



NC STATE UNIVERSITY



# An Introduction To The IBSS Partnership

T.G. Rials

Center for Renewable Carbon

The University of Tennessee

# The Leadership Team

**Dr. Kelly Tiller**



President & CEO  
Genera Energy, LLC  
Knoxville, TN

*Industry relations and  
biomass logistics*

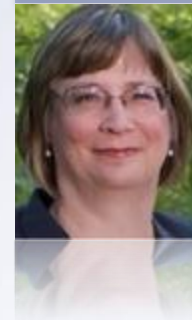
**Dr. Bill Hubbard**



Southern Regional  
Extension Forester  
University of Georgia  
Athens, GA

*Extension, education, and  
outreach coordination*

**Dr. Maud Hinchee**



Chief Science Officer  
ArborGen, Inc.  
Summerville, SC

*Woody crop genetics and  
production systems*

**Dr. Steve Kelley**



Professor & Head  
Dept. of Forest  
Biomaterials  
NC State University  
Raleigh, NC

*LCA and process  
modeling; conversion  
technology*

**Dr. Steve Taylor**



Professor & Head  
Dept. of Agricultural  
Engineering  
Auburn University  
Auburn, AL

*Woody biomass logistics;  
educational programs*

**Dr. Steve Bobzin**



Director, Technology  
Planning, Acquisition,  
& Protection  
Ceres, Inc.  
Thousand Oaks, CA

*Herbaceous crop genetics  
and production systems*

# Contributing Organizations

## Primary Program Partners

- ArborGen, Inc.
- Auburn University
- Ceres, Inc.
- North Carolina State University
- University of Georgia
- University of Tennessee
- USFS, Southern Research Station
- Oak Ridge National Laboratory – CBES
- ORNL – BESC
- Alabama A&M University
- Tuskegee University
- Fort Valley State University

## Technology Partners

- Rentech-ClearFuels
- Louisiana-Pacific, Inc.
- KiOR
- DuPont Biofuels
- Tetravitae Biosciences

## Supporting Partners

- Southern Agriculture & Forest Energy Resources (SAFER)
- 25 x '25
- National Council for Air & Stream Improvement (NCASI)
- The Pinchot Institute



