



# The Feedstock Supply Chain and Centers of Energy Excellence Update

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Today's Forest – Tomorrow's Markets

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# Key Issues

- Michigan is the 8th most energy intensive state
- Expend almost \$26 billion per year to import energy - 5% of our Gross State Product (reference year 2007)
- Michigan's economy is dependent on imported fossil fuels
  - 100% of coal and uranium used for power generation
  - 96% of transportation fuels
  - 75% of natural gas
- The Federal Government is moving towards a cap/trade or Carbon Tax
- Diversification of economy – MI is 17 times more dependent on Big 3 Jobs than any other State in the US.
- MI has lost approximately 400,000 manufacturing jobs in the last 6 years
- Cleantech industry growing at 20% plus per year with unmet demand



# Bioeconomy Opportunities

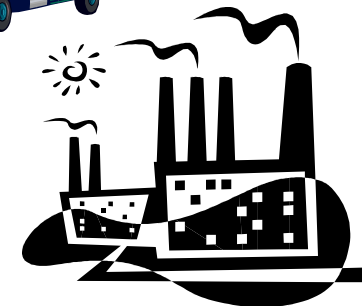
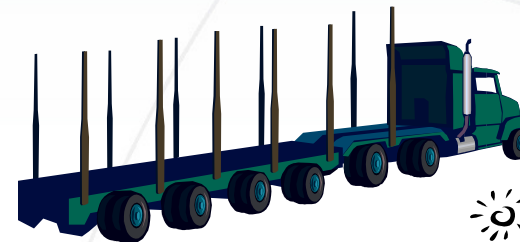
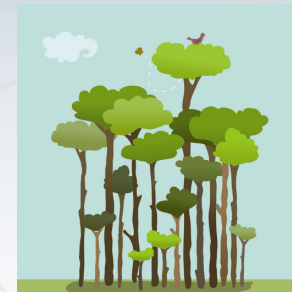
- Michigan has the 5<sup>th</sup> largest state timberland resource.
- Some forest, agricultural, and municipal woody biomass components are under-utilized (including waste/residue streams)
- Existing infrastructure utilizing and producing agricultural and forest-based woody biomass
- Potential for integrated manufacturing of the variety of forest (and non-forest) based biomass to generate highest value
- Proven technology for electricity, heat and steam





# Challenges

- Understanding feedstock/raw material availability and supply to support investor decisions
- Redesign of harvest and transportation technologies
- Developing manufacturing technology for liquid fuel production
- Competitiveness of new and existing woody biomass feedstock/raw material using businesses





# Supply Chain Components

- Sustainable Supply
- Harvest
- Transportation to mill
- Wood receiving and processing
- Manufacturing process
- Sales and distribution





# Examples of Biomass Sources

- Un-harvested annual above-ground growth on timberlands
- Logging residues
- Mill residues
- Energy crops (e.g. poplars, willows and perennial grasses)
- Agriculture residues
- Urban wood waste
- Municipal solid waste
- Biosolids from wastewater
- Food process waste
- Others...

**... We have limited accessible databases quantifying inventory, availability, and supply (actual or potential) ...**





# State Energy Grant

(Issued through the Department of Labor and Economic Growth)

- Contracted with Michigan State University - spatially based inventory of the following biomass sources:
  - Idle land
  - Corn stover
  - Sugar beet pulp
  - Animal manure
  - Straw
  - Food process waste
  - Municipal solid waste
  - Biosolids from wastewater



# Forest-Based Biomass Supply

- Inventory
- Sustainable Management Impacts on Availability
- Social Impacts on Availability
- Supply: Economic Impacts on Availability

