



Biorefining Choices

How Weyerhaeuser looks at the biofuels opportunity

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How we think about our business today

“Weyerhaeuser releases the potential in trees to solve important problems for people and the planet”

We are an international company whose products contribute to human well-being by providing a renewable resource for shelter, communication and commerce

.....and coming soon, transportation fuels?



Biofuels have always been essential to mankind



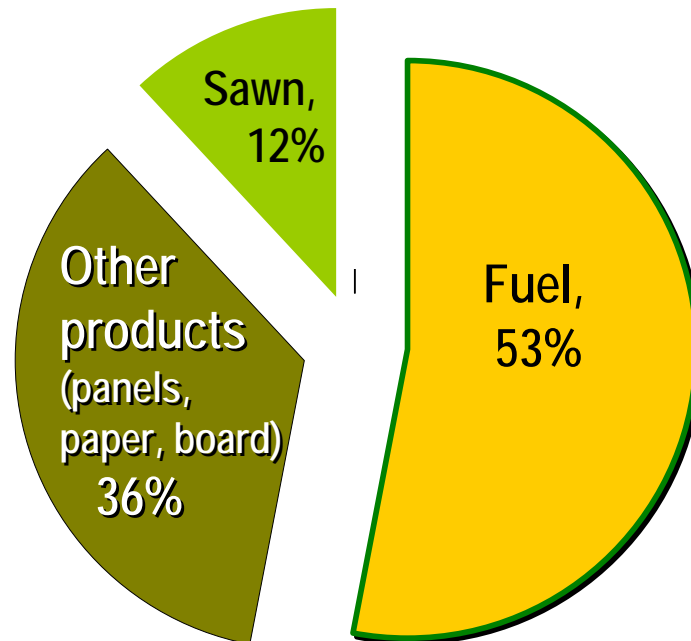
Wood is one of the most widely used materials on the planet

Material	Comparative Annual Volume
World petroleum consumption (1 barrel = 0.16m ³)	4.6 billion m ³
Worldwide harvest of wood	3.4 billion m ³
Industrial Roundwood	1.6 billion m ³
Cement	1.5 billion m ³
Plastics	0.14 billion m ³
Steel	0.16 billion m ³
Aluminum	0.01 billion m ³

Even today over half worldwide wood harvested is used for fuel.

Industrial Roundwood
1.6 billion m³ (47%)

Fuelwood
1.8 billion m³ (53%)