# The Partnership's Goals



1  
Demonstrate real world solutions to barriers limiting deployment of advanced biofuels in the SE region

2  
Create, validate, and use new metrics for improved decision-making for regional biorefinery development

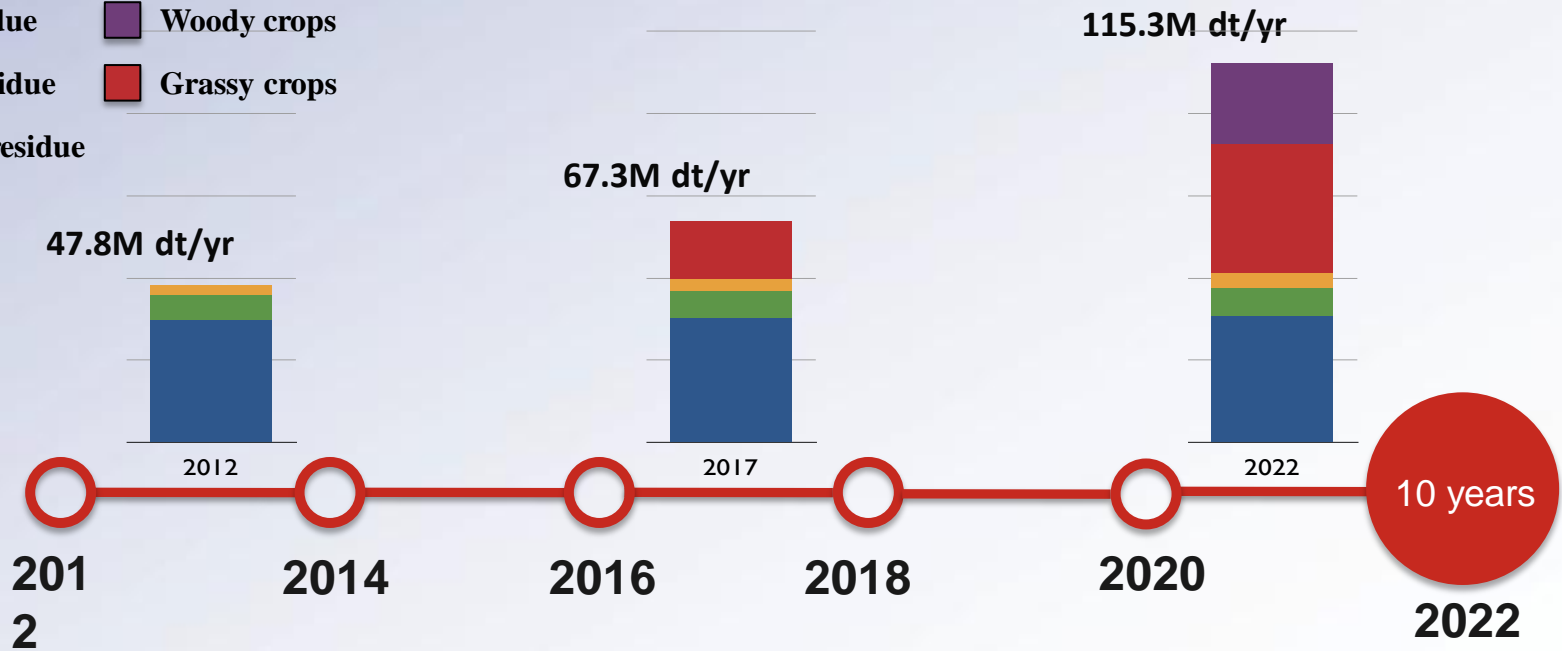


3  
Provide credible and relevant programs to dispense new knowledge for the workforce and stakeholders



# Southeastern Feedstock Projections

- Ag residue
- Woody crops
- Mill residue
- Grassy crops
- Forest residue



## Billion Ton Update

U.S. Department of Energy. 2011. *U.S. Billion-Ton Update: Biomass Supply for a Bioenergy and Bioproducts Industry*. R.D. Perlack and B.J. Stokes (Leads), ORNL/TM-2011/224. Oak Ridge National Laboratory, Oak Ridge, TN. 227p.



## 9 Southeastern States

Includes Alabama, Florida, Georgia, Kentucky, Mississippi, North Carolina, South Carolina, Tennessee, and Virginia.



## Assumptions

- Base scenario (1% annual yield increase for energy crops)
- \$60/dry ton
- Mill residues and MSW combined

# Feedstock Considerations



A part of the southern culture

30 million acres of production

Well-defined silviculture and logistics

Low reactivity in biochemical platform



Limited development in the southeast

Targets potentially available sites for expansion

Portfolio of species available

Good reactivity in biochemical platform



Good yields on marginal lands

Ideal for small farmers and landowners

Biomass supply logistics need advancement

Good reactivity in biochemical platform



# Biomass Handling, Storage & Transportation



- **Year-round supply – maintain material quality throughout storage**
- **Maximize bulk handling – current systems labor intensive, more automation reduces costs**
- **Manage moisture – moisture increases the rate of decomposition and will significantly impact material quality.**
- **Increase bulk density – most significant hurdle to overcome is low bulk density material out of field. Must improve to reduce costs.**



# Woody Biomass Logistics

- New logistics systems are needed for short rotation hardwood plantations in the Southeast U.S.
  - Low delivered cost
  - Productive and safe
  - Feedstock quality optimized for biorefineries
  - Minimal site impacts in adverse conditions
  - Minimal damage to residual stand





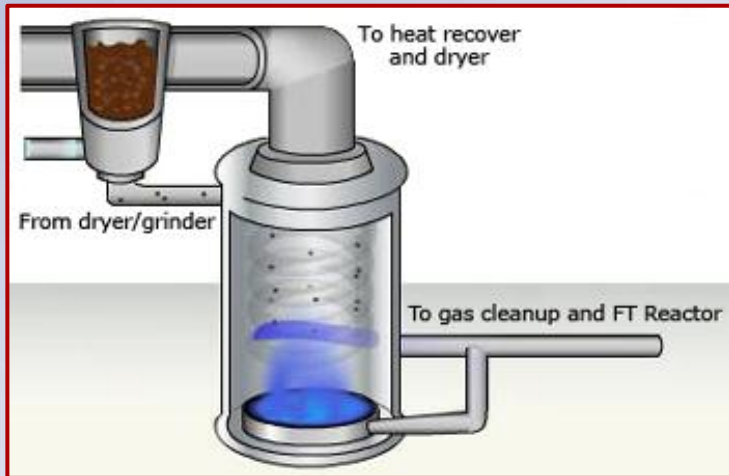
# Leveraged Resources



- >5,000 acres of switchgrass in production
  - Over 100 private farms
  - Alamo and elite varieties
  - Unique lab environment
- Biomass Innovation Park
  - Preprocessing and storage logistics
  - Versatile biomass handling capability
- 250,000 gal/yr biorefinery
- 2,500 gal/yr pdu



