



Wisconsin  
Statewide Wood  
Energy Team

# Wood Fuel Supply and Distribution Business

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# Outline

- ❖ Fuel types
- ❖ Woody biomass types/source
- ❖ Wood pellets
- ❖ Wood fuel availability
- ❖ Supply/resource needs

# Types of Fuel

- ❖ Manufacturing residue (sawdust, bark, chips)
- ❖ Logging residue (chips)
- ❖ Cord wood (8' lengths or less)
- ❖ Pellets

# Woody Biomass Categories

- ❖ Forest Industry Residue
- ❖ Manufacturing Industry Residue (e.g. pallets)
- ❖ Non-Forest Tree Residue/Waste
- ❖ Logging Residue
- ❖ Woody Biomass Crops

# Markets for Woody Biomass

- ❖ Hog Fuel
  - ❖ Direct Burn
- ❖ Wood Energy Product
  - ❖ Pellets
  - ❖ Briquettes
  - ❖ Ethanol
  - ❖ Biodiesel
  - ❖ Etc.
- ❖ Animal Bedding
- ❖ Mulch
  - ❖ Landscaping
- ❖ Firewood
- ❖ Composting



# Forest Industry Residue - WI

90% Utilized ~ 2 million tons of residue

- ❖ Best use/best price
- ❖ Transportation distance

# Mill Residue - WI

## Green (Sawmill)

- ❖ Sawdust (many different markets)
- ❖ Bark (mulch or boiler fuel)
- ❖ Clean chips (pulp mill or boiler fuel)

# Mill Residue - WI

## Dry (Secondary Manufacturers)

- ❖ Sawdust
- ❖ Chips



# Forest Industry Residue - WI

- ❖ Once considered waste, it is now in demand for various products
- ❖ Decline in the forest industry as a whole has reduced the amount of residue available

# Urban/Suburban Wood - WI

- ❖ A lot of potential
- ❖ 292,000 tons estimated – minority is utilized

# Urban Logging - WI

- ❖ Lower cost of removal
- ❖ High efficiency
- ❖ Marketable volumes
- ❖ Potential cost offset by marketing wood products

# WI manufacturers (non-wood Industry)

Generate an estimated 375,000 tons of wood residue annually, of which:

- ❖ 230,000 tons are utilized
- ❖ 145,000 tons are disposed of
- ❖ Disposal costs WI businesses approximately \$2,100,000 annually



# Thirteen trees cut, processed, & ready for removal







Taking down  
a tree near a  
powerline



# Starting to cut an Ash in front of an office





# Same Ash on the ground





# Forwarder moving wood



# WI - Landfills - 372

- ❖ Most do <500 tons of wood per year
- ❖ 247,000 estimated tons



# WI - Green Ton Availability – Logging Residue

Ownership	Green Tons Potentially Available Annually
Federal	138,657
State	85,750
County	635,178
Private Tax-Law	773,557
Private Non-Tax Law	773,557
Total	2,406,699

# Logging Residue

Logging Residue (Green chips)

- ❖ Cut-to-length
- ❖ Whole tree skidded

# Types of Harvesting – Lake States

State	Whole Tree-Mech.	CTL-Mech.	CTL-Hand
Michigan	40	50	10
Minnesota	50	40	10
Wisconsin	15	75	10

# Cut-to-Length Mechanized

- ❖ Products are cut and piled in woods
- ❖ Forwarder takes product out
- ❖ Piled tops could be removed in separate trips





# Cut-To-Length Biomass Removal

- ❖ In a cut-to-length operation with traditional equipment, the cost of delivered woody biomass is in the \$25 to \$45 per green ton range (depending on a number of variables)





# Whole Tree Cutting and Removal

- ❖ Mechanized felling and bunching
- ❖ Grapple skidding
- ❖ Process on landing
  - ❖ Slasher
  - ❖ Chainsaw
  - ❖ Chipper

# Logging Residue



# Timber Sale Method Influence

## Lump Sum

vs.

## Scaled

❖ Pros: Logger has control of the product

❖ Cons: Pay up-front

❖ Pros: Pay for what you take out

❖ Cons: Can't deviate from product specifications



# Raw Material Supply

## Sustainable Raw Material

- ❖ Ownership of Forest Land
- ❖ Supply Chain (Loggers)
- ❖ Willingness to Commit to Long-Term Contracts

# Benefits of Logging Residue Removal

- ❖ High fire hazard areas benefit from fuel reduction
- ❖ Many landowners prefer “park like” appearance
- ❖ Local economy is stimulated
- ❖ Improved utilization



# Potential Negatives of Residue Removal

- ❖ Loss of cover for wildlife
- ❖ Nutrient depletion
- ❖ Increased browsing
- ❖ Conflict with trail armoring



# Logging Residue Potential

Biomass is, and will be, an increasing product from our forests.