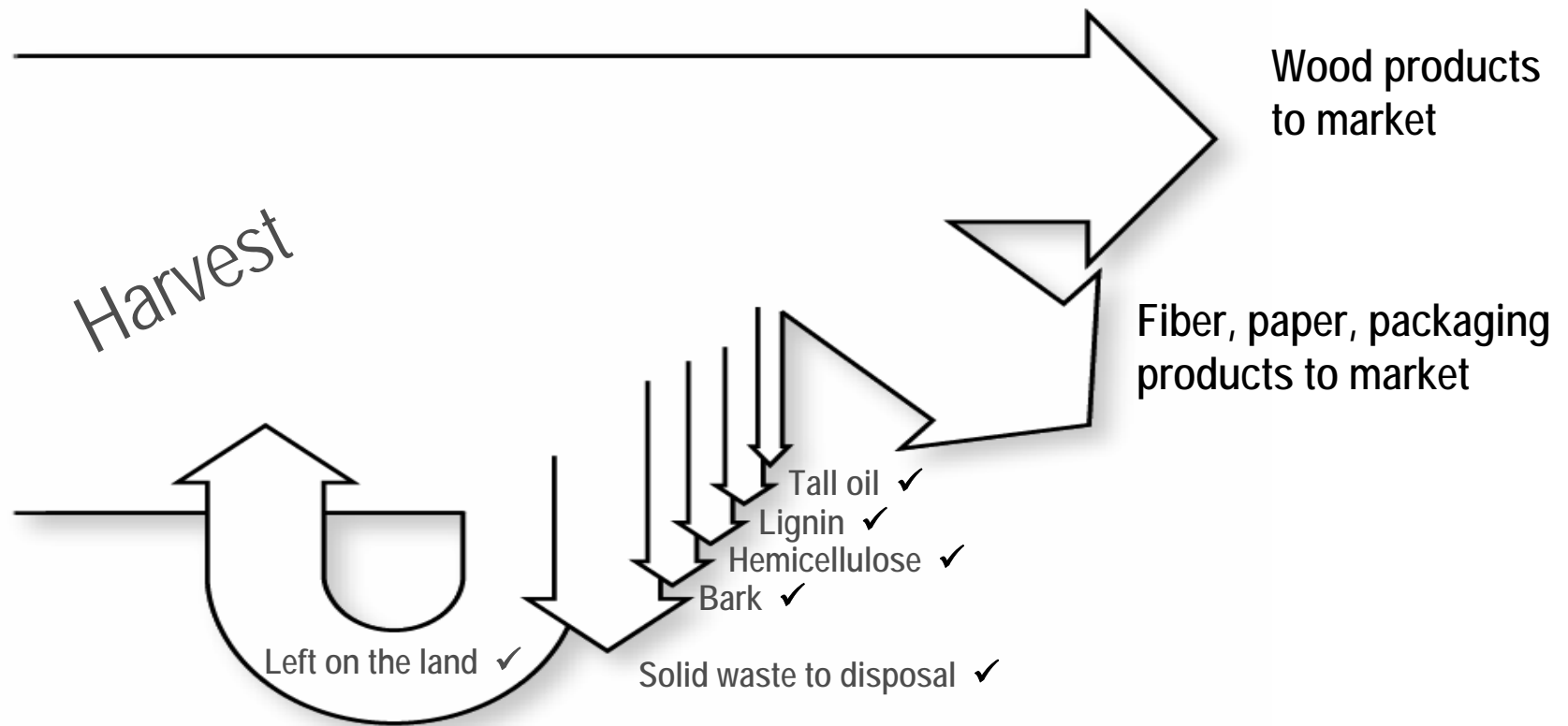


Based on FAO (2005) State of the World's Forests

TOTAL WOOD HARVESTED: 3.4 billion m³

Conventional view of the emerging biofuels opportunity

Our starting point

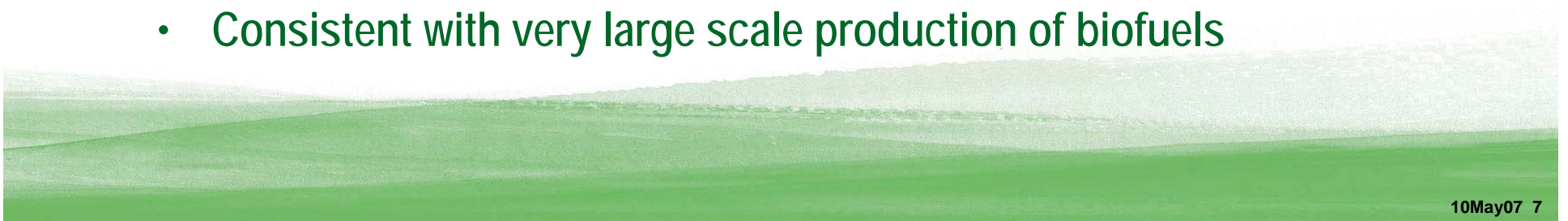


✓ - indicates stream with potential for higher and better use



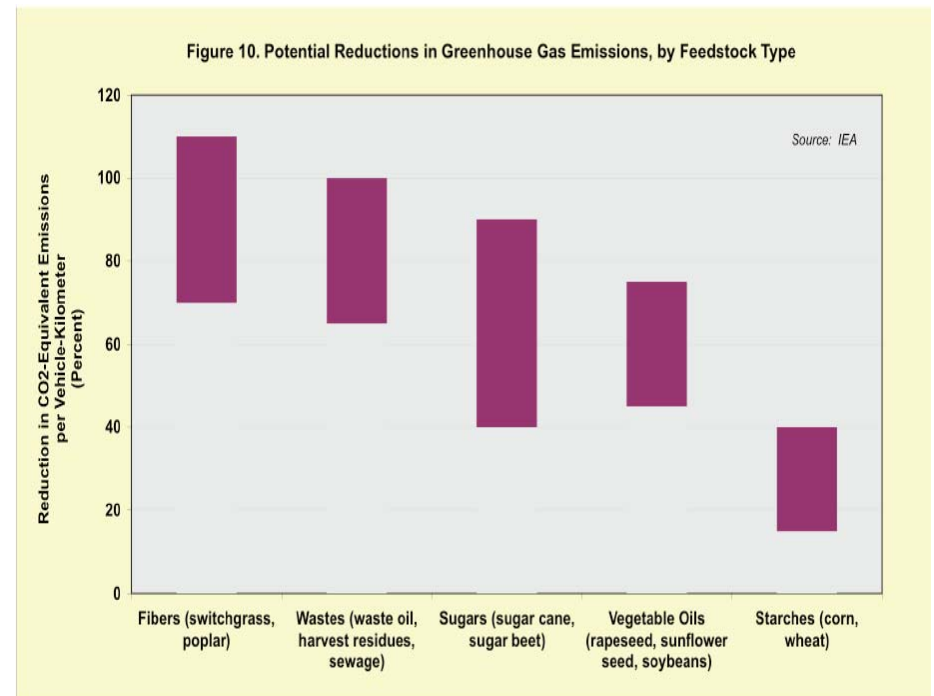
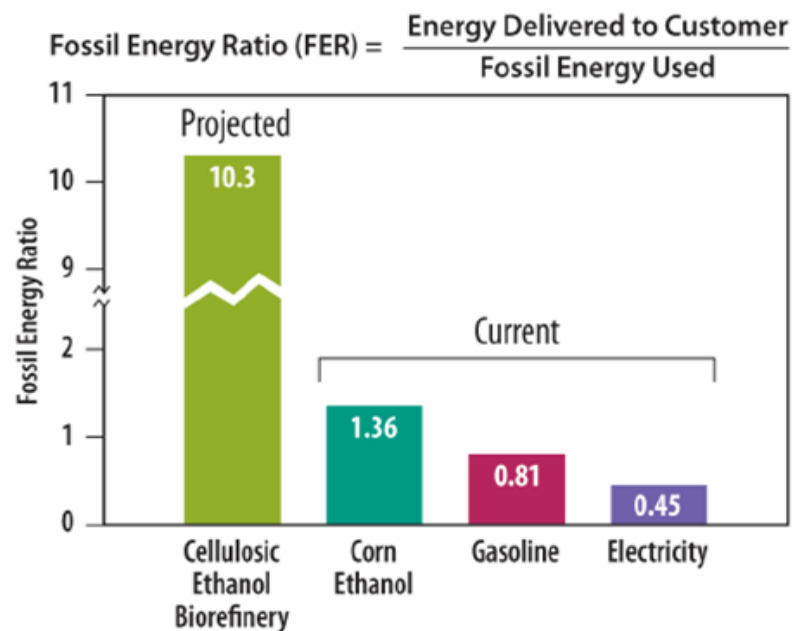
The opportunity we found

- Wood products residuals – many, but small opportunities
- Forest residuals – broadly distributed but expensive to collect
- By-products to higher value
 - Tall oil to diesel – feasible, but relatively small
 - Hemicellulose to ethanol (VPP) – raises concerns about pulp quality and yield
 - Lignin to fuels and chemicals – promising and potentially important
- Purpose grown energy resource – the really big deal for Weyerhaeuser!
 - Synergistic with growing high value sawtimber
 - Consistent with very large scale production of biofuels