# Rentech/ClearFuels



- ClearFuels
  - Demonstrated gasification technology with flexible feedstock capability
- Rentech
  - FT process for conversion to fuels and specialty chemicals
  - Diesel and jet fuel (RenJet certified in 2010)
- Rentech/Clearfuels
  - 20 ton/day demonstration unit
  - Operational in Nov '11



# Industrial Synergy Potential



## TN.gov Newsroom

*Hawaii and Tennessee Companies Join Forces to Convert Wood Products to Renewable Diesel and Jet Fuel*

NASHVILLE – Governor Phil Bredesen and Economic and Community Development Commissioner Matt Kisber, along with officials of ClearFuels Technology Inc. and Hughes Hardwood, announced today that the two companies have signed a Memorandum of Understanding to develop a biorefinery that will convert 1,000 dry tons of wood product per day to renewable diesel or jet fuel. Hawaii-based ClearFuels will site the facility at the Hughes Hardwood wood component products manufacturing facility in Collinwood, Tenn.

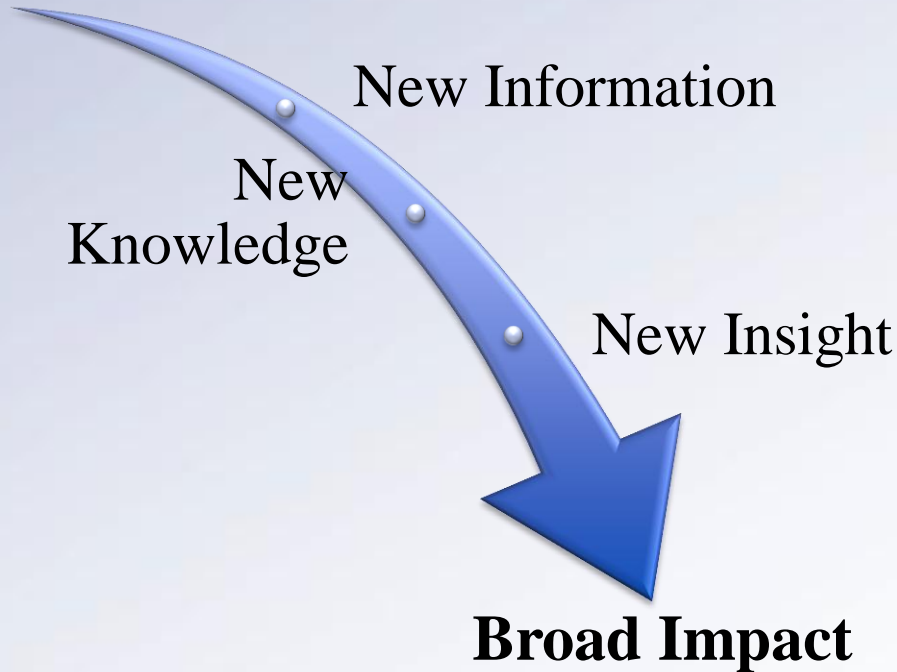
- Louisiana-Pacific
  - 250 ton/day gasifier at OSB composite mill (AL or NC)
  - Replace natural gas
  - Excess power to the grid
  - Improved composite product
  - Valuable intermediate scaling opportunity
  - Closed plants could be converted to small fuels
- Hughes Lumber
  - Planned R/CF commercial facility





