Anellotech

University of Massachusetts-Amherst
Clean Energy Connections
October 20, 2010

David Sudolsky, CEO
Lowest Cost Producer of Commodity Petrochemicals (Green or Petroleum-Derived)

- Thermochemical catalytic platform technology for producing petrochemicals from cellulosic biomass

- Biomass To BTX (benzene, toluene and xylenes) is first application

- Patent-pending technology demonstrated on kilogram scale, implementation and scale up work is next

- Two tranche Series A financing ($5 Million + $13 million), 2.5 years total to major corporate partnership

- 1st commercial plant starts up end year 4 with additional $47 million from partner, jv, and/or equity markets.

- Lucrative business based on technology licensing, catalyst sales
Huge Market, Broad Applications

2008 Global Petrochemical Market
$390 billion

- Ethylene: $147
- Propylene: $98
- Methanol: $20
- Xylenes: $43
- Benzene: $49
- Toluene: $21
- Butadiene: $12

Source: Chemical Economics Handbook, ICIS

Products Made From BTX

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Multiple Feedstocks

• Broad array of non-food feedstocks
Anellotech’s Process Uses Known Chemical Engineering Operations with Unique Reactor Design, Catalyst and Operating Conditions

- **Compressor**
- **Drying & Grinding**
- **Biomass**
- **Catalytic Fluidized Bed Reactor**
- **Gas Recycle Loop**
- **Catalyst Recycle Loop**
- **Catalyst Separator**
- **Steam for electricity**
- **Catalyst Regenerator**
- **Separation Train**
- **CO, CO₂, H₂ to processing or combustor**
- **BTX**
- **Water**
Simpler Process vs. Competitors—Much Lower CAPEX, Operating Costs, Complexity

Gasification/Range Fuels

Biomass → Gasification → Steam Reforming Reactor → Gas Cleaning → Catalytic Reactor → Product Separation

Ethanol → Methanol

Biological/Verenium

Biomass → Hydrolysis (2) → Fermentation (2) → Product Separation

5 day residence time

Water

Lignin

Anellotech/Catalytic Fluidization

Biomass → Catalytic Reactor → Product Separation → BTX
Anellotech’s Costs Are Very Competitive

*Benzene Price, cents/gal

*Assumes $50/dry ton delivered feedstock cost
Anellotech is the Exclusive Global Licensee

- Univ. Massachusetts Patent Application covers the process, products, and catalyst

- R&D at Amherst supported by $4 million NSF, DOE and DARPA grants

- Patent application under review by patent office. Favorable international search report issued

- Anellotech has option rights to technology improvements
Anellotech is the Exclusive Global Licensee

• Univ. Massachusetts, Amherst patent application covers the process, products, and catalyst

• R&D at Amherst supported by $4 million U.S. government grants

• Patent application under review

• Favorable international search report issued
10 Kg/Day Feed Reactor Shows Viable Yields

- 2” diameter reactor
- Screening catalysts, feedstock and operating conditions
- Next step: 12” diameter 2 ton/day pilot reactor

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Four Years to Commercial Operations

Technology Implementation
- Catalyst optimization
- Pilot reactor operations
- Demo mfg plant design

Demo Mfg Plant Build, Proven

Comm. Plant Construction

Comm. Plant Operations

Total Financing Needed

$18 million

$47 mm
Rapid Path To High Valuation

• Substantial corporate partnership after completion of demonstration plant phase (2012)
  – Chemical companies generally make major investment decisions based on pilot plant operations
  – The chemical industry has decades of experience scaling up fluidized bed reactors [contrast with biotech processes]

• Profitable Small-Scale Commercial Plant on line in 2014

• Substantial licensing book established rapidly thereafter

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44% IRR for Large-Scale 2,500 mton/day $220 million Commercial Plant with $50/dry ton-delivered Feedstock

<table>
<thead>
<tr>
<th>Revenue</th>
<th>($ million)</th>
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<tbody>
<tr>
<td>BTX</td>
<td>192</td>
</tr>
<tr>
<td>Byproducts</td>
<td>17</td>
</tr>
<tr>
<td>Total Revenue</td>
<td>209</td>
</tr>
</tbody>
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<table>
<thead>
<tr>
<th>Expenses</th>
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<tbody>
<tr>
<td>Feedstock</td>
</tr>
<tr>
<td>Other operating Costs</td>
</tr>
<tr>
<td>Total Expenses</td>
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</tbody>
</table>

