feedstock in **pilot plant**
- Optimize **process parameters** and enzymes for **feedstock**
- Support in the **development of a biomass** supply chain
- Support in **financing**

Deploy
- Basic **engineering package**
- Qualify **EPC contractor**
- Permitting **support** and **procurement** of critical equipment
- Support in the **construction of the plant** and deployment
- Start-up and **training**

Empower
- Support in **finding product off-takers**
- Ensure **joint performance guarantees** hold
- Provide **ongoing customer** support
- Supply of enzymes and **yeast**
GraalBio Licenses Beta Renewables' PROESA Process to Build Brazil's First Commercial Cellulosic Ethanol Plant

Rivalta Scrivia, Italy, May 23, 2012

GraalBio Investimentos S.A. and Beta Renewables announced that GraalBio will build Brazil's first commercial cellulosic ethanol plant, with a planned start of operation by the end of 2013. The plant, with a production capacity of 65,000 metric tons per year (22 million gallons) will use Beta's PROESA ® technology to deliver cost-competitive ethanol while using non-food cellulosic biomass as its feedstock.

PROESA is the same technology as will be used at the world's first commercial-scale cellulosic ethanol plant in Crescinto, Italy, expected to start operations in the second half of 2012. Chemtex, a division of the leading chemical firm Gruppo Mossi & Ghisolfi (M&G) will provide engineering services, key equipment and technical field services. This announcement follows the initial October 2011 announcement of a collaboration between the firms.

The plant will be built at Nord Est, Alagoas, Brazil, starting this summer, next to an existing plant that produces bio-ethanol from sugarcane; the two plants will share utilities. The plant will use sugarcane straw and bagasse as feedstock, sourced locally. Additionally, the plant will generate its own power, by using the lignin produced as a byproduct of the PROESA process.

"We applaud GraalBio's vision in choosing the PROESA process to produce second-generation bioethanol," said Guido Ghisolfi, CEO, Beta Renewables. "We believe that PROESA technology will let producers see superior returns on their investments, while enabling more sustainable production of advanced biofuels and bio-based chemicals."

Canergy selects Chemtex and Beta Renewables for its Cellulosic Ethanol Project in California

Brawley, CA & Wilmington, NC, USA and Tortona, Italy – April 30, 2013

Canergy, LLC, an advanced biofuels company based in California that is focused on the production of ultra-low carbon intensity ethanol from sustainable non-food energy crops, is pleased to announce that it has selected Chemtex, a leader in chemical engineering and renewable processes, and Beta Renewables, a global leader in cellulosic bio-fuels, for the development of their 25 million gallon a year cellulosic biofuels facility to be located in the Imperial Valley of California. Construction of the new facility is targeted to begin in Q1, 2014 pending successful completion of permitting and financial activities. The facility is expected to be operational in 2016.

Tim Brummels, Canergy's CEO, said, "We are excited to be moving this project forward. California is the country’s largest retail gasoline market and this first project’s biofuel will facilitate obligated parties compliance with California policy directives to reduce their carbon footprint through 2020. We have completed extensive research and have concluded that PROESA® Technology is both ready now and is the most advanced and competitive cellulosic platform in the marketplace today. We are also excited to have CHS Inc., a leading global energy, grains and foods company, working with us as a development partner in the project."

The facility we are announcing today will help create more than 300 jobs in North Carolina and is a perfect example of how producing home-grown energy is good for the economy and good for our energy future."
Proesa®: We Are Ready
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