OTECSS: Organic to Electricity Coupled Cell System

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EXECUTIVE SUMMARY

• The world is nearing an energy crisis as natural resources are diminishing

• The OTECCS is a product designed to meet the energy needs of newly developed households in America

• Converts organic waste generated in homes into sustainable energy

• EnSYR’s mission is to revolutionize energy supply for every new house built in 2016 and beyond
SIGNIFICANCE

- HVAC accounts for **31%** of the total electricity consumed by households in the United States.

- Refrigerators and laundry appliances consumed **33%** of household electricity.

- Oil, coal, and gas account for approximately **70%** of United States energy sources (U.S. Energy Administration Information).
SIGNIFICANCE

• Natural resources are finite

• The United States needs to end its dependence on foreign oil

• Eliminating the carbon footprint of household energy will significantly decrease United States dependence on natural resources
POTENTIAL IMPACT & MARKET

US Housing Starts with Projections Through 2012

2005: 2,068,000 units
2006
2007
2008
2009: 554,000 units
2010: 689,000 units, +6.3% over 2009
2011: 708,000 units, +20.2% over 2010
2012: 1,063,000 units, +50.1% over 2011

Sources: US Census Bureau and NAHB
Graph: Hardwood Market Report

2005 2006 2007 2008 2009 2010 2011 2012

Thousand Units
POTENTIAL IMPACT & MARKET

• Each household with an OTECCS will function independent of a large power supplier

• Homeowners and Real Estate are the ultimate user market

• Prospective houses in progress by 2012 is 1,063,000 units authorized
MARKET ANALYSIS

• In 2009, 12,421 housing units were authorized in New Jersey

• Housing market decline has slowed from about 30% to 5% and shows signs of recovery

• Within the next four years the expected market capture is about 2-5%.
COMPETITION

Other Alternative Energy Companies

• Fuel cell distributors
  – Involve storage of hydrogen
  – Not combined with a microbial electrolysis cell

• Solar energy companies
  – 37% absorption rate for commercial methods (average)
  – Require precise orientation of solar cells for practical implementation
PROPOSED PLAN

• A sustainable energy source which is also controllable

• **OTECC System**
  – Coupled microbial electrolysis cell and hydrogen fuel cell
  – Converts organic waste material into electricity

• Uses microbes to catalyze electrolysis

• Domestic implementation for a self-sustaining household
Microbial Electrolysis Cell

Photo courtesy of Green Car Congress
PHASE-I PROJECT GOALS

Research, development, and tests for efficiency of:

- Residential-supply-sized MEC
  - Input: wastewater, food waste
  - Output: hydrogen

- Residential-supply-sized PEMFC
  - Input: hydrogen
  - Output: current

Combination of two cells into one device
  - Working prototype
Recently discovered technology that converts waste into sustainable energy

- Provides a clean energy source that does not affect atmospheric carbon levels.

Photo courtesy of dreamstime.com
THE COMPANY

EnSYR (Energy Supply for Your Residence)

• Mission Statement: to be the leading supplier of domestic energy technologies

• Core values
  – Consumer’s safety
  – Restoring the environment
  – Increasing awareness of energy crisis

• Specific strengths
  – Addresses a current pressing issue
  – Offer a more durable solution
**Business Management Plan**

- **Organizational structure**
  - CEO: Asim Zaman
  - CTO: Nevedha Rajan
  - CFO: Anjali Mitra
  - CCO: Lindsey Oh
  - Other personnel

- **Marketing strategy**
  - Channel: construction companies
  - Customer sales through channel

- **Service**
  - Warranty (1st 2 years)
  - Installation
  - Maintenance
  - Uninstallation
PROJECT MANAGEMENT

• Personnel
  – Biochemists (R&D)
  – Engineers (R&D)
  – Contractor Liaison (Implementation)
  – Public Relations (Implementation)

• Resources
  – Class 2 lab facility (R&D)
  – Individual component batches (Implementation)
  – Production factory (Implementation)

