



*Algae:  
Biofuel of the Future*

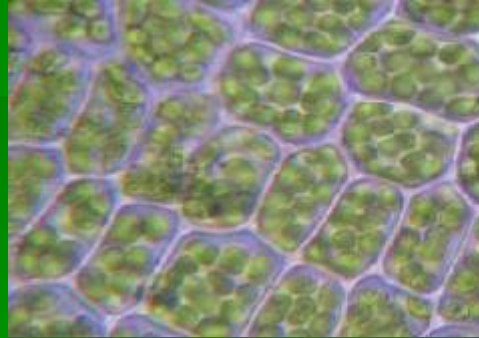
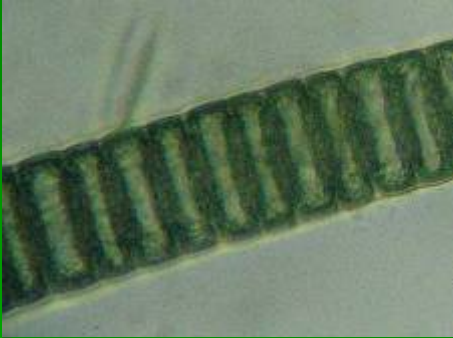
*Algal Farms, Inc.*

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*A Division of Sprouse Industries*

Jes Sprouse

# What are algae?



- Ancient aquatic “life forms”
- Most abundant photosynthetic organisms
- 100,000 + species
- Micro and macro algae
- Helpful and harmful algae

# Global benefits of algae

- Converts CO<sub>2</sub> to food and Oxygen (photosynthesis)
- Primary aquatic food source
- Produces 70-80% of earth's oxygen
- Petroleum oil is fossilized algae

# Traditional Biofuels

- Corn, grains, wood & soybeans
  - *Compete with food crops*
  - *Low net energy output*
  - *Contribute to water quality degradation*



# "Next Generation" Biofuels

**Switchgrass**



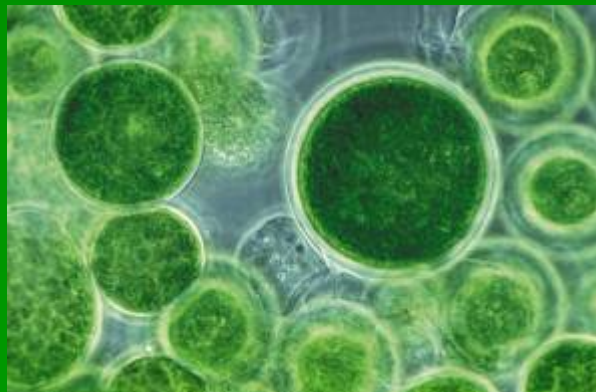
**Wood Chips**



**Animal Waste**



**Algae**



**Urban Waste**



# *Algae Biofuel*

- ***Fastest growing biomass***
- ***Most energy per acre***

## Liquid

- Synthetic fuels

## Solid

- Coal
- Pellets

## Gas

- Methane
- Hydrogen
- Syngas

# Algae Biofuel Feedstock

- Fastest growing biomass on earth
  - Up to 100X faster than traditional crops
- Converts to liquid, solid and gaseous fuels
- Higher oil / btu content than traditional crops
- No toxins

# *Solid Fuel*

## *Energy Comparison*



**Anthracite  
Coal**

11,100 btu / lb.



**Solid Algae  
Fuel**

10,500 btu / lb.



**Wood  
Pellets**

7,500 btu / lb.



# Environmental Benefits

(from growing algae)

- Safer air emissions (from biofuel)
- Consumes 2X its weight in CO<sub>2</sub> (reduces global warming)
- Removes nutrients (N & P) from water
- Grows on non-arable land
- Can use non-potable water (salt water)
- Carbon negative combustion

# Other Algae Products

- Fertilizers and soil amendments
- Food (animal & human)
- Pharmaceuticals
- Cosmetics
- Plastics
- Chemicals
- Liquid fuel

# *Can "couple" with Other Enterprises*

- ***Industrial & Municipal Wastewater***
  - *Alternative treatment processes*
  - *Nutrient assimilation*
- ***Power Plants***
  - *CO2 source (carbon credits)*
- ***Agriculture***
  - *Recycle wastewater and nutrients*
  - *Algae Farming?*