Various factors will affect how and when this happens:

- ❖ Stumpage prices
- ❖ Regulations/guidelines
- ❖ Distance to market(s)
- ❖ New and emerging markets
- ❖ Decline/increase of competing markets
- ❖ New technology for harvesting, transporting, and processing

# Woody Biomass Harvesting Guidelines

- ❖ Developed by Wisconsin's forestry community in recognition of an emerging interest in wood-based bio-energy.

# Woody Biomass Harvesting Guidelines

- ❖ Woody biomass offers Wisconsin woodland owners a potential market for a previously underutilized product – small diameter trees and the branches, tops and limbs of harvested trees.



# Woody Biomass Harvesting Guidelines

- ❖ Emergence of this new market has raised concerns about sustainability including the potential loss of soil nutrients, reduced wildlife habitat, and compaction of forest soils.

# Woody Biomass Harvesting Guidelines

- ❖ Wisconsin Council on Forestry recognized the need for harvesting guidelines to ensure that woody biomass harvest does not compromise the long-term productivity of Wisconsin's forestland and that woody biomass is a sustainable, reliable forest product for landowners and timber producers.



# How long has biomass harvesting been occurring in Wisconsin?

A. 5 years

B. 10 years

C. 50 years

# Regeneration Harvests

Dry Tons per Acre	Timber Type
24	A
18.6	A
13.4	A
25.7	MR
18.8	MR
28.2	OR
29.1	PJ
18.9	PJ



# Selective Harvests

Dry Tons per Acre	Timber Type
12.4	NH
10.9	NH
10.6	NH
10.2	NH
8.2	NH
7.6	NH
7.2	NH
5.1	NH
4.7	NH
4.1	NH

# Thinning Harvests

Dry Tons per Acre	Timber Type
11.1	OR/PW
9.9	PR
7.2	PR

# Woody Biomass Availability

Type of Harvest	Mean Dry Tons per Acre
Regeneration	22.1
Selective	8.1
Thinning	9.4



