
# Integrating Feedstocks Development and Production with Conversion Processes and Distribution Across the Supply Chain to Improve and Accelerate Biofuels Commercialization

**Public Meeting of the Biomass Research and Development Technical Advisory Committee**
**August 13, 2013**
**by**
**Bryce Stokes*, CNJV**
***On the behalf of the BR&D Interagency Working Group**

# Report on Supply Chain Integration White Paper Overview

The white paper will focus on improving full integration and achieving higher efficiency in the production, conversion, and delivery of biofuels.

The specific objectives of this report are to:

- Provide a science and technology review of the role of biomass feedstocks' physical and chemical properties and material flow through the supply chain for improved efficiency,
- Understand primary parameters that effect the whole supply chain,
- Identify the barriers and understand the implications of fully integrating feedstock development, production, and handling with conversion and delivery of final products,
- Evaluate and make recommendations for improving supply chain components and overall system efficiency and cost competitiveness, and
- Facilitate coordination among the federal agencies to improve the supply and end use chain to take advantage of technology breakthroughs.

# White Paper Team

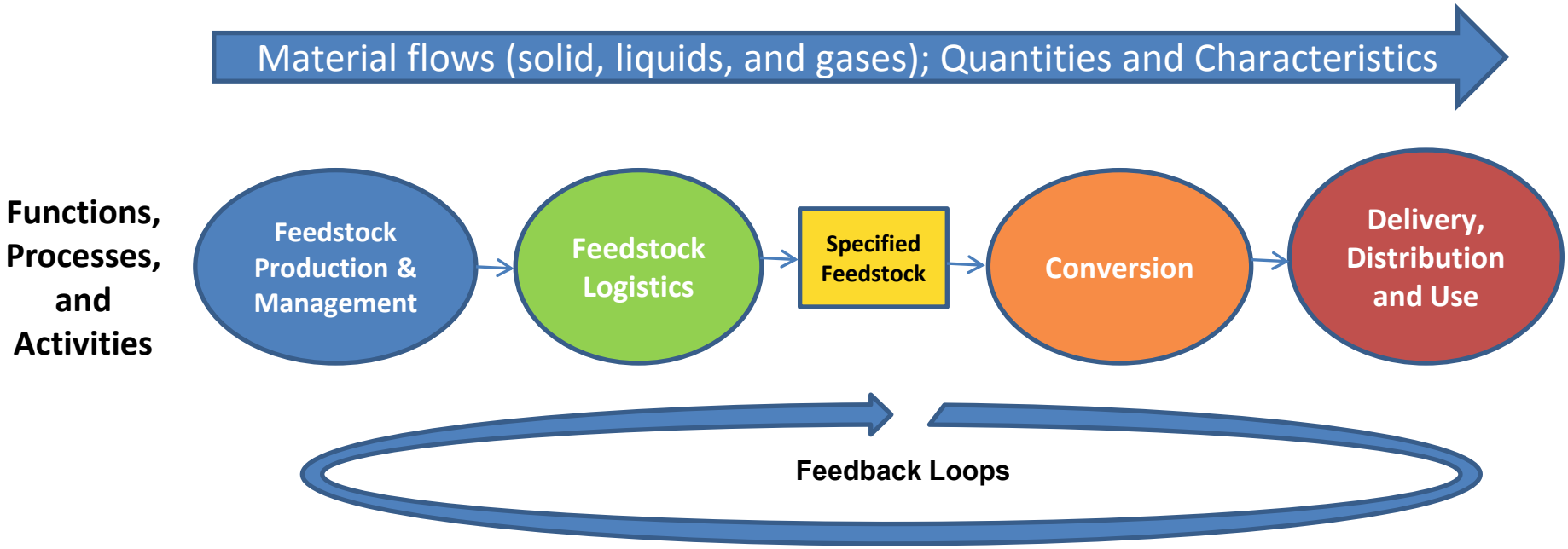
Work on the White Paper is coordinated through representatives of specific Interagency Working Groups* listed as follows:

- Feedstocks Production – Genetic Improvement
- Feedstocks Production and Management
- Feedstocks Logistics
- Conversion
- Transport and Distribution Infrastructure
- Analysis