# Algae Cultivation

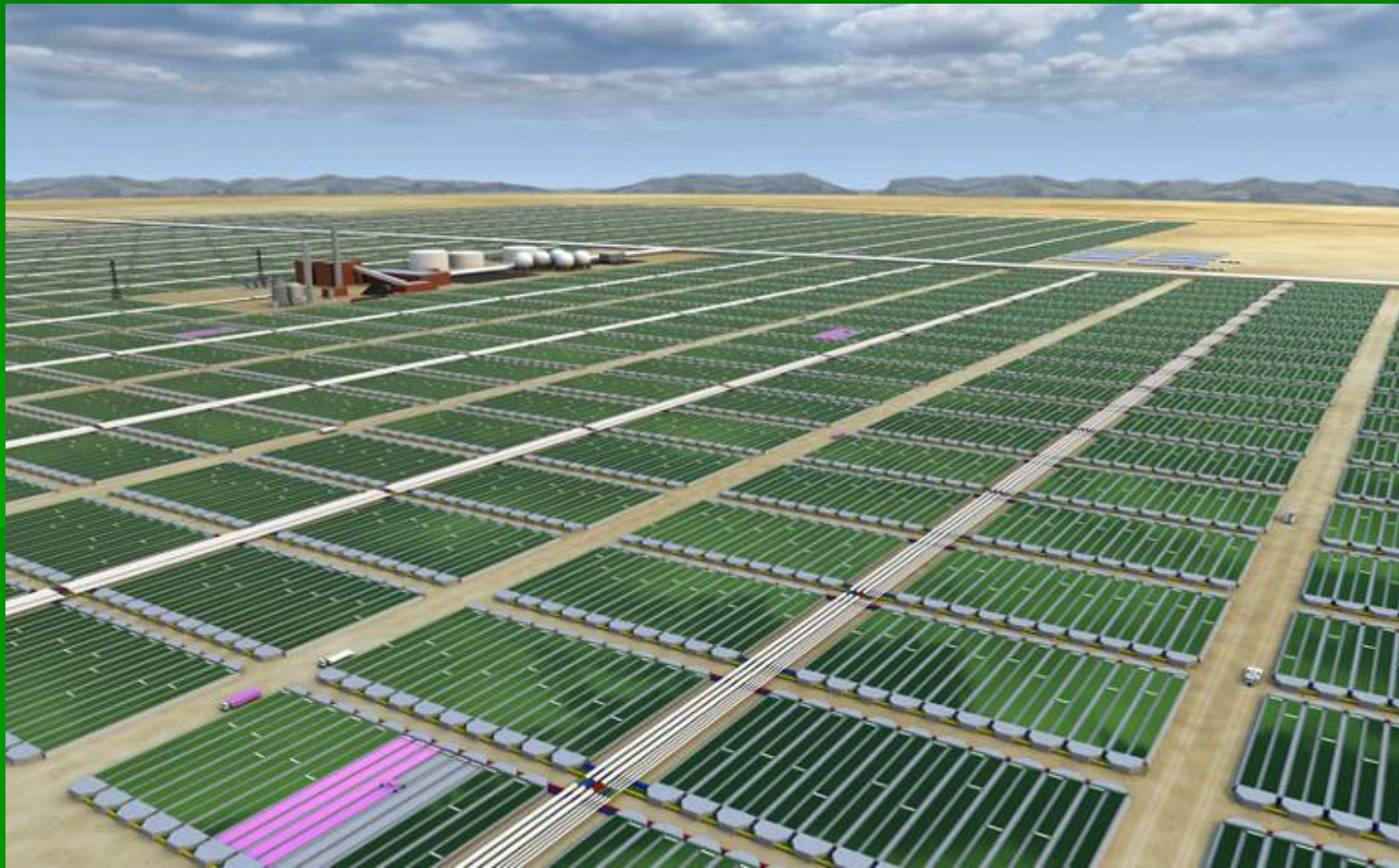
## Open Systems



## Closed Systems



# "Big Algae" Scale Perspective



*What's Happening  
In Virginia?*

# *Virginia "Algae Attributes"*

- **Good climate**
  - *Sunshine & moderate temperature*
- **Lots of nutrient enriched water**
  - *WWTP's*
  - *Tidal Rivers & Chesapeake Bay*
- **Lots of power plants** (*CO<sub>2</sub> sources*)
- **Lots of potential biofuel customers**

# *Virginia's 1<sup>st</sup> Algae Farm Ribbon Cutting - September 2008*





# Algal Farms Inc.

What makes us different?

While most other algae biofuel ventures are focused on developing liquid transportation fuels from genetically superior algae species, Algal Farms Inc. is working to maximize the cost effective production and processing of native algae species. We believe that the intrinsic value of algal biomass justifies moving from experimentation to production.

# Second Pilot System



# Algae Car

(Runs on algae biodiesel)



# Algae Coal



- Burns like coal
- Similar energy content
- Carbon negative
- Lower pollutant emissions

What's Next?

# *The Sustainability Park*

## *Chester, Virginia*



- On-site WWTP
- Algae ponds for nutrient removal
- Harvest algal biomass
- Convert to hybrid wood / algae fuel pellets
- Conversion process to algae coal

# *Appalachian Electric Power Company Clinch River Power Plant Carbo, Virginia*



*Working with the Southwest  
Virginia Higher Education Center  
with funding through the  
Tobacco Commission*

- Coal Fired Power Plant
- Run stack emissions through algae pond
- Capture CO<sub>2</sub> and enhance algae growth
- Harvest biomass for biofuel
- Co-fire with coal
- Preliminary permit & engineering work

What is needed?

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# Q&A

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[www.algalfarms.com](http://www.algalfarms.com)