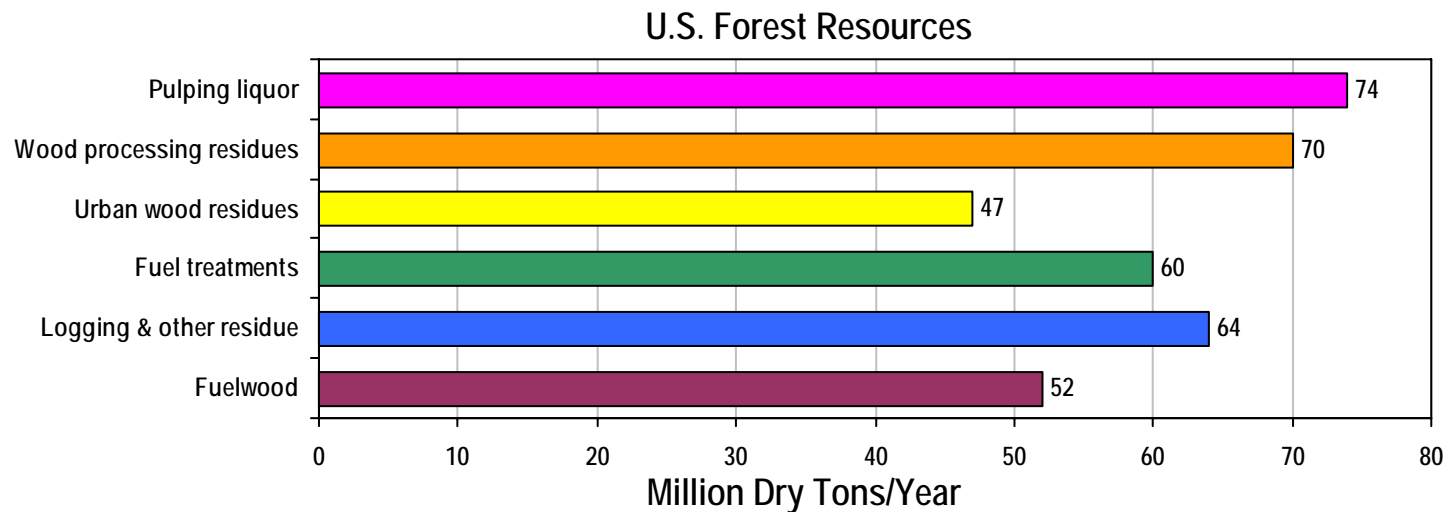


The opportunity as we see it now

- Is principally about renewable transportation fuels – largely ethanol
- To make a difference it has to be large in scale



The world of secondary forest resources, when thought of as bioproducts feedstocks, is huge



If converted to ethanol at 100 gals/ton, these feedstocks represent over 35 billion gallons/yr

AND — it's sustainable and renewable

Forest products and residuals have value — none are free as long as there is a market

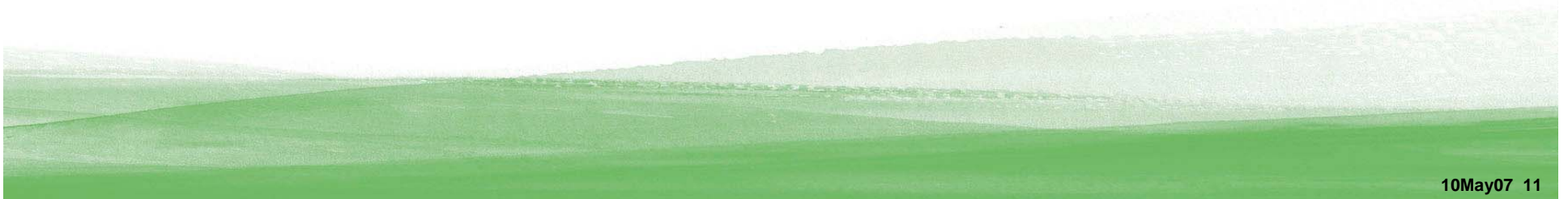
Sawn lumber (2x4)	\$400/ton
Pulp	\$800/ton
Newsprint	\$600/ton
OCC (old corrugated container)	\$100+/ton
Firewood at Safeway	~\$400/ton

