UL Efforts in Facilitating the Transition to Bio-Based Energy

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OUR VISION...

GROW LOUISIANA’S VAST BIOMASS PRODUCTION CAPABILITY INTO SOURCES OF FEEDSTOCKS FOR PRODUCING RENEWABLE ENERGY IN LOUISIANA

This will be accomplished via strong interaction between university, governmental, and industrial entities working in concert to make this an economic reality
Roadway to Success

Development – Lead by Strong Integrated, Multi-University Teams

Business Interest – Championed by State Government Entities

Investment – Made by Industry via solid Due Diligence
CLEAN POWER AND ENERGY RESEARCH CONSORTIUM

A Joint Venture Between

Louisiana State University
University of New Orleans
Nicholls State University
Southern University
Tulane University
University of Louisiana
LSU AgCenter

Chairman - Mr. Charlie Cuisimano

A Partnership for Clean, Reliable, Low-Cost Energy Solutions for the State & the Nation
CPERC Represents:

Louisiana Institutions
Working in Unison
Toward a Common Goal.

Thereby Yielding,

✓ Clean, Cheap Power for Louisiana
✓ Louisiana Energy for the US
✓ New Economic Development
SUCCESSFUL BIOFUELS TECHNOLOGY DEVELOPMENT

Governmental Policies

Feedstock  Processing  Market

Each Aspect is Highly Inter-Dependent on the Other
The Primary Focus of UL’s Activities are Directed Toward Engineered Systems (Processing)
Participating Academic Colleges:

- College of Engineering
- College of Sciences
- College of Business Administration

>25 Affiliated Key UL Faculty

Over $2.5 Million in Recent Equipment Purchases

Initiation of Several Joint R&D Ventures with Other Universities

Numerous Industrial Development Agreements Recently Initiated
Highly Equipped Facilities

BIOPROCESSING
RESEARCH
LABORATORY
SELECTED ALTERNATIVE ENERGY PROJECTS AT UL

- Production of fuels from algae
- Conversion of rice residuals into ethanol
- Growing fatty microbes using culled yams
- Conversion of meat processing wastes into fuels
- Design of a new generation biomass-fed gasifier
- Production of biogas from waste materials
- Production of bio-based diesel from sewage sludge
- Production of renewable diesel via novel biofeeds
NorthStar Resources Inc.
Boise
City of St. Martinville
Eagle Green Energy
MarTek BioScience
StarEnergy Co. Inc.
Aquatic Energy Inc.
RENEWABLE DIESEL

Soybeans

Sunflowers

Algae

Poultry

Lipid Feedstocks
Fats & Oils

Hydrogen Treater (HydroTreater)

Catalytic Cracker (Cat Cracker)

To Market: Any Diesel Engine

Housed Within Most Refineries
UL’s QUADRA-C System
-40 – 350°C RX-1MS Column

MS-OpenSplit System
Gas to Liquid Diesel Fuels

Feedstocks: Carbon-Based Materials

Gasification of Biomass or Reformed NG into Syngas (H2/CO/CO2)

Fischer-Tropsch Catalytic Conversion followed By Refining into Liquid Fuels (FT Diesel)

To Market: Most Diesel Engines
North Star RMS
UL College of Engineering
Biomass Gasifier Initiative
Overview of Design

- **Reactor Type**: Bubbling Fluidized Bed
- **Special Features**: Semi-Portable, 90% $O_2$ Oxidant
- **Feedstock**: Salt Cedar Woodchips, Other Coarse Biomass
- **Products**: Medium-BTU Syngas and Electrical Power (Phase I), Methanol (Phase II)
From The Toilet To the Fuel Tank?
Producing Bio-Based Diesel from Sewage Sludge
Bio-Based Diesel from Sewage Sludge

Biodiesel from Sewage Sludge

Oil from Sewage Sludge
Comparison of Lipid Building Blocks

**Triglyceride**
(Plants and animals)

**Phospholipid**
(Bacteria)
Evaluation of Anticipated BioDiesel Production Costs (Assuming 30% lipids in the sludge)

Soybean Oil
- Feedstock cost: $2.70/gal
- Processing cost: $0.40/gal
- Transportation cost: $0.20/gal
- Other cost: $0.10
- Total cost: $3.40/gal

Waste Sludge
- Feedstock cost: $1.60/gal
- Processing cost: $0.50/gal
- Transportation cost: $0.10/gal
- Other cost: $0.10
- Total cost: $2.30/gal
Biogas Production From Waste Products & Manures
(Waste Algae, Litter, Meat Products, etc.)
Methanogenic Bioreactors
Overall Application of Biological Methanogenic Conversion of Organic Substrates

Organic Feedstock (Waste)

Bioconversion

Biogas Utilization

Hydrogen Source for Fuel Cells

Direct Combustion For Heat or Steam Production

Feedstock Source:
1 – Industrial
2 – Agricultural
3 – Municipal
* Sewage Sludge
* MSW

Bioreactors:
1 – Lagoons
2 – Mixed
3 – Plug Flow
4 – Sludge Blankets
5 – Landfill

Gas Utilization:
1 – Electricity
2 – Combustion
3 – H₂ Source

Electrical Power Production Via GenSet
Tracking the Growth of Targeted Biogas Producing Bacteria in Digester Units

(Example Use: Algae Cake to Methane)
Experimental Results – Phase I

- No significant increase in CH$_4$ production with the addition of nutrients
- Initially, methane yield is highest at lower solids content
An Evaluation of Alternative Energy Sources for Small Rural-Based Louisiana Towns: St. Martinville, LA

College of Engineering
The University of Louisiana
&
Poche Prouet Associates Ltd.
INTEGRATED SOLAR AND BIOMASS BASED ELECTRICAL POWER GENERATION

>>> Biomass to Gasification to Steam

>>> Sunlight to Thermal Solar Troughs to Steam

Steam Powered Electricity Generation
QUESTIONS?