

Report Out I: Forest Resources— 2012 Target

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A Scenario for Supplying 30% of 2004
Motor Gasoline with Biofuels by 2030

Biomass

Forest Resources: Conversion Processes and Feedstocks

Technologies cut across the Pathway options

- Gasification
- Fermentation
- Pyrolysis
- Feedstock

Forest Resources: Barriers – Gasification

Technology issues with scale and syngas quality, and process integration

- » Feeder systems
- » Gasifier availability/reliability
- » Gas cleanups – tars, sulfur, ...
- » Matching scale to economy: size
- » Business links – fuel resources->converter>product distribution
- » Biomass vs. coal, oil, natural gas for GTL equipment, etc. – drawing talent
- » Lack of demo plants

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Forest Resources: Barriers – Fermentation

(Early impact, lower capital risks)

Mixed sugar fermentation

Cellulose hydrolysis

- » Simultaneous effective conversion of sugars
- » Extraction of hemis
 - ♦ Maintain paper value
 - ♦ Concentration of hemi
 - ♦ Acetic acid
- » Production of cheap sugars
 - ♦ Hydrolysis
 - ♦ Gasification (fermentation)

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Forest Resources: Barriers – Pyrolysis

Distributed production, integration into current petrochemical infrastructure

- » **pH of oil product**
- » **Scale-distributed is “better”**
- » **Efficiency & Yield – amt. of py oil needs to be enhanced**
- » **Catalyst Stability & Robustness**
- » **Catalytic Process for Upgrading or converting Py-oil**
- » **Competing markets for biomass resources**
- » **Permitting**
- » **Stability- Lack of fungability**

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Forest Resources: Barriers – Feedstock

Sustainable collection and handling (costs), significant regional differences

- » **Growing – species management**
 - Species differences – feedstock characteristics (yield, mc, specific gravity juvenile wood)
 - How much hardwood can be used
 - How much can we remove (nutrient removal)
 - Public vs. private land issues (tribal)
 - Time – (for 2012 its already there, for 2030, a fair amount is there)
 - Land ownership and current tax laws
- » **Regulatory & Social Expectations**
 - More efficient use impactful harvest systems
 - Fuel efficiency
 - Trained work force
 - Not enough resources for R&D
- » **Economic**
 - Fuel & iron costs
 - Leakage of the resource (pellet plants ship to EU) degraded potentially
 - Infrastructure (Roads, bridges, RR lack of)
 - Capital requirements
 - Trucks & Drivers
 - Production costs and site capital

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Forest Resources: Research and Development Needs – Gasification

- » **Feeders (solid biomass)**
- » **High temperature materials (bldg.)**
- » **Syngas conversion match to scale – better processes/catalysts**
- » **Gas cleanup**
- » **Gasifier type**
- » **Blended fuels**
- » **Technology demonstrations**

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Forest Resources: Research and Development Needs – Fermentation

- **Sugars conversion**
- **Simultaneous or Sequential C-5, C-6 fermentation**
- **Optimization of mixed C-6 fermentation**
- **Upgrading of sugars**
 - » **Conc.**
 - » **Inhibitors**
 - » **Co-product (separation)**
- **Extract with Pulp Quality**
- **Eng. Studies on modifications**
- **Cellulose hydrolysis (could allow enzyme recycling)**

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Forest Resources: Research and Development Needs – Pyrolysis

- **Institu process to raise Ph and lower O2 level**
- **Institu process to change chemical composition**
- **Modular & Portable Systems – distributed better, move to source of biomass**
- **Reactor Design and/or catalytic materials**
- **Catalyst Process Development**
- **Char seperation**
- **Integration**

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Forest Resources: Research and Development Needs – Feedstock

- » **More Efficient Logging and wood production systems**
- » **Define resource need (feedstock characteristics)**
- » **Infrastructure Assessment**
- » **Enzyme integration**
- » **Ecosystem services & delivery & valuation (impacted by urbanization/fragmentation of landscape) value of forests in landscape**
- » **Economic & Environmental analysis of product leakage & harvest transport systems – impact on existing industry and on the landscape/ecosystem/environment**

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Forest Resources: Policy

- » **Support integrated demo plants**
- » **Even-handed renewable, transportation fuels incentives (not ethanol only)**
- » **Plant permitting**
- » **Sustained level R&D funding**

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Forest Resources: Federal Role

- » **Long-term feedstock supply commitments (20-30 yrs)**
- » **Coordinating research funding**
- » **Implementing complementary farm +forest + policy**
- » **Even-handed capital assistance programs**
- » **Communications**
- » **Mitigate risk for investment in biofuels**

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Tomorrow's Discussion

- Discuss further RD&D and Policy needs to 2030
 - » Prioritize needs
 - » Add timeline
- Discuss Synergies and Conflicts with other breakouts
- Revisit Cost and Volume targets