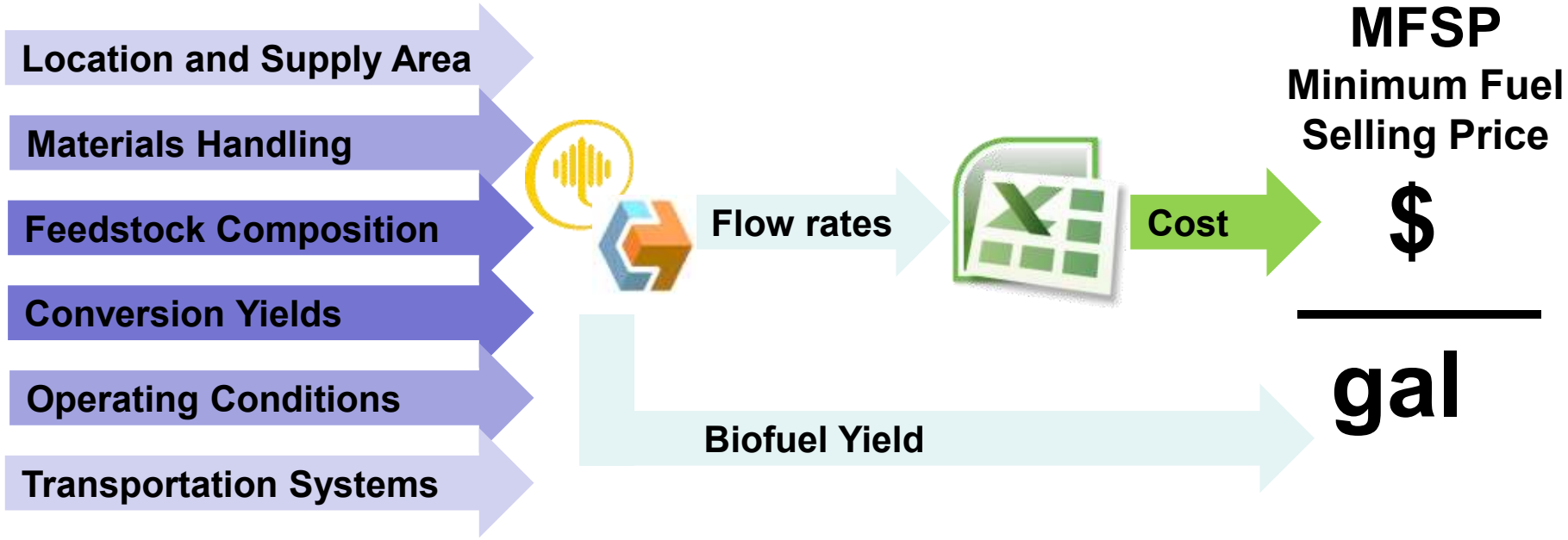
Agencies involved:

*The Algae IWG is the only Board group not participating in this effort.