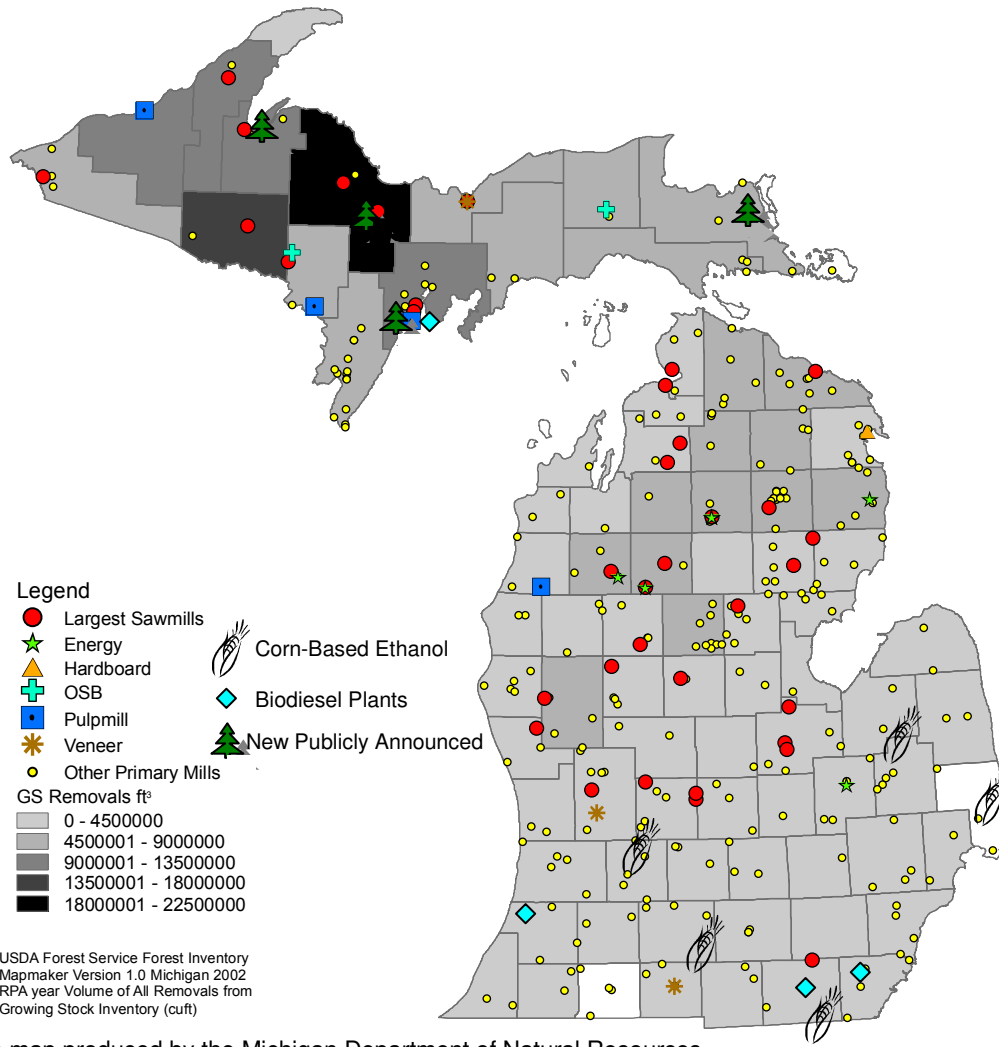






# Forest Product Primary Mills and Growing Stock Removals

With addition of operational corn-based ethanol plants, biodiesel plants  
and new publicly announced renewable energy projects



USDA Forest Service Forest Inventory  
Mapmaker Version 1.0 Michigan 2002  
RPA year Volume of All Removals from  
Growing Stock Inventory (cuft)

Base map produced by the Michigan Department of Natural Resources

[www.michigan.org](http://www.michigan.org)

MICHIGAN ECONOMIC DEVELOPMENT CORPORATION



# Statewide Forest-Based Biomass Assessment

- Development Forest-Based Information System in a spatial framework (GIS), with a user friendly interface that includes forest-based biomass inventory, current forest-based biomass availability, and an identification of constraints that limit availability
- An assessment of sustainable forest-based biomass availability and a definition of potential availability that could exist if constraints are relaxed thus giving the user an idea of where investments may be made to improve availability
- An assessment of the potential role that forest-based biomass can play in supporting the State's renewable energy goals while supporting existing forest-based biomass demand.