Net Profit 127

BTX Production Volume 62 million gal/yr

BTX Production Cost, $/gal* $1.05

*(Total Expenses minus Byproducts Revenue)/BTX Production Volume

• Analysis excludes leverage, subsidies and tax credits

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Aggressive Licensing and a 250 t/day Plant Generates $300 Million Pre-Tax Profit 5 Years After 250 ton/day Plant Start up

Anellotech Licensee Ramp Up

Cumulative Licenses Sold

Plants Coming Online

Year

Anellotech After-tax Profit ($MM)

Year

Licensing

250 t/day Plant

6 7 8 9 10 11 12 13

0 100 200 300 400 500 600 700
# Management

<table>
<thead>
<tr>
<th>Name</th>
<th>Position</th>
<th>Experience/Role</th>
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</table>
| David Sudolsky     | Founder and President & CEO | • CEO/officer of four biotech/bioprocessing start-ups, one was sold for $1.8 billion  
|                    |                           | • Ex-Dura Pharmaceuticals, Union Carbide, Booz-Allen                           |
|                    |                           | • Chemical engineer, MBA from Columbia University                              |
| Dr. George W. Huber| Founder and Chair of the SAB | • Armstrong Prof of Chemical Engineering at U. Mass-Amherst                   |
|                    |                           | • Biofuel research licensed by Virent Energy Systems                            |
|                    |                           | • Scientific American July 2009 cover story                                    |
| Dr. Anne Gaffney   | VP Research               | • Former VP Technology at Lummus, ex-Arco, Rohm & Hass                          |
|                    |                           | • 30+ years experience in developing catalytic processes                        |
| Dr. Dennis McCullough | Business Dev. Consultant | • Former president Badger Licensing (Shaw/Exxon JV)                            |
|                    |                           | • 30+ years business development experience with Shaw Group, ABB Lummus Global, Bechtel, Litwin, and Eastman Chemical |
| Dr. Cawas Cooper   | VP Process Eng            | • Air Products (Chemicals division), Catalytica                                 |
|                    |                           | • 30+ years experience in pilot plant process engineering                      |
| Jeffrey Whiting    | VP Operations             | • Monsanto/Solutia chemicals business                                          |
|                    |                           | • 30+ years experience in construction, start-up and operations of pilot to commercial scale chemical plants |
## Advisory Board

<table>
<thead>
<tr>
<th>Name</th>
<th>Title/Role</th>
<th>Profile</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dr. Edward Wolynic</td>
<td>R&amp;D, Catalysis</td>
<td>Former Engelhard CTO and Group VP Strat. Tech&lt;br&gt; Former UOP VP R&amp;D</td>
</tr>
<tr>
<td>Dr. Steven Lerner</td>
<td>R&amp;D, Industrial Gases</td>
<td>Former CTO Praxair, 25+ years R&amp;D management experience</td>
</tr>
<tr>
<td>Carl Bartoli</td>
<td>Engineering &amp; Construction</td>
<td>Former President &amp; CEO, Foster Wheeler USA&lt;br&gt; Engineering &amp; construction of HC, coal&lt;br&gt;  gasification and infrastructure facilities</td>
</tr>
<tr>
<td>Dr. Fred Pesa</td>
<td>R&amp;D, Fluid Bed, Catalyst</td>
<td>R&amp;D Head, BP USA&lt;br&gt; Teams pioneered several fluid bed cat processes</td>
</tr>
<tr>
<td>Dr. Andrew Swanson</td>
<td>Chemical Markets</td>
<td>Global Business Manager, CMAI&lt;br&gt; 20 years chem company mgmt experience , ICI</td>
</tr>
<tr>
<td>Dr. Lanny Schmidt</td>
<td>Prof, ChE and MS&amp;E, U Minn</td>
<td>Reactor, Catalyst, Biofuels Expert, Member National Academy of Engineering</td>
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Petrochemicals from Biomass

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