Residuals or purpose-grown energy crops will cost \$40/bdt or more



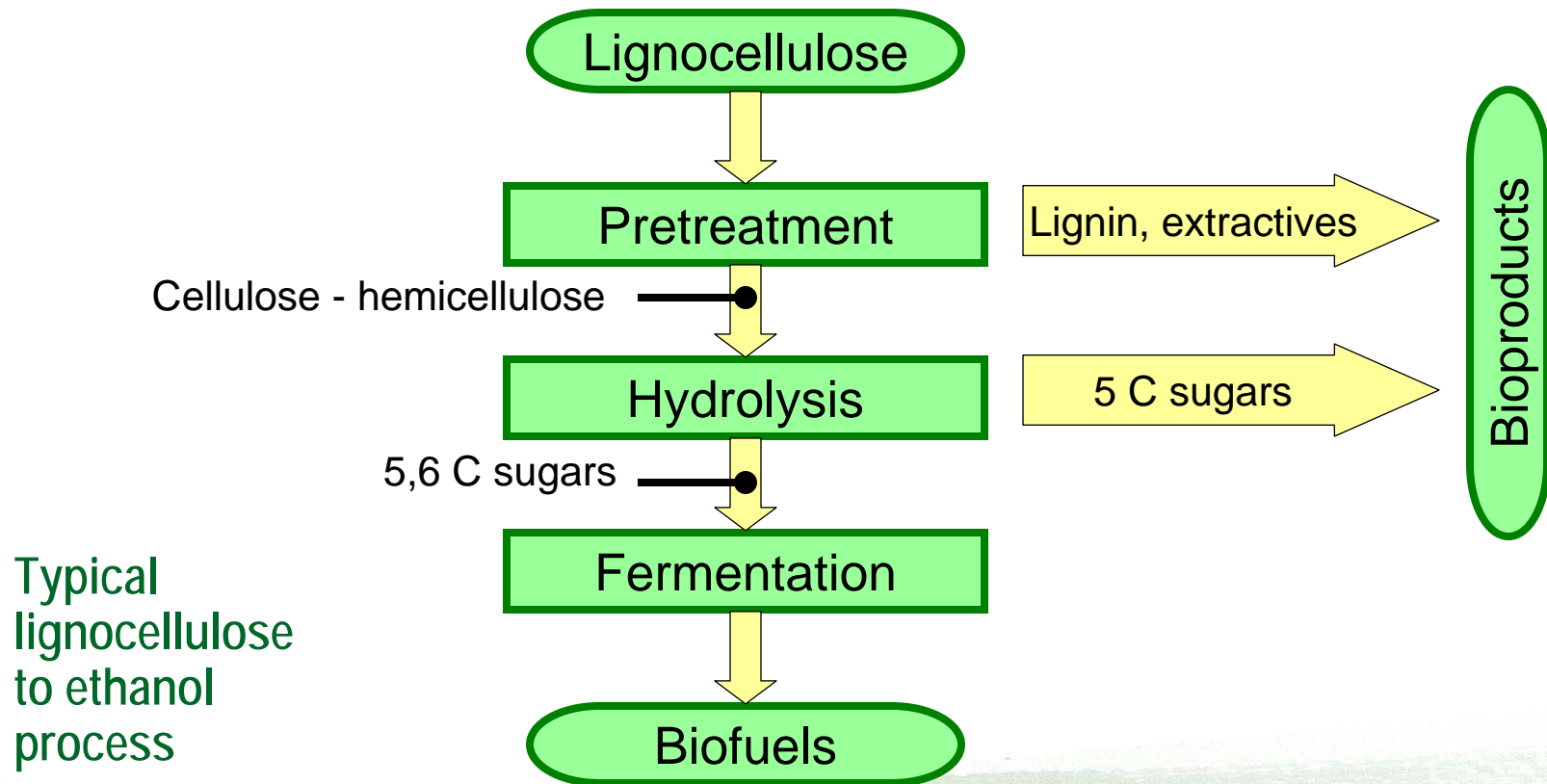
Advantages of lignocellulosics from the forest complex compared with current agricultural-based feedstocks