Finalizing funding for immediate implementation



# Michigan Centers of Energy Excellence Program



# Key Assets

- Key Anchor Companies
- Presence of OEMs
- Top manufacturing workforce
- Top wood fiber resource
- Top universities in key fields
- Sense of Urgency
- 21<sup>st</sup> Century Jobs Fund
- International relationships (Sweden, Israel, etc.)
- Existing relationship with key cleantech venture capital firms (Flagship, VantagePoint, Khosla, etc.)
- Fresh Water
- Outstanding Geological Formations for CO<sub>2</sub> Sequestration



# MEDDC Response – Cluster Based Economic Development

- Targeted industries
- Potential for significant growth
- Leverage state strengths
- Generally not mature
- Gap exists – requires economic assistance

1. Wind Turbine Mfg.
2. Bioenergy/Fuels
3. Advanced Energy Storage
4. Solar/Photovoltaic
5. Water Technology
6. CO<sub>2</sub> Capture, Reuse & Sequestration

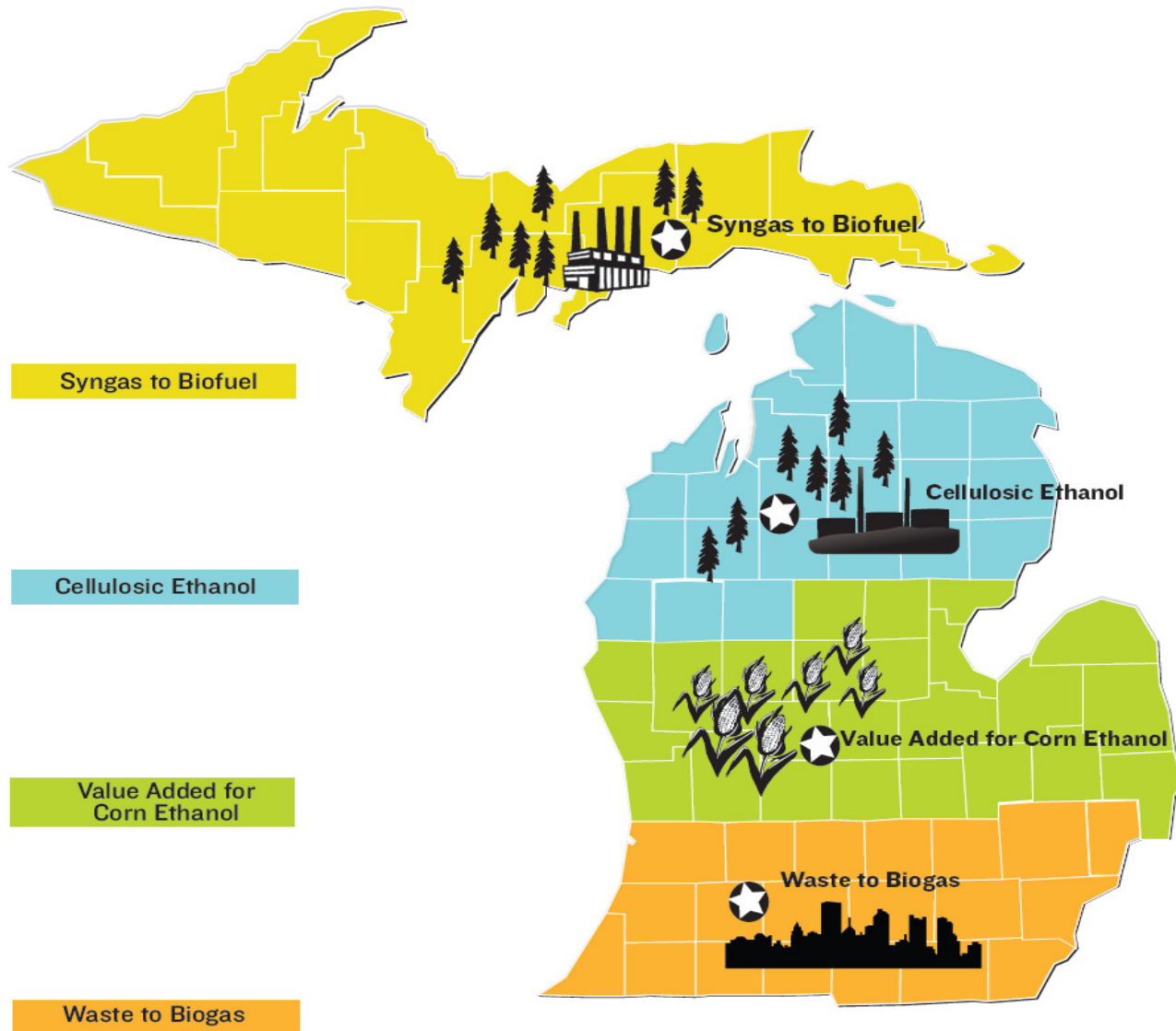




# Cellulosic Biofuels

- **Target Focus:** Bio-fuel production using cellulosic biomass as feedstock (e.g., wood waste, energy crops, agriculture stover)
- **Data-Driven Research**
  - Michigan competitive advantages (forest products)
  - Related commercial/industrial expertise - pulp/paper mill industry
  - Relevant workforce in place
  - World class universities
- **Cluster Team** – Formed in 2007. Actively participated in the creation and implementation of a strategy.
  - **Potential focus areas across multiple technologies and regions.**
    - Gasification of Cellulosic Biomass to Motor Fuels
    - Biochemical Conversion of Cellulosic Biomass
    - Value-Added Products for Corn Ethanol Producers
    - Municipal Waste to Biogas/Motor Fuels

