An overview of Cool Planet’s strategy to produce engineered Biocarbon™ and renewable fuels

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Agenda

• Overview of Cool Planet Energy Systems

• What is CPES trying to do?

• General process and technology

• Barriers to commercialization

• Conclusions
About Cool Planet Energy Systems (CPES)

**Locations**
- Headquarters – Denver, CO
- Operations – Camarillo, CA (2 locations)
- Commercial Plant – Alexandria, LA

**History**
- Started in 2009 in Camarillo, CA
  - 2009 to 2011 – Focused on fundamental R&D and financial viability
    - Primarily founder driven
    - Changed name from Cool Planet Biofuels
  - 2012 to 2014 – Developed pilot units and co-developed commercial process
    - New management with traditional structure
    - Expanded to Denver (corporate), Louisiana, and 2\textsuperscript{nd} site in California
  - 2015 forward
    - Mid year pivot to focus on Cool Terra\textsuperscript{®}
    - Currently 35 employees
    - Focused on development of Cool Terra\textsuperscript{®} market and applications

**Company Goal**
- Commercialize a technology to create green fuels and biocarbon
Path to commercialization

Targeting plants worldwide

Integrated demo unit

First commercial plant

US rollout

Worldwide rollout

R&D

Pilot

Integrated demo unit

2009

Series A - $3MM

NRG

Google ventures

North Bridge

venture partners

2010

Series B - $18MM

ConocoPhillips

Shea Ventures

Exelon

Energy Financial Services

2011

Series C - $25MM

ConocoPhillips

Shea Ventures

Exelon

NRG

Energy Financial Services

2012

Series D - $100MM

ConocoPhillips

Shea Ventures

Exelon

NRG

Energy Financial Services

2014

2016

2025-2030

Goal is to commercialize technology

Ongoing support by key investors
The Cool Planet technology
Addresses the world’s major challenges
Biomass to Renewable Products

World population to reach almost 10 billion by 2050
General Process

Biomass
Wood-based feedstock
Agricultural waste
Energy crops, etc.

Hydrocarbons

Fuels
High octane gasoline, jet fuel, diesel

Chemicals
PX/PET feedstocks, others

Specialties
Lubricants, others

Engineered Biocarbon™

Soil enhancer
Turf, horticulture, production ag, others

Animal feed
Poultry, cattle, others
Why Pine?

Feedstock availability
Readily available in United States

Composition
Low ash content

Louisiana Commercial Site
Depleted paper industry with many stands of pine
Near Red River with barge access

Existing wood handling infrastructure
Well developed and understood

Mountain Beetle Killed Pine – Northern Rockies
Low value feedstock in other US locations
Bioenergy Alliance Network of the Rockies (BANR) – Led by CSU

http://www.barkbeetles.org/mountain/fidl2.htm
General Process Diagram

- Preprocessing & Drying
- Thermal Conversion (Pyrolysis)
- Upgrading
- Product Separation

Simple Process

Multiple products:
- Renewable Fuel
- Engineered Biocarbon
Multiple design generations
A key technology target – cutting edge pyrolysis hardware

Original fractionator
- Race track – illustrated fractionation to char/fuel (vapors)
- Strawberry Field – demonstrated large scale production

Streamlined fractionator
- Simplified stationary lower platens
- Higher output heaters integrated with the platen plate – no re-heating required

Simple Continuous
- Continuous versus stop-start operation
- Mechanical simplicity
- Lower capital costs
- Higher reliability

Integrated Continuous
- Higher uptime – more fuel production
- Higher reliability

Enhancing performance and minimizing capital cost of the commercial design
# Multiple stages of R&D and testing capabilities

<table>
<thead>
<tr>
<th>Objective</th>
<th>Early-stage innovation</th>
<th>Refine design basis</th>
<th>Test at pilot scale</th>
<th>Commercial production</th>
</tr>
</thead>
<tbody>
<tr>
<td>Functional focus</td>
<td>Chemistry</td>
<td>Engineering</td>
<td>Systems integration</td>
<td>Operations</td>
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<tr>
<td>Operations</td>
<td>Batch 200 g</td>
<td>Continuous 1.5 kg/hr</td>
<td>Continuous 10 kg/hr</td>
<td>Continuous 1 to 10 t/hr</td>
</tr>
<tr>
<td>Number of runs</td>
<td>2000+</td>
<td>180+</td>
<td>60+</td>
<td>N/A</td>
</tr>
</tbody>
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*Bringing confidence in design, commercial results, and economics*
Biofuel and Biocarbon from Beetle-Killed Pine

BANR High Octane Fuel

Engineered Biocarbon
Engineering Biocarbon

Qualify raw biocarbon feedstock

Adjust out of specification parameters
Demetra Process

Verify performance

Consistency is key to product success
Cool Terra significantly increases turf root development and biomass compared to controls.
Barriers to Commercialization

Consistent supply of feed
  Moisture, particle size, chemical content

Dedicated supply at economically viable price
  Longevity of supply in one location is key

Government regulation, Federal and State
  Feed side – Access to lands with deteriorated woods
  Product side – Regulation of labelling-packaging

Low Crude Oil Price
  Discourages investment in biofuels

Overcoming the stigma of competitors’ “biochar”
  Inconsistent performance in marketplace
Current Strategy

Our focus is on:

Production of Engineered Biocarbon
   Obtain raw stock from foreign and domestic sources and upgrade

Field Trials of Cool Terra Engineered Biocarbon
   Deployment of more than 40 commercial field trials

Commercialize biocarbon production
   Distribution partnerships with Simplot and Triangle Chemical Company

Engineered biocarbon is the current focus with long term biofuels objectives in mind
Conclusions

Cool Planet is adjusting to the market by concentrating on the biocarbon business:

- Executing external field trials
- Developing biocarbon relations and markets
- Maintaining biofuels capability
Thank you!