

Woody Biomass Risk Management Solutions

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Heating the Northeast
with Renewable Biomass

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Innovative Natural Resource Solutions LLC

- Based in New Hampshire and Maine, a region with 25+ years of continuous biomass power experience
- Based in the forest industry
- Focus is on feedstock supply for biomass electric, thermal, pellet and liquid fuel projects
- Clients include utilities, merchant generators, investors, developers, and industries
- Conducted work in all regions of the country
- www.inrsllc.com



Biomass Feedstock Prices

- Wood pricing highly localized
- Recent biomass fuel prices (electric, truck dumps) in New England currently range from low-\$20s to nearly \$40 per green ton, delivered
- Some parts of U.S. are without a market for biomass grade wood
- Other parts of the country have competition on top of one another
- Highly dependent upon geography, specifications, delivery method, etc.



Biomass is a Fragmented Supply Chain

- Landowners
 - Many small, not in the forestry business day-to-day
- Foresters
 - Providing professional advice to landowners
- Loggers
 - Own and operate harvesting equipment, generally not landowners
- Truckers
 - May or not be affiliated with logging firm
- Aggregators
 - Fill a role by coordinating supply, generally unwilling to assume price risk
- Everybody Wants to Get Paid

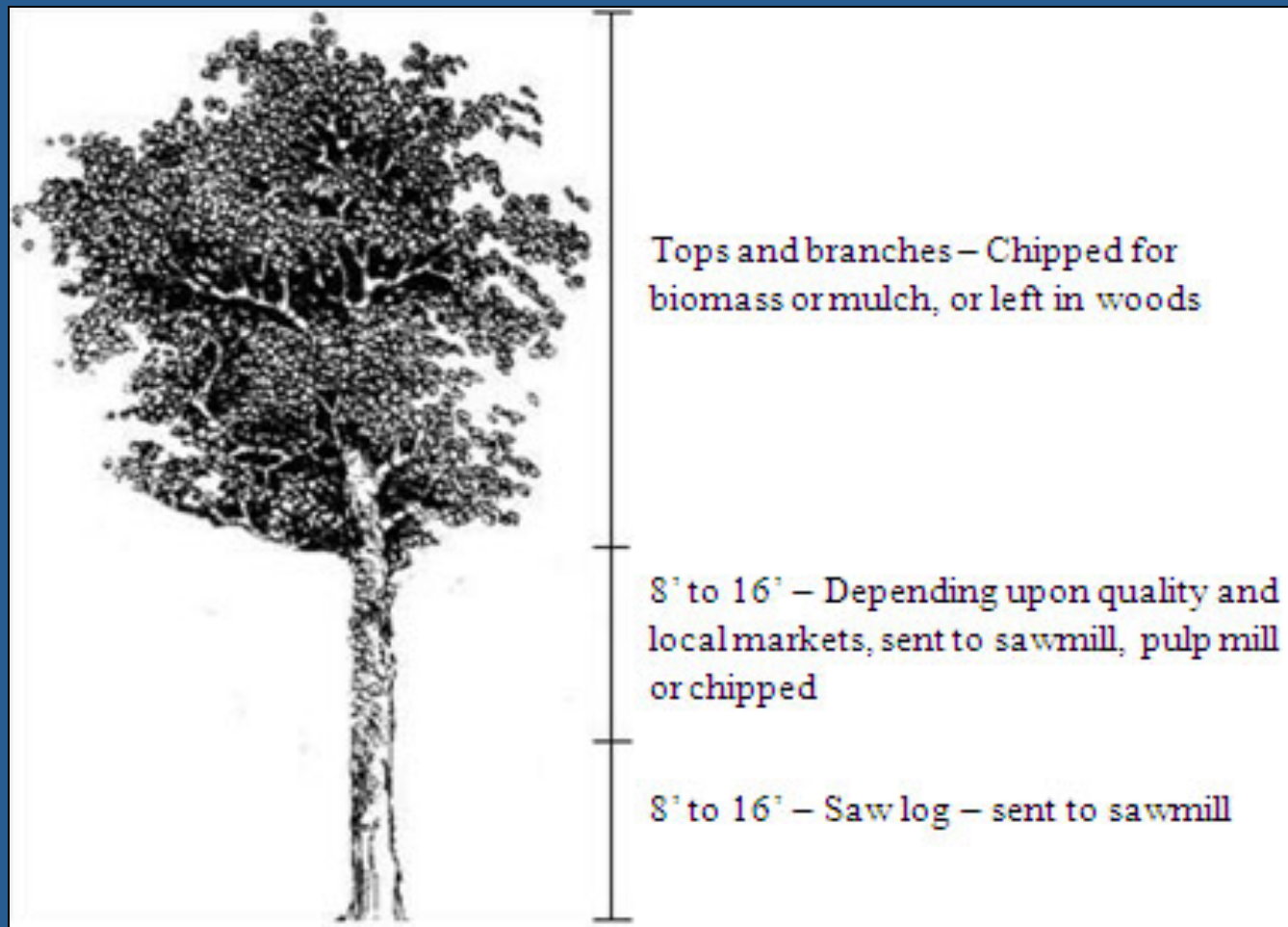


Many Products from a Timber Harvest