# Components in Biomass Supply Chain



# Supply Chain Integration Concept

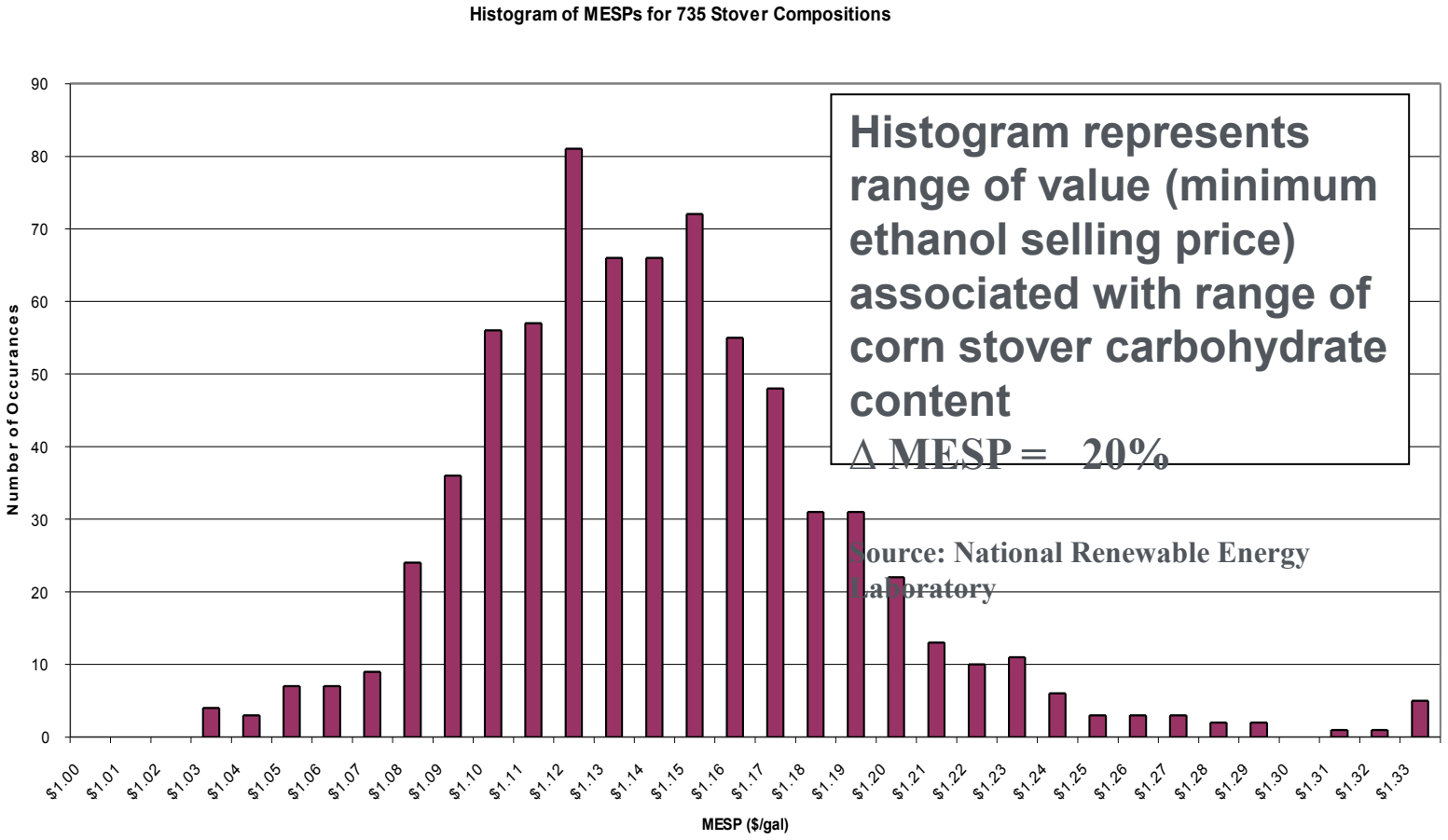



- Cost reductions are dependent on increasing flow rates and product yield
- This is achieved by “optimizing” and controlling inputs and outputs along the entire supply chain
- The supply chain components have parameters that can be controlled or managed through design, manipulation, or selection.
- These parameters are affected by upstream actions and have an effect on downstream actions

# Variability has Cost Implications

Goal: Reduce variability/uncertainty around feedstock quality specs

**Upstream and downstream effects**



# Biomass, Feedstocks, and Commodities

Feedstocks

Improvements in characteristics, properties, and attributes

Biomass

Commodity

**Feedstocks**
- Plant material (genetics)
- Manage properties
- Production systems
- Logistics
- Preprocessing

Value added – cost competitive final product cost

**Biomass**
- Heterogeneous quality, density, format
- Not stable
- Distributed and spatial variability
- Temporal variability

**Commodity**
- On-spec quality
- Uniform density
- Consistent format
- Stable
- Reliable supply
- Infrastructure compatible
- Fungible