- Do not compete with food uses
- Can be very productive — for example, one acre can produce 1,000+ gallons of ethanol (vs. an acre of corn, which can produce 350 gallons)
- Sustainable forests require less-intensive management (fertilizer, irrigation, etc.)
- More efficient from a greenhouse gas perspective



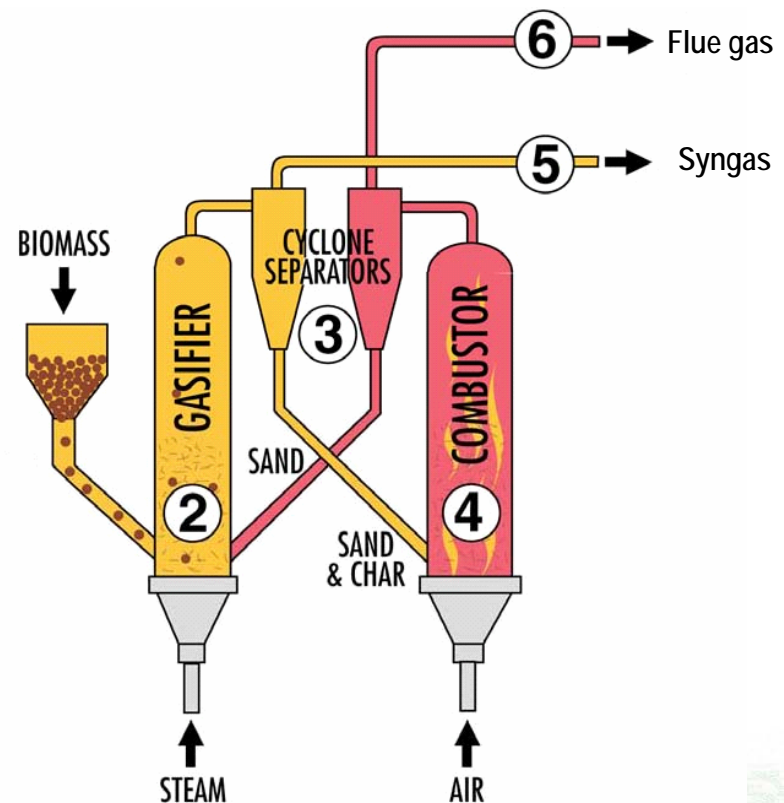
Q: So why haven't lignocellulosics been more quickly adopted?

A: Because the conversion technologies still need to be optimized; even the "easy" approaches need work



Don't count out thermochemical conversion

- Technologies have been around for decades, capital costs are high, but ...
- Pyrolysis can give high conversion to liquids that can be upgraded
- Today's gasification technologies can give higher yields than enzymatic conversion



Lignocellulosic potential goes far beyond ethanol

- Ethanol
 - Green diesel, DME
 - Alkanes and aromatics
 - Industrial and specialty chemicals
 - Methanol and other alcohols
 - Polymers
 - *PLUS products not yet imagined!*

The expertise Weyerhaeuser brings to this emerging opportunity includes

- Precision forestry and science-based sustainable forest practices
- Capability to deploy quickly and sustainably across the landscape
- Extensive and efficient harvest, handling and transport infrastructure
- Expertise with large-scale biomass conversion and an existing manufacturing infrastructure that offers potential synergies
- Expertise in genetic improvement to improve yield, product quality and throughput of conversion processes

The bottom line

- The biofuels opportunity is real and important – but it comes with risk and uncertainty
- We are positioned to be significant producers of biofuels from our sustainable forest resource
- We can not do it alone; key partnerships are essential
 - Research universities
 - National Labs
 - Technology-based suppliers
 - Energy companies