- Sawlogs and Veneer
 - Highest value, often by far
 - Used for lumber and plywood
 - This is where landowners and loggers make the greatest dollar per ton
- Pulpwood
 - Used in paper making, also now pellets and someday cellulosic ethanol
- Biomass Chips
 - Tops, branches, sweep, crook
 - Some low-grade roundwood, depending upon local markets , etc.



Products from a Single Tree



Challenges for New Large Biomass Facilities (Industrial CHP and Large-Scale Biomass Thermal)

- Breaking into a difficult marketplace
 - Constrained wood availability (?)
- High capital costs
- Lack of transparent wood market
 - Difficulty with long-term contracting
 - Few “credit-worthy” companies
- Instability / hurdles of public policy (new plants often built in part on public policy)



Biomass Challenged by Two Myths

The Myth of Free Wood –

a belief on the part of some developers that wood should be free or close to free – thinking of it as waste (residue), not as a product that has embedded costs

Reality: The growing, harvesting, skidding, processing and transport of wood has costs.



Biomass Challenged by Two Myths

The “Oil Sheik” Landowner –

- landowner or supplier belief that energy projects will be able to pay “unlimited” prices for wood, as energy is highly valuable

Reality: What users can pay is limited by the laws of physics (a tons of wood contains only so much energy), the market (the product is worth only so much), and the need for the processor to make a reasonable profit.