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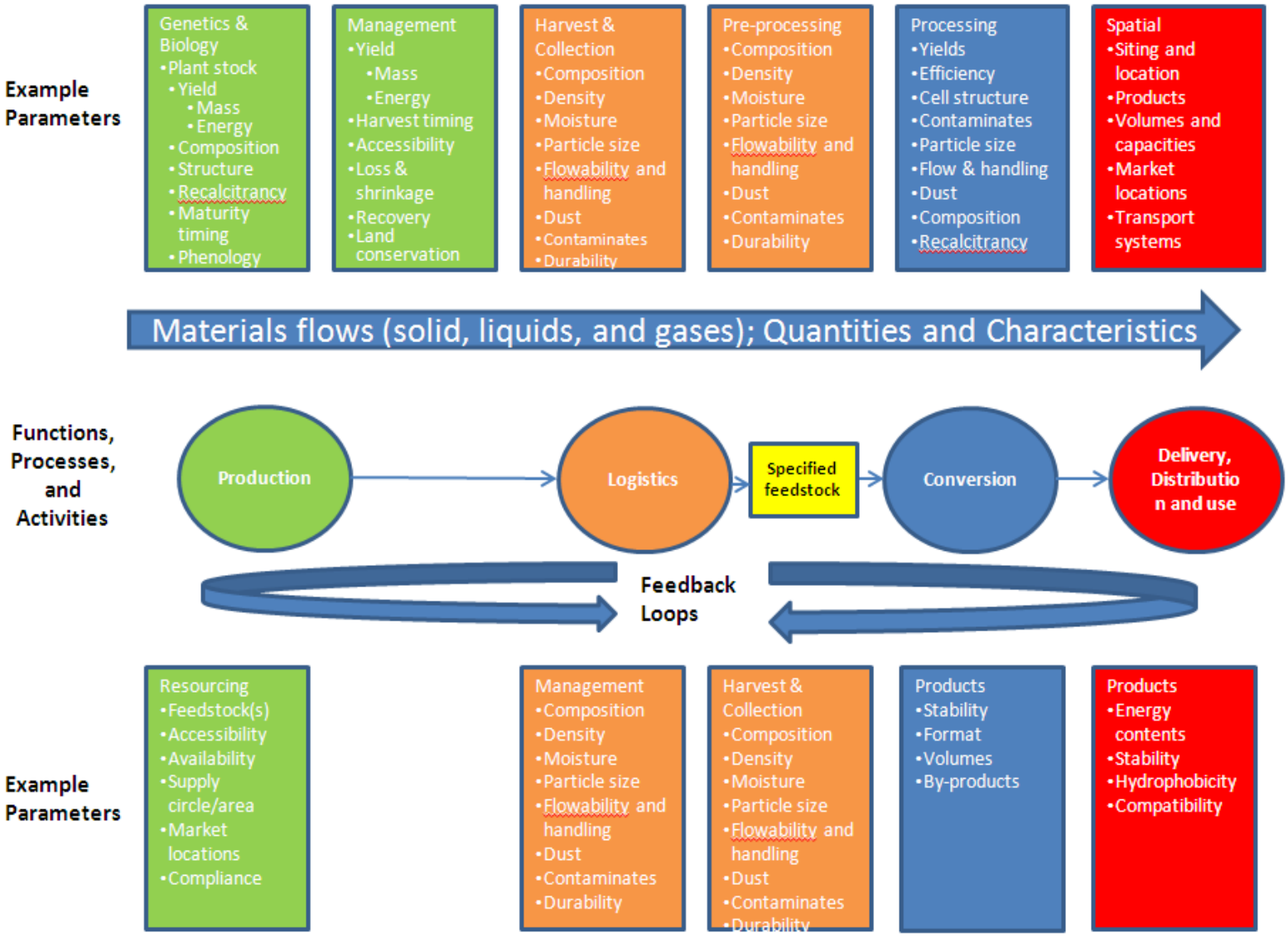
# Example Parameters