Photo courtesy of RafterTales
PROJECT MANAGEMENT

• Risks
  – Hydrogen storage
  – Deterioration of components
  – Death of bacterial culture
  – Sanitation risks

• Risk Management Plan
  – Constant input/output => minimize hydrogen existence
  – Scheduled check-ups for part replacement
  – Sealed system beyond consumer reach
### Financial Plan: Company Startup

<table>
<thead>
<tr>
<th>Operating Expenses</th>
<th>Amount</th>
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<tbody>
<tr>
<td>Salary (Office &amp; Overhead)</td>
<td>$2,331,661</td>
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<tr>
<td>Supplies (off and operation)</td>
<td>20,000</td>
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<tr>
<td>Repairs/ Maintenance</td>
<td>12,000</td>
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<tr>
<td>Advertising</td>
<td>300,000</td>
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<tr>
<td>Accounting and Legal</td>
<td>18,000</td>
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<tr>
<td>Insurance</td>
<td>30,000</td>
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<tr>
<td><strong>Total Expenses</strong></td>
<td><strong>$2,711,661</strong></td>
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</table>
Phase I Research Budget

- Total Request: $7,000
  - Full scale Model: $3,000 - $4,000
  - Sets of small scale models: $1,000
  - Testing equipment and other supplies
Breakeven Analysis I
**Breakeven Analysis**

- Cost to Produce Unit: $3,000
- Price to Sell Unit: $10,000
- Expected Housing Constructions: 1,063,000
- 1st Year Capture 0.5% of Market = 5,315 units
- Total income from sales for 1st year $53,150,000
- Breakeven with first 100 units Sold
<table>
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<tr>
<th>Task Name</th>
<th>Duration</th>
<th>Start</th>
<th>Finish</th>
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<tr>
<td>Project Start</td>
<td>0 days</td>
<td>Fri 4/1/11</td>
<td>Fri 4/1/11</td>
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<tr>
<td>E - R&amp;D Proof Of Concept Completed</td>
<td>277 days</td>
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<td>SA - Background Research Completed</td>
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<td>SA - MEC + HFC Design Completed</td>
<td>97 days</td>
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<td>SA - Design for Home Install Completed</td>
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<tr>
<td>E - R&amp;D Commercial Prototype Completed</td>
<td>270 days</td>
<td>Tue 4/24/12</td>
<td>Mon 5/6/13</td>
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<tr>
<td>SA - Prototype Revision Complete</td>
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<td>Mon 8/27/12</td>
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<td>SA - Field Test Plan Completed</td>
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<td>Tue 8/28/12</td>
<td>Mon 12/31/12</td>
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<td>SA - 5 Prototype Completed</td>
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<td>Tue 1/1/13</td>
<td>Mon 5/6/13</td>
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<tr>
<td>E - Field Evaluation &amp; Final Design Completed</td>
<td>270 days</td>
<td>Tue 5/7/13</td>
<td>Mon 5/19/14</td>
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<tr>
<td>SA - Housing Trials Completed</td>
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<tr>
<td>SA - Design Revisions Completed</td>
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<td>Tue 9/10/13</td>
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<tr>
<td>SA - Final Specs Defined</td>
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<td>Tue 1/14/14</td>
<td>Mon 5/19/14</td>
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<tr>
<td>E - Company Startup &amp; Implementation Completed</td>
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<tr>
<td>Project End</td>
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MILESTONES & GANTT CHART

• By Spring 2012
  – Proof of Concept Completed
• By Spring 2013
  – 5 Commercial Prototypes Completed
• By Spring 2014
  – Field Evaluations Complete
  – Final Design Specs Defined
• Fall 2014 Full Scale Company Startup
REFERENCES & ACKNOWLEDGEMENTS

Thank you,
Dr. Dhawan, Professor Sava, Dr. Dine
External Advisory Board
Fellow classmates
for your time.

Any questions?
REFERENCES & ACKNOWLEDGEMENTS