Challenges for a Long-Term Contract

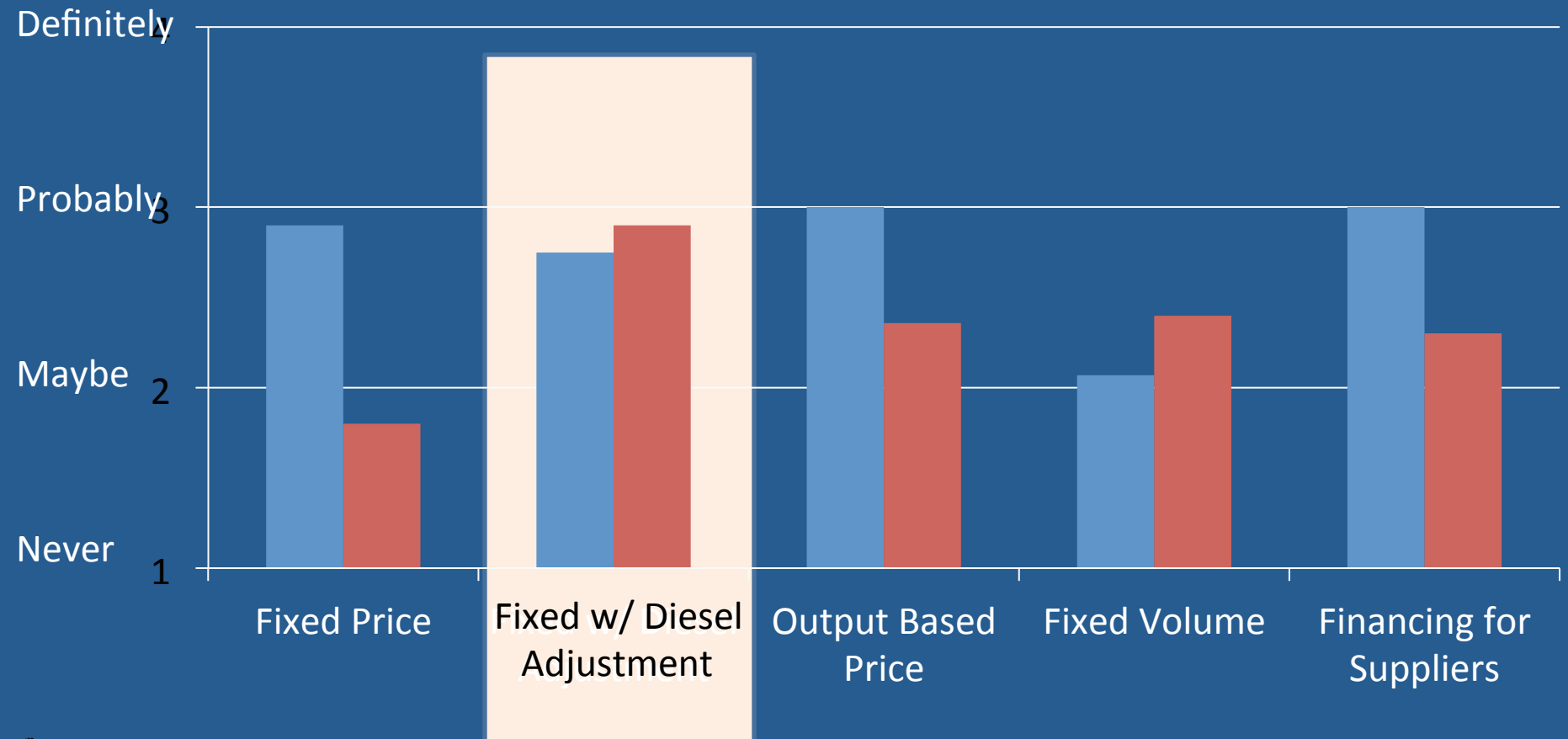
- Fragmented Supply Chain
- Credit-Worthy Counterparties
- Risk Associated with Input Costs
- “Lost Opportunities”
 - Unrealistic expectations about future revenues
- Time Lag Between Groundbreaking and Operations



