Reinhold Environmental Ltd.

2010 NOx-Combustion Round Table & Expo Presentation

February 8 & 9, 2010 Chattanooga, TN

Southern Company
Biomass Power Generation R&D

Reinhold NOx Conference

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Biomass-to-Power Demonstrations

Biomass Co-milling test

Hammond

Gadsden

Gorgas

Gaston

Gulf Power
Mississippi Power
Alabama Power
Georgia Power

Greene County

Auburn

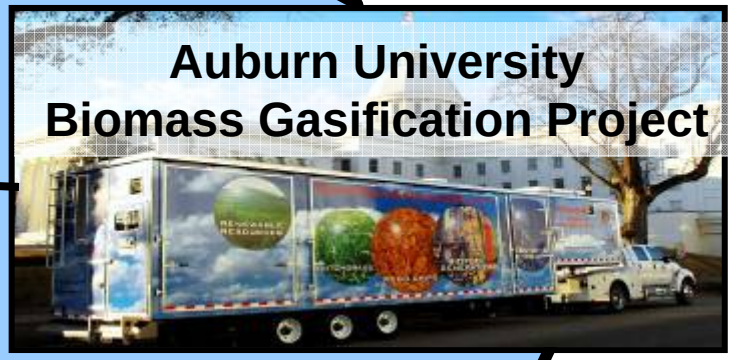
Sweatt

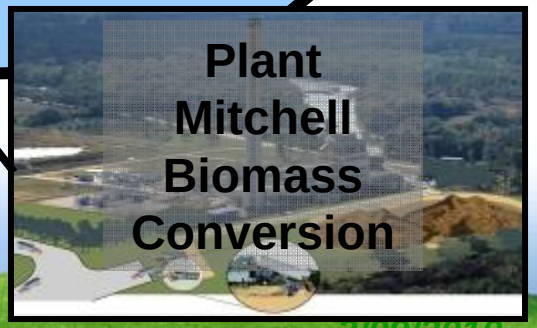
Barry

Watson

Scholz

Mitchell





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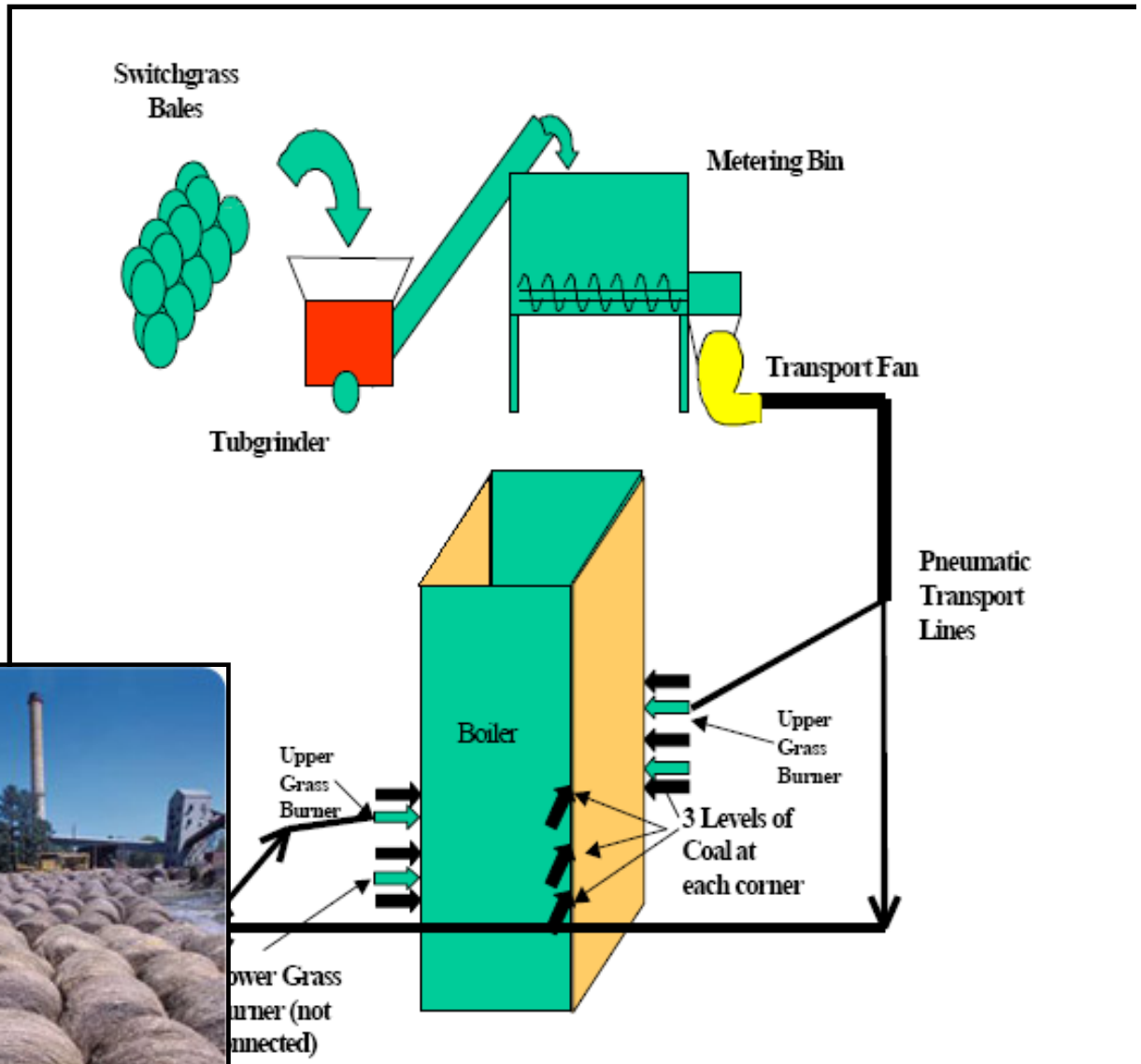
Plant Gadsden Direct Injection System