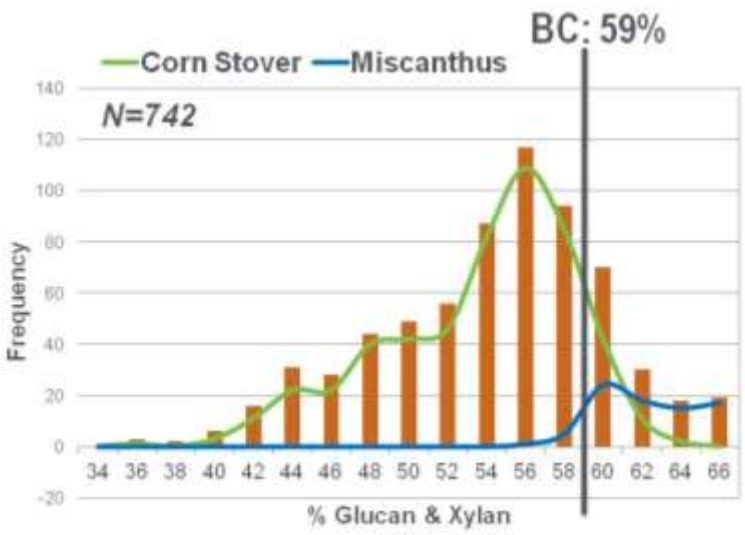
# Examples of Parameter Effects

**Parameters are the variables, attributes, and characteristics associated with materials, actions, processes, and designs.**

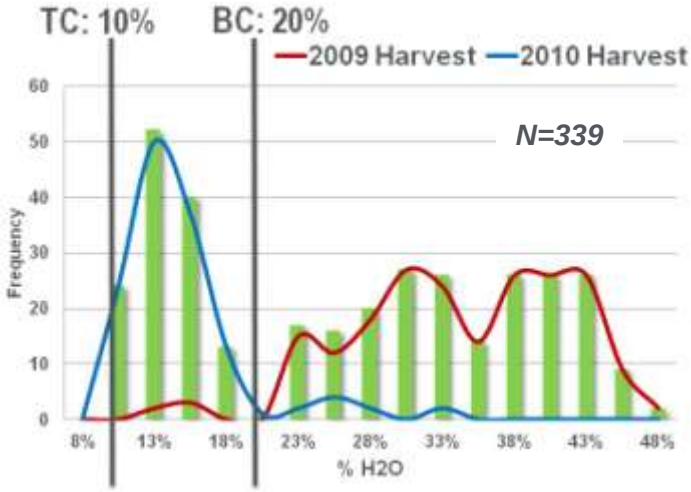
| | |
|---|---|
| Location | • Location defines the feedstock and could define the product<br>• Feedstock type(s) defines the supply area and resourcing/transportation systems and could define the conversion process<br>• Supply system defines the capacity, storage and material flow rates<br>• Product defines scales, markets, and delivery systems |
| Feedstock Moisture Content | • Feedstock type and management define inherent plant moisture<br>• Conversion system defines the moisture specification<br>• Plant stock, management, and logistics control moisture<br>• Moisture is affected by location<br>• Moisture affects transportation and storage systems<br>• Yield, conversion efficiency, system losses, and other quality factors are impacted by moisture content |