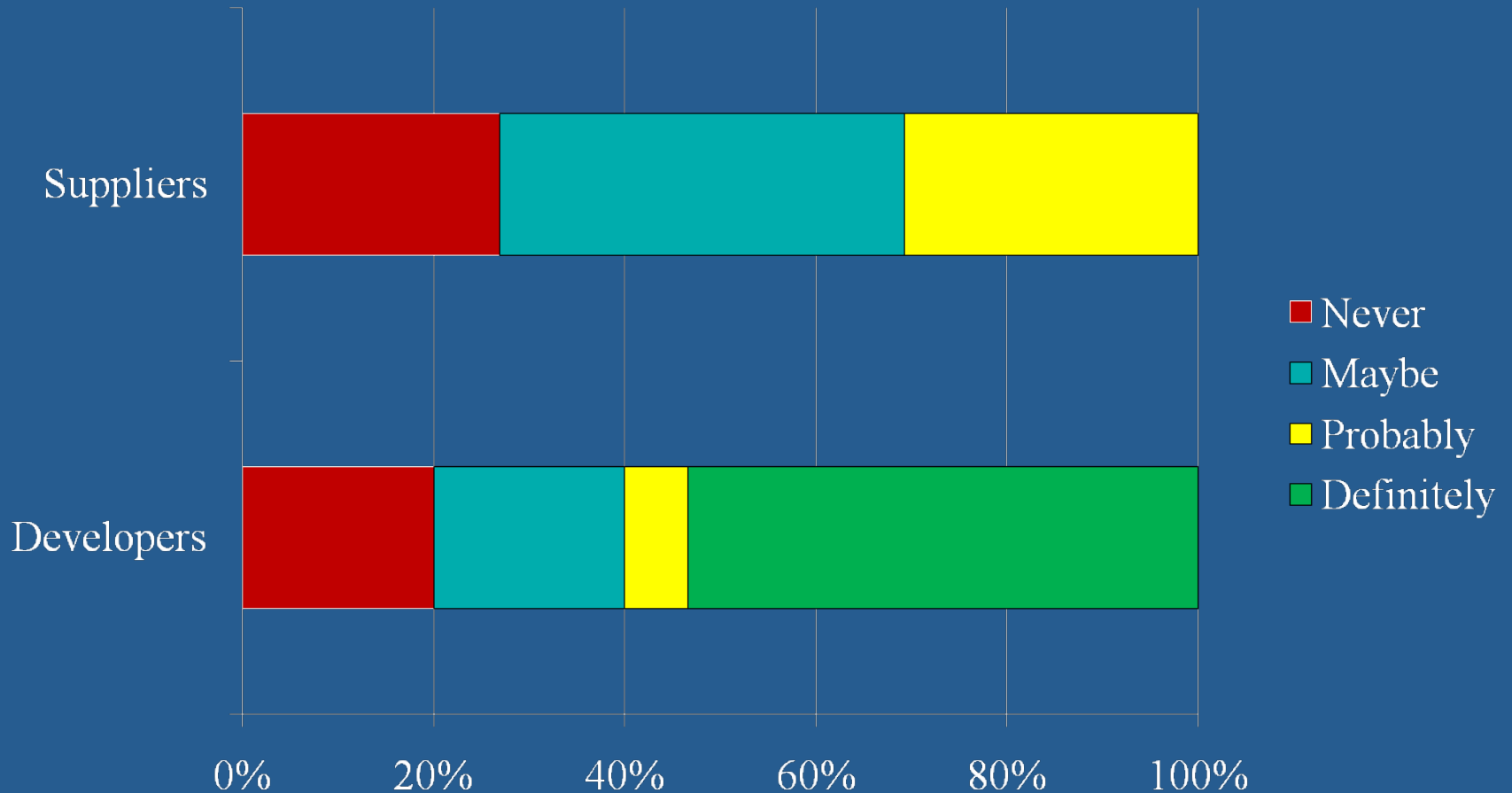
Interest in entering into the following business arrangements for biomass fuel

(mean response)

■ Developers ■ Suppliers



Willingness to Enter Into Biomass Supply Arrangement Fixed Price Contract



Traditional Ways to Manage Risk

Large Biomass Users

- Diversity of Supply
 - Make sure that you have multiple suppliers with multiple sources of feedstock / fuel
- Surge capacity with existing suppliers
 - Make sure that existing suppliers can “turn up the volume” to account for interruptions from others
- Significant storage capacity
 - Ability to have 30 days is nice, but keeping it full is costly. Supply capacity mitigates short-term risk, but adds expense.