# Biomass Processor Head





# Bundler



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



Wisconsin  
Statewide Wood  
Energy Team



# Bundles being forwarded





# Baler



# Eagle Claw Forwarder



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





# Eagle Claw Forwarder



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





# Eagle Claw Forwarder & Chipper



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





# Loading the Chipper





# Chipper





# Chipper



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



# Chipper Loading the Trailer



# Distribution Systems

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





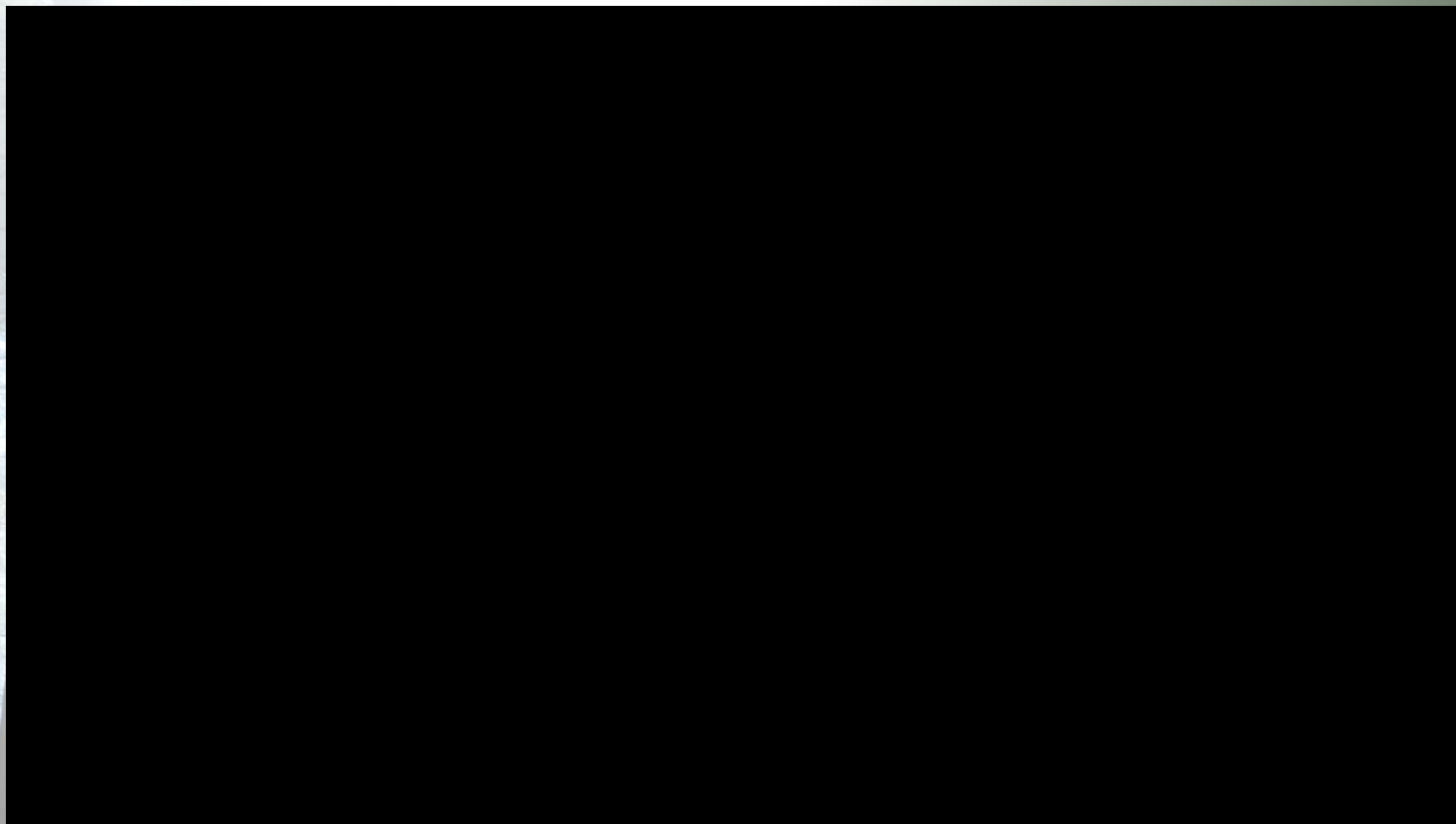
# Chip Distribution



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



# Chip Distribution – Walking Floor Trailer



# Chip Distribution – Dump Station





# Woody Biomass Crops



# Cordwood

- ❖ Direct from loggers (usually 10 cord loads)
- ❖ Green (40-50% moisture)
- ❖ Dried for a year (25-40% moisture, diameter and species dependent)
- ❖ Price (\$80-\$120/cord, dependent on time of year, other demand markets)
- ❖ A list of loggers can be obtained from the local DNR office



# Pellets

## Residential/Premium

- ❖ Bagged
- ❖ Totes
- ❖ Bulk

## Commercial

- ❖ Totes
- ❖ Bulk



# Pellet Raw Material





# Premium Pellets



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



Which pellet produces more BTUs?