# Feedstock Quality Specifications

## Sugars

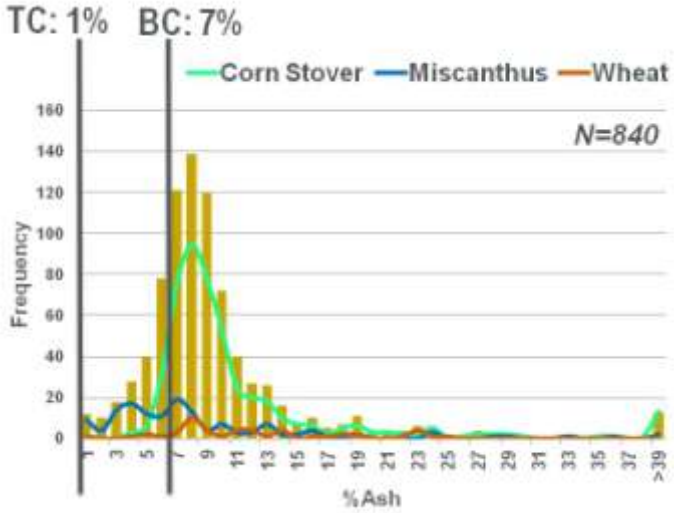



## Moisture




**Quality specs (vertical line) are shown for representative biochem (BC) and thermochem (TC) pathways**

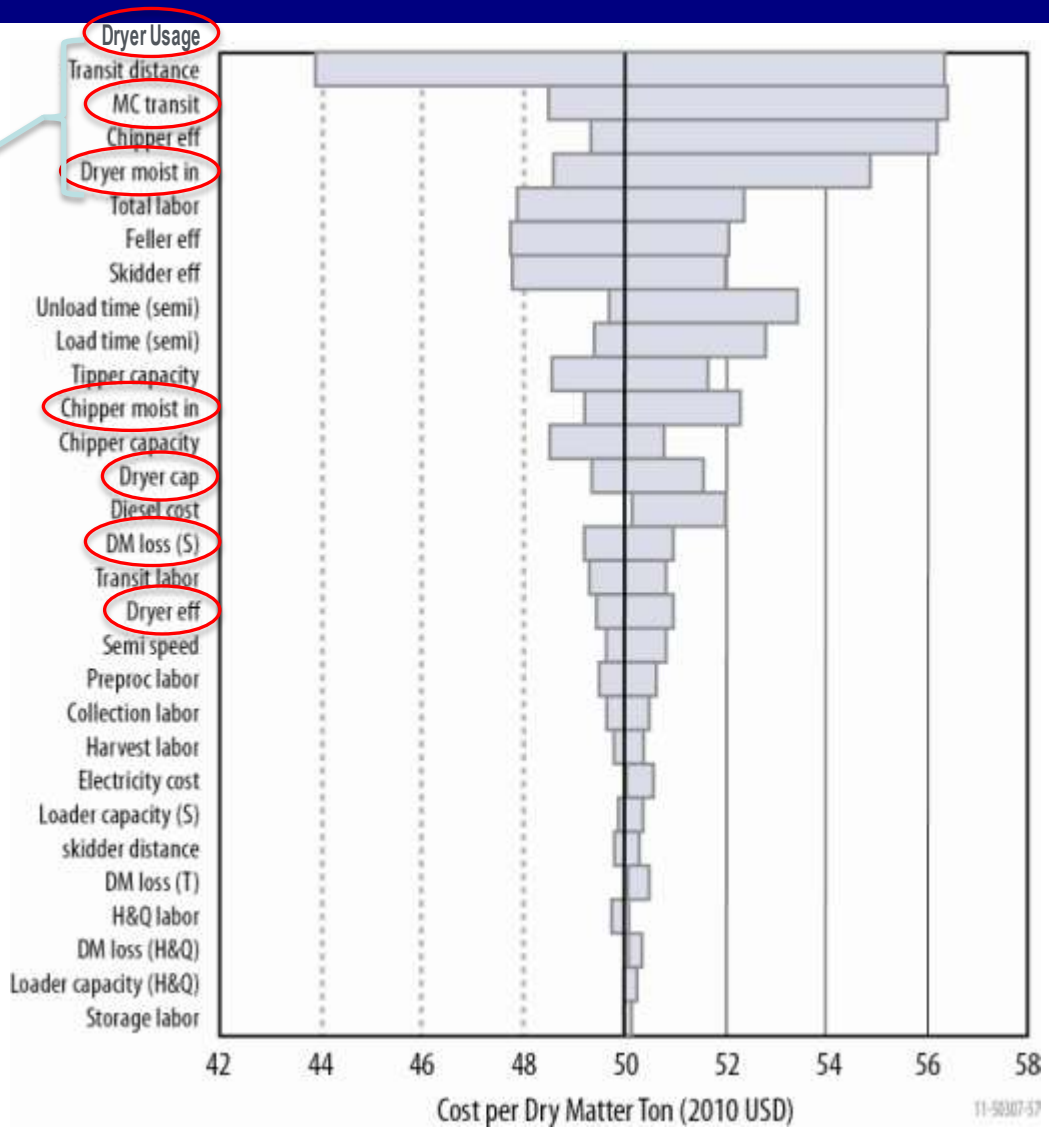
## Ash



# Total System Cost Impacts- Conventional Woody Example

- Dryer usage at the refinery not included because it overpowered all other costs
- Key parameters
  - Transportation distance
  - Moisture content
  - Chipper, feller, skidder utilization efficiency
  - Labor
- Sensitivity and model inputs reviewed both internally and externally

https://inlportal.inl.gov/portal/server.pt/gateway/PTARGS_0_3647_96127_0_0_18/Uniform-FormatFeedstockSupplySystemDRAFT2.pdf