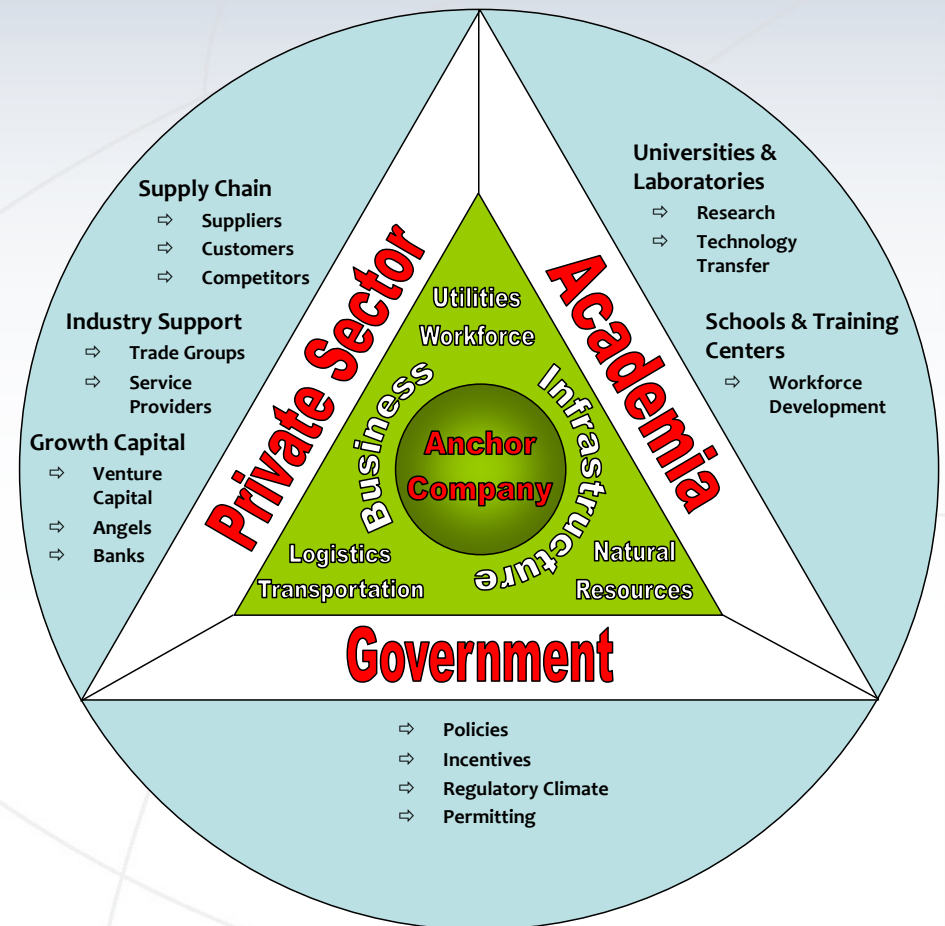
# Biofuel Focus Areas





# Centers of Energy Excellence

- Goal is to rapidly grow an industry cluster (energy security and environmental profile)
- Includes high profile anchor company at the center
- Geographically located in area with strong business infrastructure
- Surrounded by private sector companies, academic institutions, and government entities
- Assigned to areas where technical or supply chain issues limit commercialization
- Significant economic impact





## SB 1380/PA 175 – Centers of Energy Excellence

- Michigan Strategic Fund (MSF) to create and operate a COEE Program to *promote the development, acceleration, and sustainability* of “energy excellence sectors” in Michigan.
- MSF board to *spend up to \$45 million* from the 21<sup>st</sup> Century Jobs Trust Fund appropriations
- *Only to for-profit companies.*
- Include *at least one institution of higher learning*
- Require at least *50% of the funds* allocated for the Program be *used to match* foundation funding, federal funding, or international investments.
- All funding allocated for 2007-2008 and 2008-2009 has been awarded and the program is currently suspended and not accepting further applications.



# 6 Centers Awarded

- **Swedish Biogas International Center of Energy Excellence in Waste to Energy**
  - Partners: Kettering University, City of Flint, Linkoping University (Sweden)
  - \$4 Million
- **SAKTI3 Center of Energy Excellence in Advanced Batteries**
  - Partners: University of Michigan, Ann Arbor SPARK
  - \$3 Million
- **A123 Center of Energy Excellence in Rechargeable Lithium Batteries**
  - Partners: University of Michigan, Michigan State University
  - \$10 Million