A. Hardwood

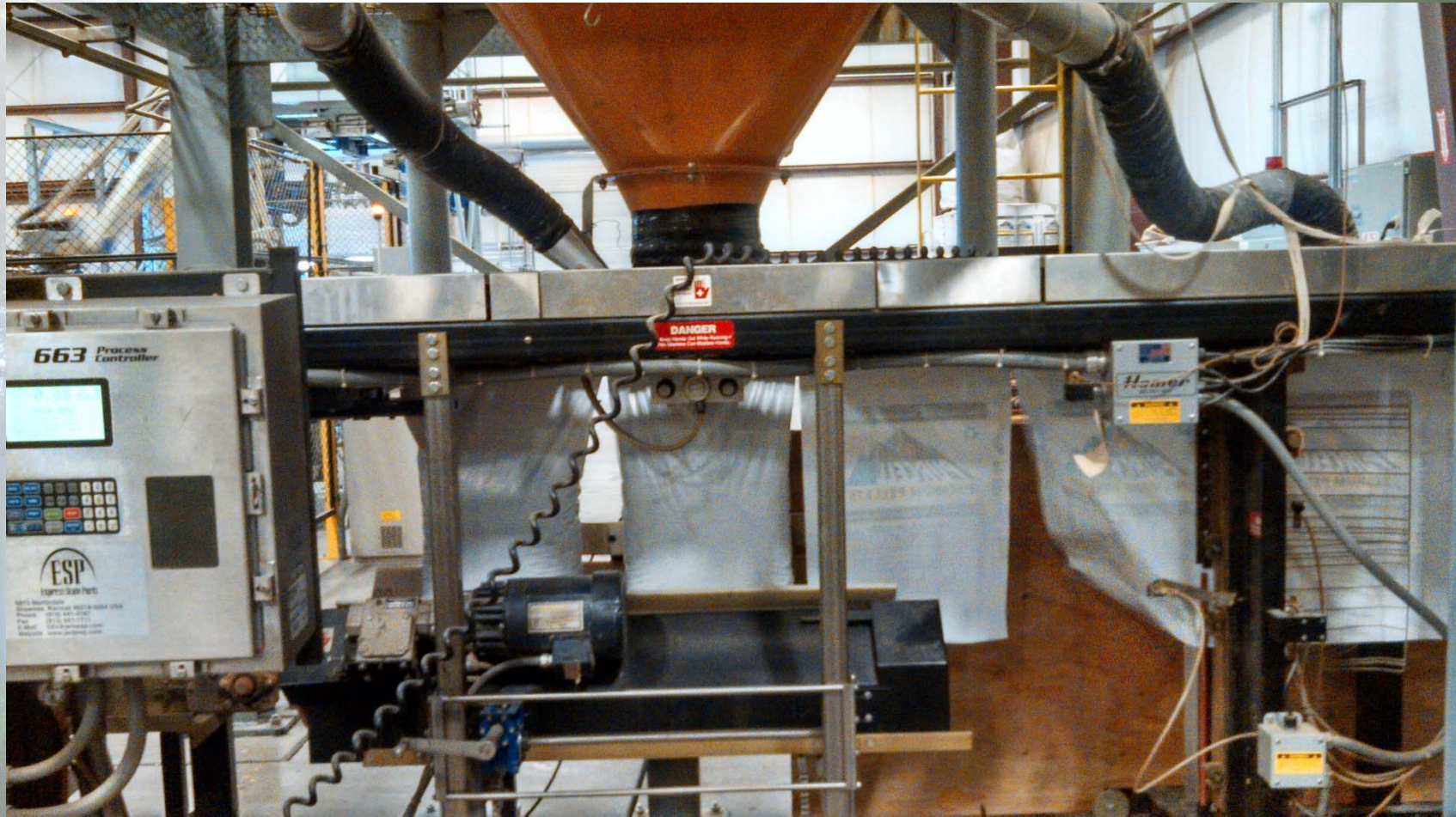
B. Softwood



# Pellet Distribution

- ❖ 40 lb bags
- ❖ 1 ton totes
- ❖ Bulk delivery

# Pellets Being Bagged





# Shrink Wrapping



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





# One-Ton Pallet of Bags





# Totes



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











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







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



# Determining availability and price for wood chips

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





# Amount of Fuel Used

- ❖ <5000 tons
- ❖ 5,000 – 20,000 tons
- ❖ 20,000+ tons

# Seasonal or Year-round

❖ Continuous

❖ Sporadic



# Fuel Specifications

❖ Species

❖ Size

❖ Ash Content

# Ash Content

- ❖ Clean chips <1%
- ❖ Biomass chips (CTL) 3-5%
- ❖ Biomass chips (whole tree) 4-8%
- ❖ Contaminated 8%+



# Reality

- ❖ Procurement radius
- ❖ What's available in that radius?
- ❖ At what price?

# Potential Sources of Woody Biomass

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



# WE Domtar Plant

50 Megawatt

500,000 tons of biomass annually

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





# WE Domtar Plant

## Sources

- ❖ Wood from land cleared of trees for development
- ❖ Residue from saw mills & paper mills
- ❖ Urban wood

# WE Domtar Plant

*“Rothschild biomass plant only getting  
10% of fuel from forest waste”*

stevenspointjournal.com

# Manufacturing and Other

- ❖ Identify sources and develop a procurement plan



# Facility Location

- ❖ Need a specific radius/county analysis
- ❖ Need analysis by ownership
- ❖ Need to identify existing and project competition

# Resource Analysis For a Biomass Facility

- ❖ Potentially available
- ❖ Really available
- ❖ At what price?

# Summary

- ❖ Raw material is available – price is the driver
- ❖ Source of wood fuel is location dependent
- ❖ Pellets are readily available in Wisconsin Fuel
- ❖ Knowing sources and prices is essential before installing a wood energy system



# Questions?



# Resources

- ❖ Statewide Wood Energy Team:  
[www.wisconsinwoodenergy.org](http://www.wisconsinwoodenergy.org)
- ❖ Wisconsin Forest Products Services Team  
[www.dnr.wi.gov](http://www.dnr.wi.gov);  
[steven.hubbard@wisconsin.gov](mailto:steven.hubbard@wisconsin.gov)
- ❖ US Forest Service Forest Products Lab:  
[www.fpl.fs.fed.us](http://www.fpl.fs.fed.us)

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