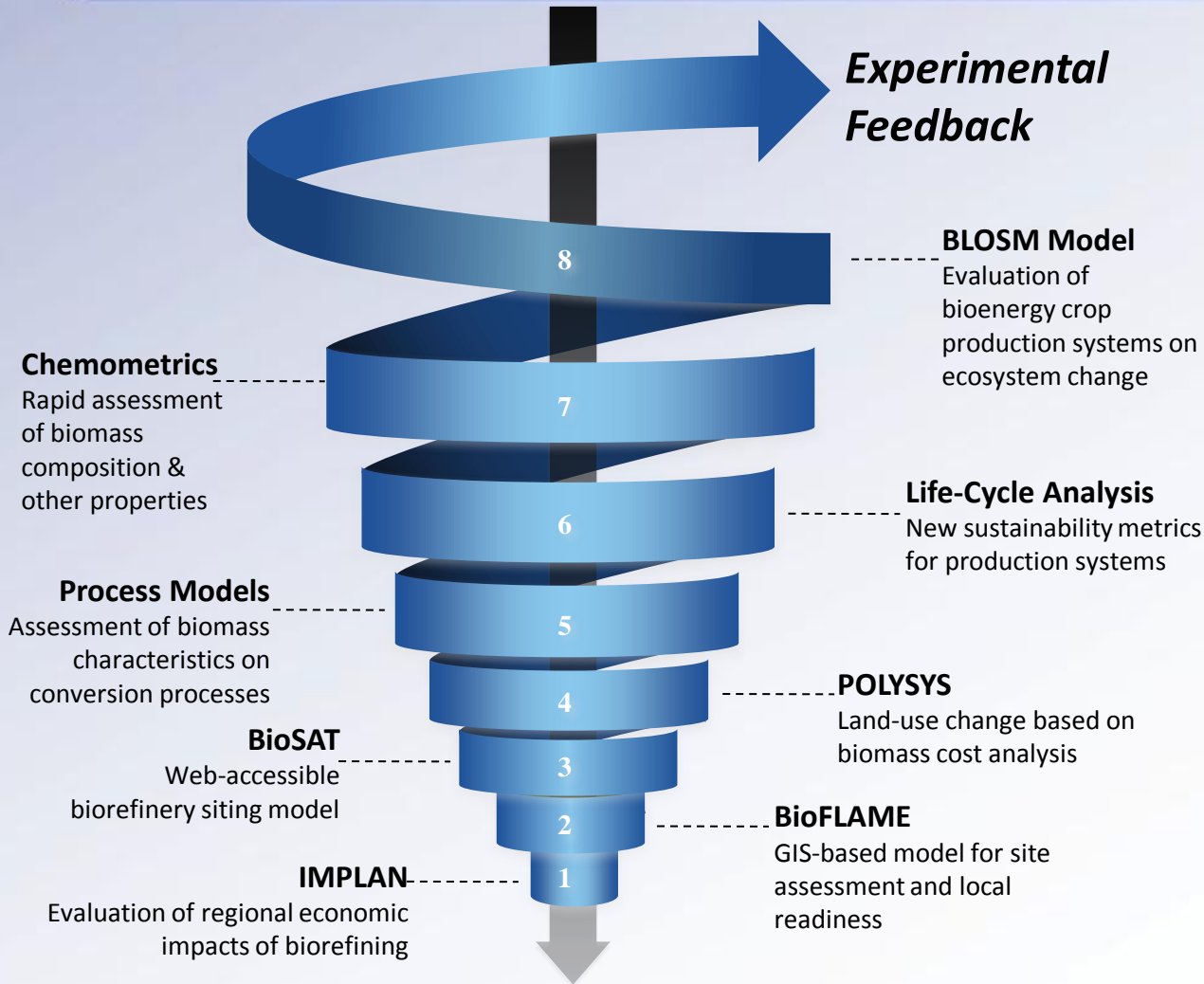
# Sustainability Is Paramount!

New Data



- Uncertainty around sustainability issues is a major barrier
- Increased biomass (and component) yield directly impacts sustainability
  - Reduces overall footprint of the operation
  - Increases efficiencies

# Industry Insight for Deployment



**Experimental Feedback**

## System Metrics

1. **Data collection**  
Watershed-scale hydrology and life-cycle analysis inputs.
2. **Coordinate models**  
Address need to assimilate models for more timely analysis and widespread data availability
3. **Validate models**  
Program will provide experimental results to evaluate model accuracy.
4. **Integrate E2O**  
Vital role for extension in generating front-end data and disseminating new information.

**READINESS INDICES (to inform decisions)**

# Certified Biomass Professionals

- Certified Biomass Professionals program will require new educational content and certification systems



## Program Elements

- 1. Distance ed courses**  
For completion by working professionals, as well as by traditional college students.
- 2. In-service training**  
Extension programs developed for continuing professional competence and training.
- 3. Certification procedures**  
Developed and piloted in collaboration with other organizations (e.g., Council on Sustainable Biomass Production).



# SEED Fellowship Program

- South East Energy Development (SEED) Fellows

- Immersing undergraduate students in challenges of deploying biofuel industry

- Science and Engineering
- Leadership
- Economic
- Social



- “Citizen students” will be selected from across the Southeast U.S.
- Trans-disciplinary student teams assembled
- Faculty mentors will guide teams in solution of real industry problems
- 2-semester experience
  - First semester develop tentative problem solutions
  - Second semester, work with community/industry to implement solutions
- Program will plant seeds of innovation and leadership across the region

# Thank You! Questions?