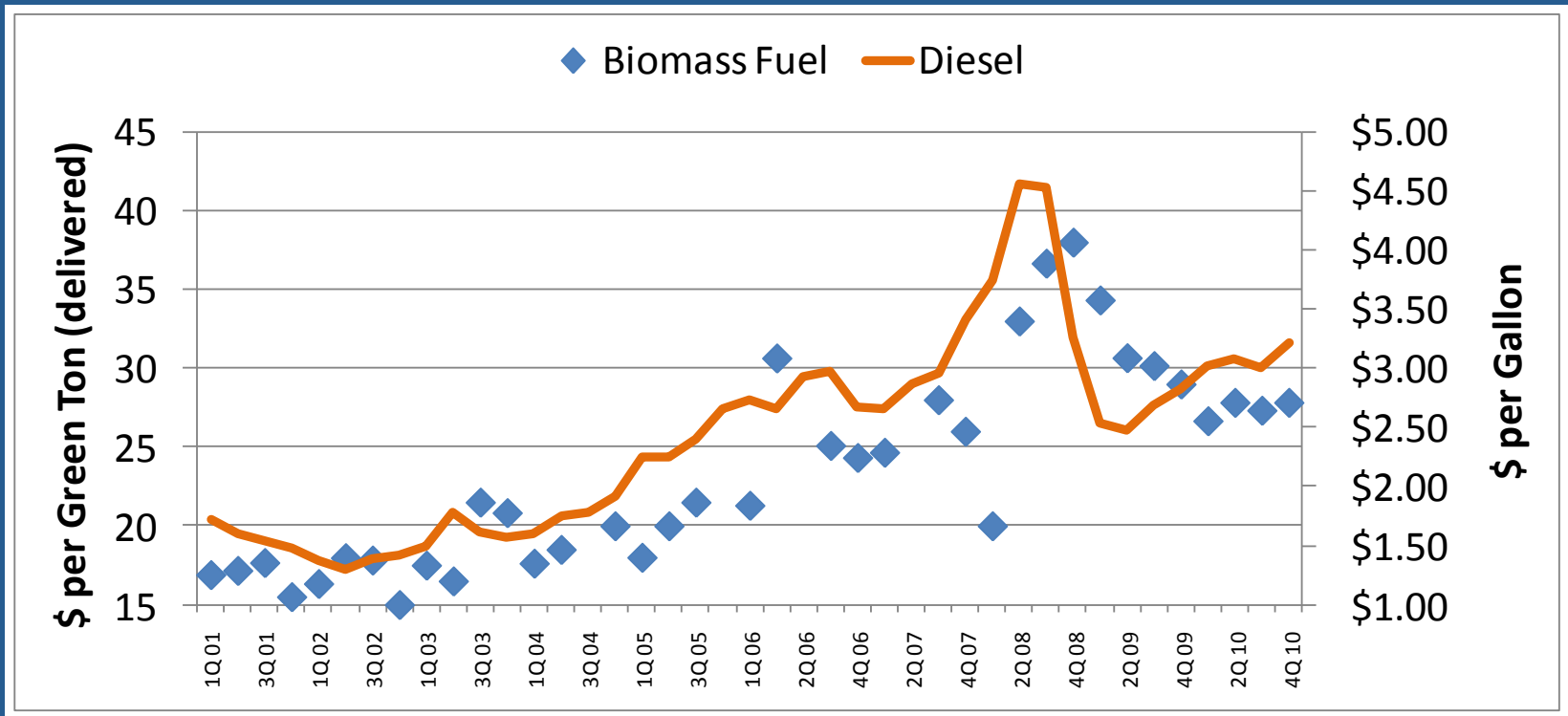


Price Drivers

- **Sawlog Markets** – encouraging higher timber harvesting activity
- **Competing Markets** – other users of low-grade wood (most important for many thermal projects)
- **Diesel** – largest variable in biomass price equation (thermal often self-hedging)
- **Weather** – prolonged poor weather can limit logging activity
- **Seasonality**



Biomass and Diesel Prices – New Hampshire 2001 – 2010



Diesel as a Component of Woody Biomass

- Estimate ~2.1 gallons of diesel to harvest, process and transport one green ton of biomass
- Assumptions:
 - 50 mile one-way trip
 - \$3.00 per gallon diesel
 - 27 green tons per load
- \$6.28 per green ton of diesel cost
- You can hedge your exposure to diesel risk *once you understand it (thermal self-hedging?)*



INRS Diesel and Trucking Calculator

Developed simple calculator to estimate diesel and trucking costs per green ton of biomass fuel

- **Diesel variables**
 - One-way distance
 - Diesel (\$ per gallon)
 - Tons per load
- **Trucking variables**
 - Average truck speed
 - Cost for truck and driver
 - Turn-around time