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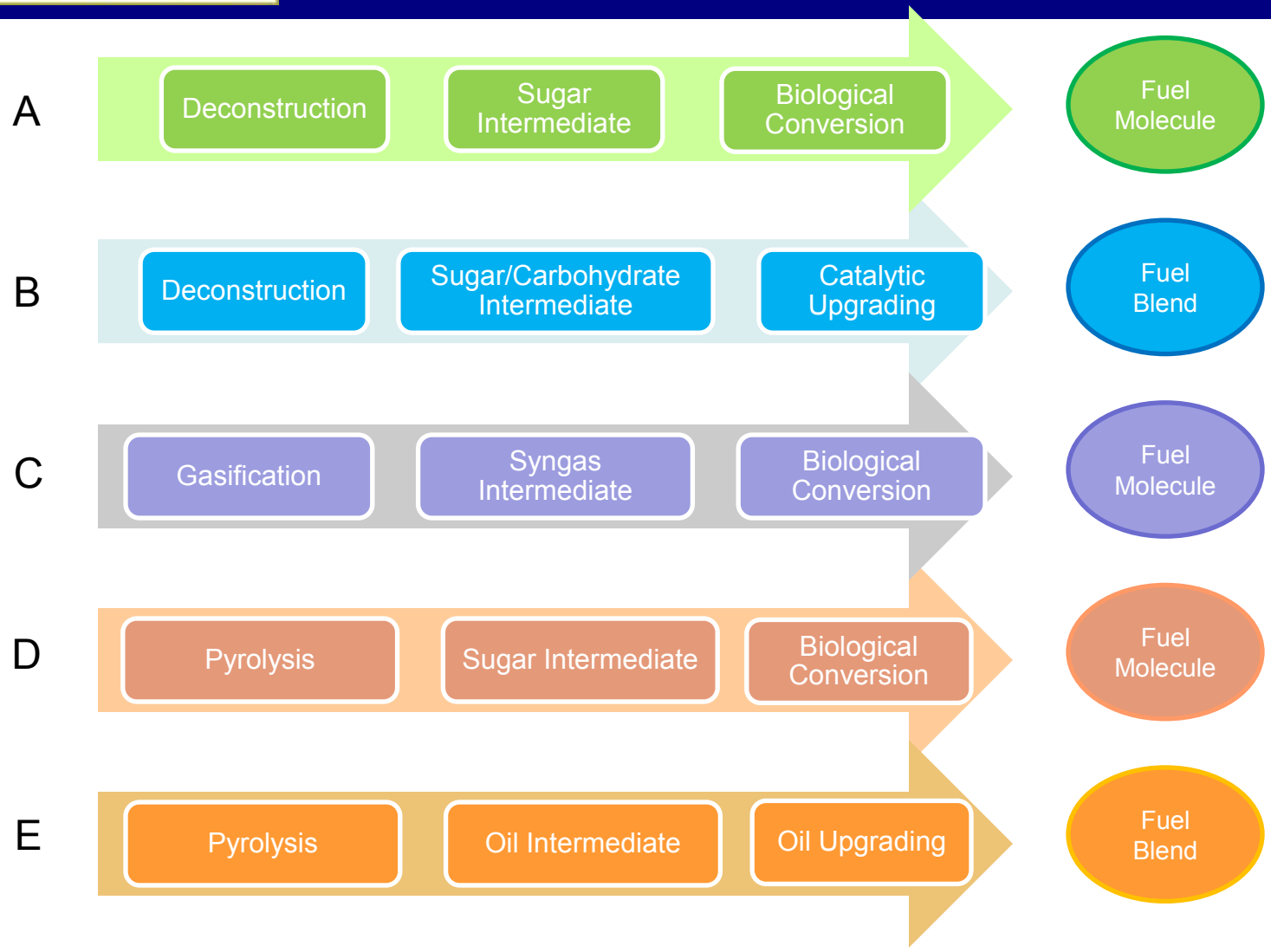
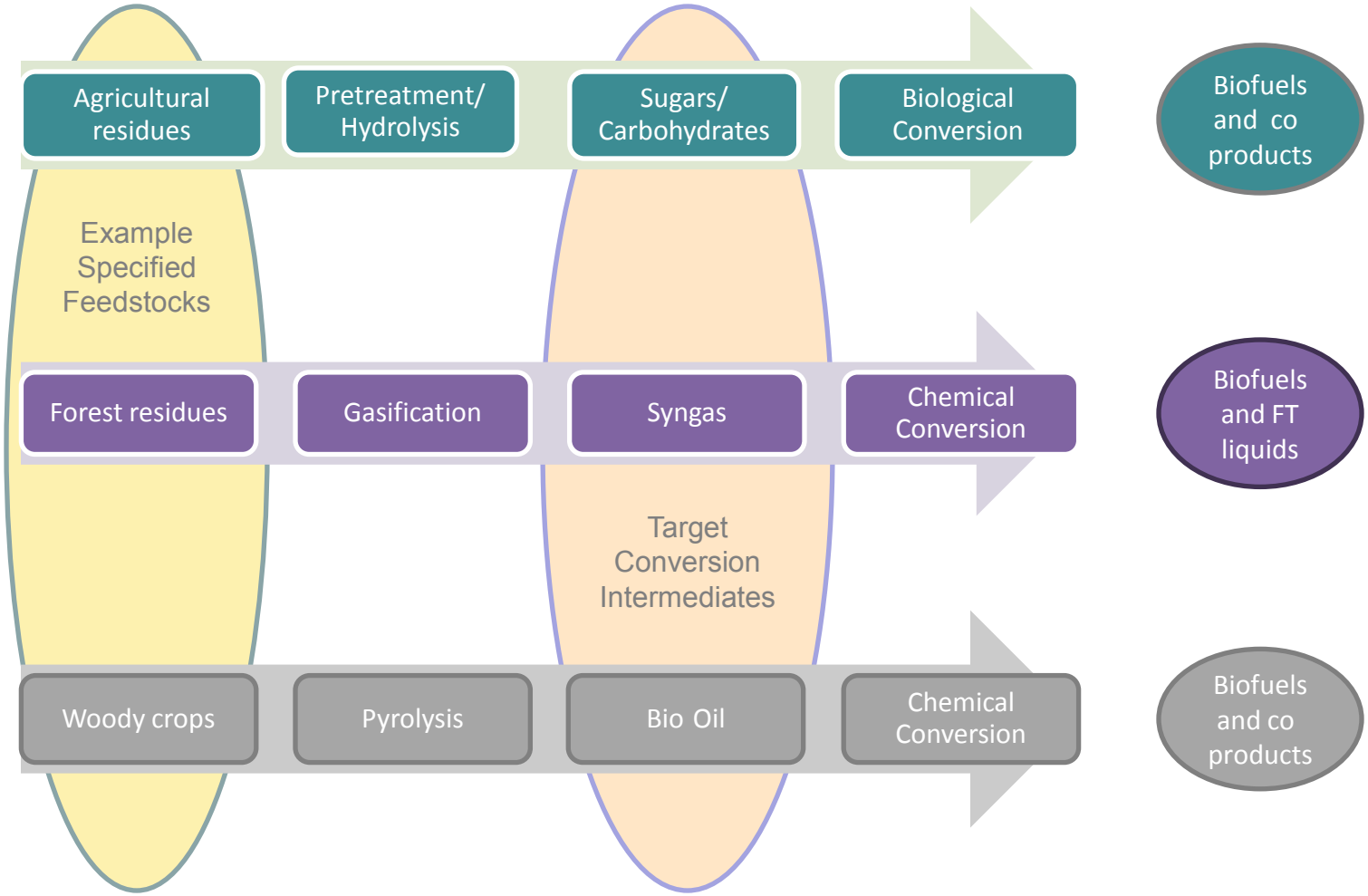
# Initial Conversion Routes Considered



# Example Conversion Pathways Chosen for White Paper



# White Paper Status and Timeline

Current Status

- White Paper team has been meeting since February.
- Consensus was reached on goals, approach, and product, and concept was presented at June Board meeting.
- Early draft has been prepared and is under internal review.

Timeline

- First draft was completed for reviewers on July 31
- Formatted draft by August 23
- "Agency" review by September 6
- External TAC Member reviewers identified by September 18th.
  - If anyone is interested please let **Ashley** know.
- Draft Paper completed to be presented to the Board at December meeting

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# *Questions and Discussions?*