- **Working Bugs Center of Energy Excellence in Biorefineries for the Production of High Value Specialty Chemicals from Natural Feedstocks**
  - Partners: Michigan Technological University
  - \$2 Million
- **American Process, Inc. in Partnership with Valero Energy Center of Energy Excellence in Biorefinery Conversion of Process Waste Effluent into Cellulosic Ethanol, Sodium Acetate and Clean, Warm Water**
  - Partners: Michigan Technological University
  - \$4 Million





## Six Centers Awarded

- **Mascoma Corporation Center of Energy Excellence in Cellulosic Ethanol**
  - Partners: JM Longyear, Michigan State University, Michigan Technological University
  - \$20 Million



# Mascoma Feedstock Supply Chain Center of Energy Excellence

- \$2 Million of the Mascoma Center of Energy Excellence Grant is dedicated to improving wood biomass feedstock supply and the supply chain
- Frontier Renewable Resources, Michigan State University and Michigan Technological University
- Feedstock availability, harvest and transportation to develop overall supply chain efficiencies
- Development of technologies and tools
- Broader benefit



# Feedstock Supply Chain COEE **Mission**

Promote the development, acceleration, and sustainability of the feedstock supply chain from production, availability and supply through delivery to the facility by developing technologies, tools and outreach that quantify and increase feedstock supply, facilitate business decisions and promote cost effective, low greenhouse gas supply chain solutions.



# Feedstock Supply Chain COEE Project Areas

- Increasing Sustainable Biomass Feedstock Availability
- Improving Forest Feedstock Harvesting, Processing and Hauling Efficiencies
- Feedstock Supply Chain Modeling
- Outreach Extension and Technology Transfer





# Can We Do It? Yes We Can.