INRS Diesel and Trucking Calculator

Diesel per green ton, delivered - estimator				
Miles (one way)		50	variable	insert distance from logging site to market, road miles
Diesel (\$ / gallon)	\$	3.00	variable	insert current price of diesel
Tons per Load (tons)		27	variable	insert assumed payload per delivery
Total Diesel Cost (\$/ton)	\$	6.28	estimate	cost of diesel per ton of fuel, delivered
Total Diesel (gallon/ton)		2.09	estimate	gallons of diesel used in production of a green tons of chips
Average Truck Speed (mph)		55	variable	insert average truck speed (miles per hour)
Cost for truck and driver (\$/hour, no diesel)		55	variable	insert contracted cost for a truck and driver, exclusive of fuel costs
Turn-around Time (minutes)		20	variable	insert time for truck to scale in, wait for a truck dump, dump load and scale out (minutes)
Total trucking and diesel (\$/ton)	\$	10.66	estimate	total cost for diesel (harvesting, processing and transportation) and trucking cost, per ton

A typical scenario has diesel and trucking at **\$10.66** per green ton

This is before logging costs, payment to a landowner, profit, etc.



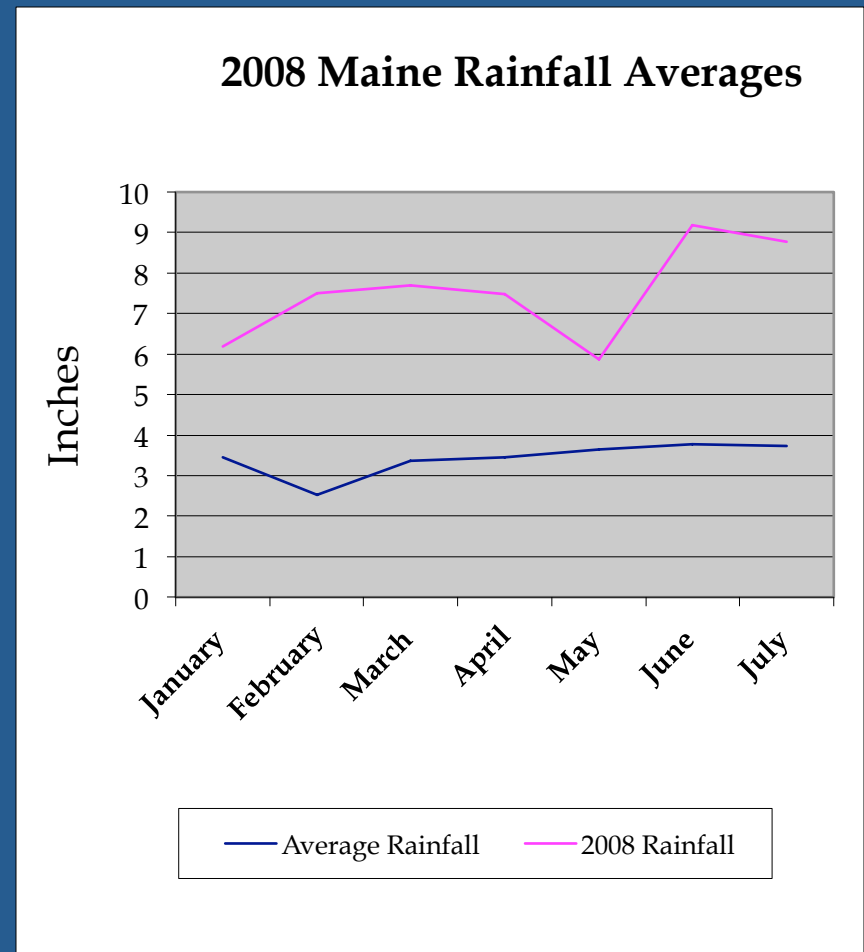
Competing and Complimentary Markets

- Sawlog markets promote increased harvesting
 - Are complimentary to biomass and tend to drive availability up and price down
 - Are indicators of housing starts, which tend to increase land clearing (with similar results)
- Low-grade markets often compete with biomass
 - Pulp mills, OSB, MDF, etc.
 - Strength in these markets can increase competition and drive up costs
- These drivers can be hedged



Precipitation Impacts Price

- Precipitation impacts logger's ability to work in the woods
- Seasonality can be planned for, unique events cannot
- 2008 in New England, 2009 in Mid-Atlantic
- *Can be hedged*