- Can co-fire up to 10% by energy at low loads, 5% at high loads
- ~ 3.5 MW
- Giant Miscanthus Testing – 3/2010



Biomass Gasification – Auburn University

- Auburn Small Scale Gasifier
  - 25kW Distributed Gasification Trailer

- Auburn Gasification Lab
  - 150 psi fluid bed gasifier
  - Testing to begin on Southern & Loblolly Pine in 1Q 2010

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Biomass Gasification – TRIG technology

- PSDF Research in Biomass Gasification
  - Tested Pellet feeding 1Q 2009
  - Gasification test of 20% by energy in 4Q 2009
- UND EERC Gasification
  - Collaboration with EPRI
  - Transport Reactor Development Unit (TRDU)

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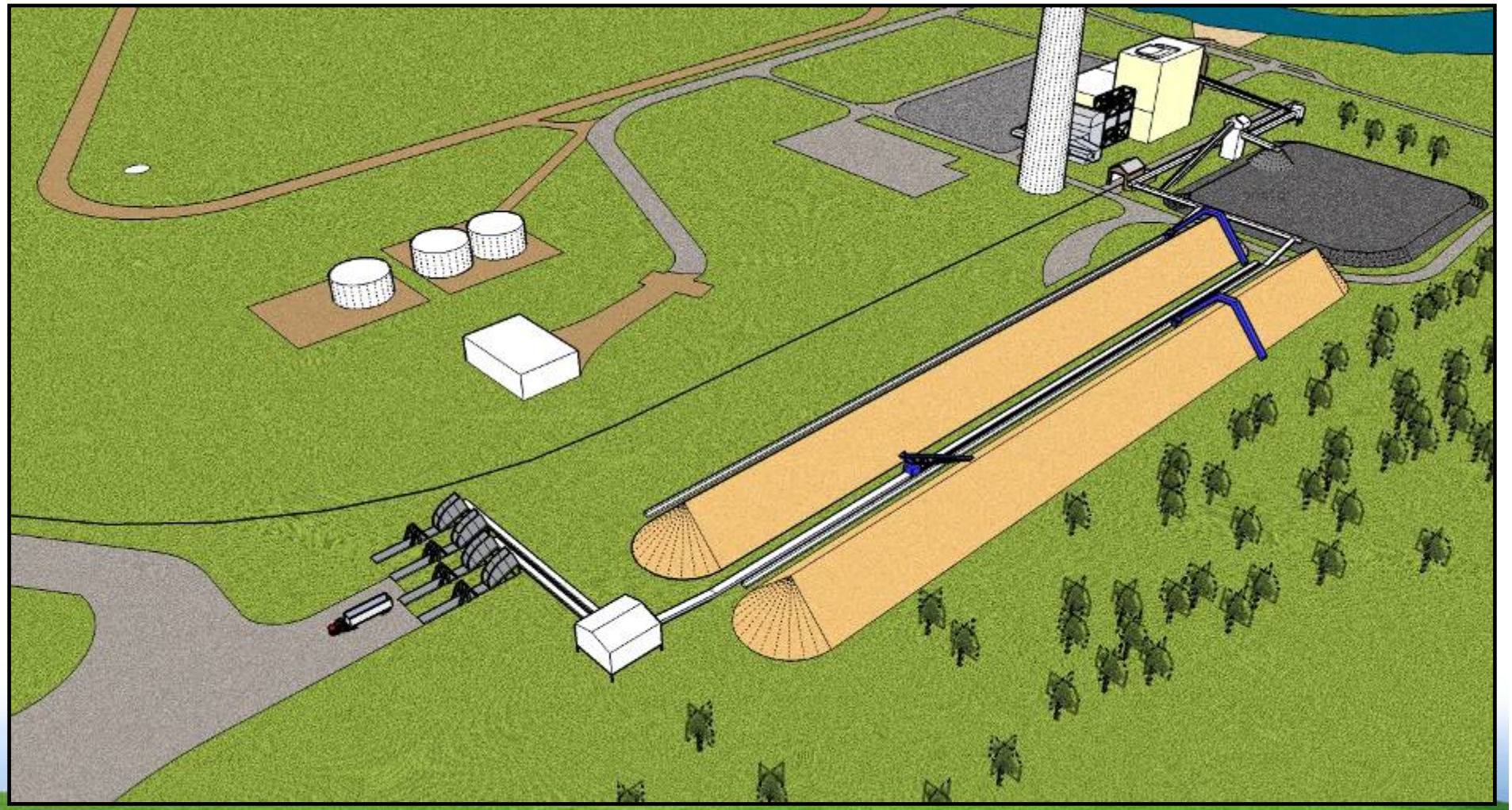
Mitchell Biomass Repowering Study

- Biomass plants have the advantage of being able to be dispatched like typical generation mix
- Accepted as CO2 neutral
- More cost competitive than Greenfield sites
- Direct replacement for coal generation capacity

Mitchell Wood Yard Concept #1 – Linear Piles



Plant Mitchell Repowering

- Capacity: 96 MW net w/ new Stoker Grate and Suspension Firing (Original 156 MW net coal-fired)
- Approx. 1.1 million ton/yr biomass use
  - 180 trucks per day
- Emissions
  - SO2 , NOx, & Hg emissions lower
  - 96% Net reduction in CO2
- Schedule – (To be Modified!)
  - 3/2010 Final air permit expected
  - 4/2011 Retrofit construction begins
  - 6/2012 Begin operations

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Biomass Co-milling

- Pulp and Paper size chips – Big Problems
- ½" minus Whole Tree Chips
  - Pine thinnings
  - Mixed hardwoods
- Sawdust
- Urban wood waste
- Peanut Hulls

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Biomass Co-milling

Biomass Co-Milling Test Results

- Smaller % by energy than originally assumed (1% – 3%)
- Co-milling limitations are mainly pulverizer related.
  - Amount of spare capacity
  - Wood vs. coal
  - Pulverizer condition
  - Moisture
- Some added operational expense
- Emissions were unchanged or slightly lower.

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Current Biomass Plans

- GPC Plant Mitchell Retrofit to Biomass firing
  - 96 MW – 1,100,000 green tons per year
- Southern Power – Nagadoches (Austin, TX)
  - 100 MW – 1,100,000 green tons per year
- APC Plant Gadsden
  - Continue co-milling of cost competitive fuels
  - Support APC Renewable Energy rate
- Pursue LFG projects in service territory
  - Gulf Power, Escambia County – 3.2 MW

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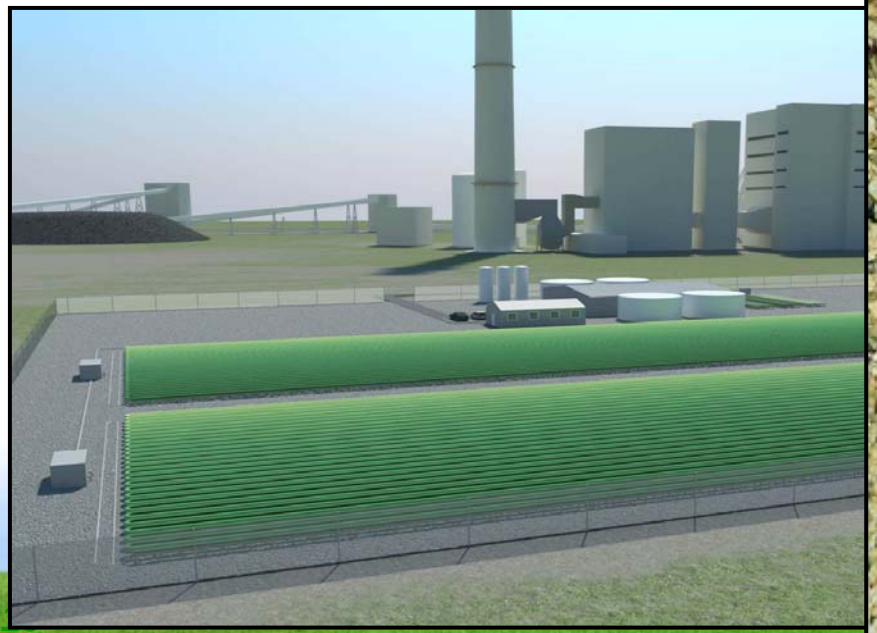
Next Steps

- High % Co-Firing
  - Enhanced Fuels
  - Large Direct Injection
  - SCR Catalyst De-Activation
- Gasification
  - Pressurized Utility Scale
  - Distributed Atmospheric
- Feedstock Research
  - Fuel Sustainability
  - Algae
  - Torrified Wood
  - Energy Crops
  - Ash Research



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