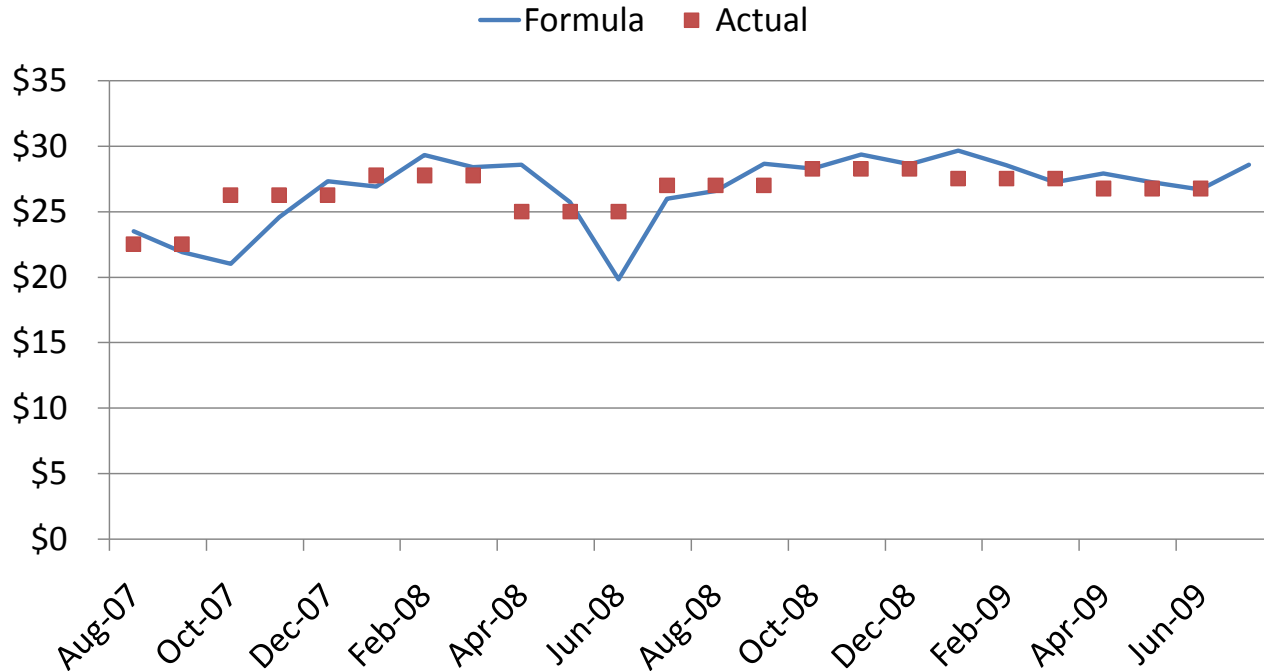
Developing a Hedging Strategy

- Each project is unique, and faces unique influences
- Formula development based on 10+ years of pricing data from a wide range of geographies
- Use of existing hedging vehicles (e.g., oil futures)
- Done appropriately, does not increase or decrease fuel cost – **manages volatility**
- Can account for over 80% of volatility in fuel costs – and help address a major risk factor for new (and existing) biomass projects



Actual Quarterly Prices vs. Formula Price

August 2007 – July 2009



A customized analysis is expected to account for over 80% of the monthly variation in biomass fuel costs



Resources from Innovative Natural Resource Solutions LLC

- Establishing Long-Term Wood Supply Agreements for Wood Energy Facilities
 - http://www.na.fs.fed.us/pubs/werc/supply_agreements/wood_energy_facilities.pdf
- Forest Harvesting Systems for Biomass Power Production: Renewable Biomass from the Forests of Massachusetts
 - <http://www.inrsllc.com/download/Forest%20Harvesting%20Systems%20for%20Biomass%20Production%20June07.pdf>
- The Myth of Free Wood
 - <http://www.inrsllc.com/download/The%20Myth%20of%20Free%20Wood.pdf>



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