



# **Transforming the Forest Sector: Some Thoughts**

**Don Roberts  
CIBC World Markets Inc.**



# Analytical Implications

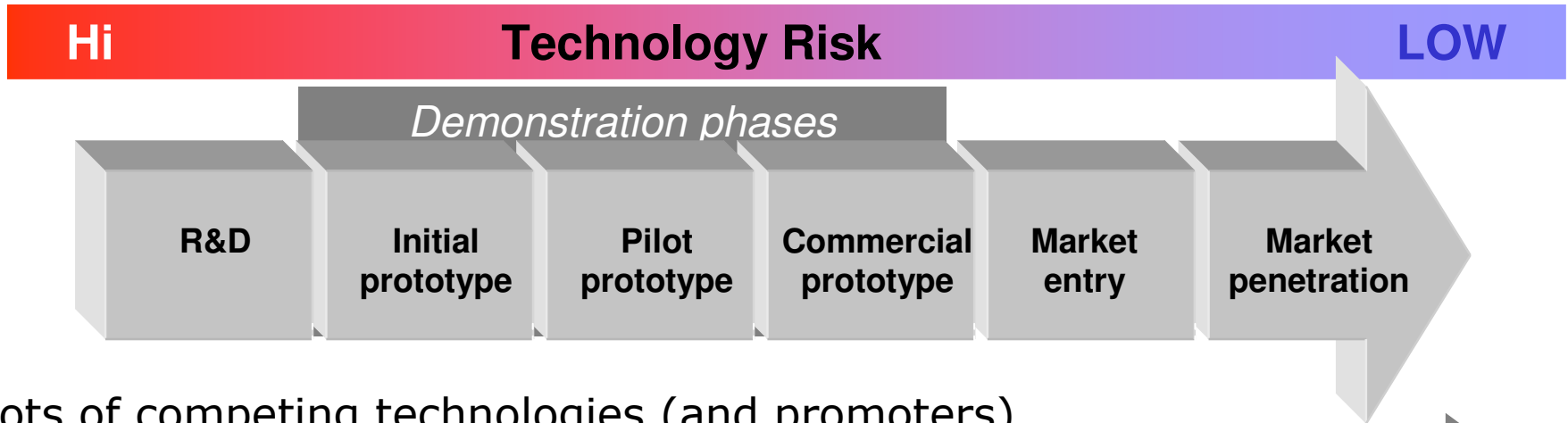
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- **The forest sector is in need of a transformational change. It is coming whether we like it or not.**
- **In Canada, FPAC, FP Innovations and the Federal Government have embarked on the Future Bio-Pathways Study.**
  - **How to identify the right transformational strategies for the Canadian sector?**
  - **Six lines of inquiry. #2 involves the quantification of key economic, social and environmental metrics associated with the main existing and emerging bioproducts & technologies.**

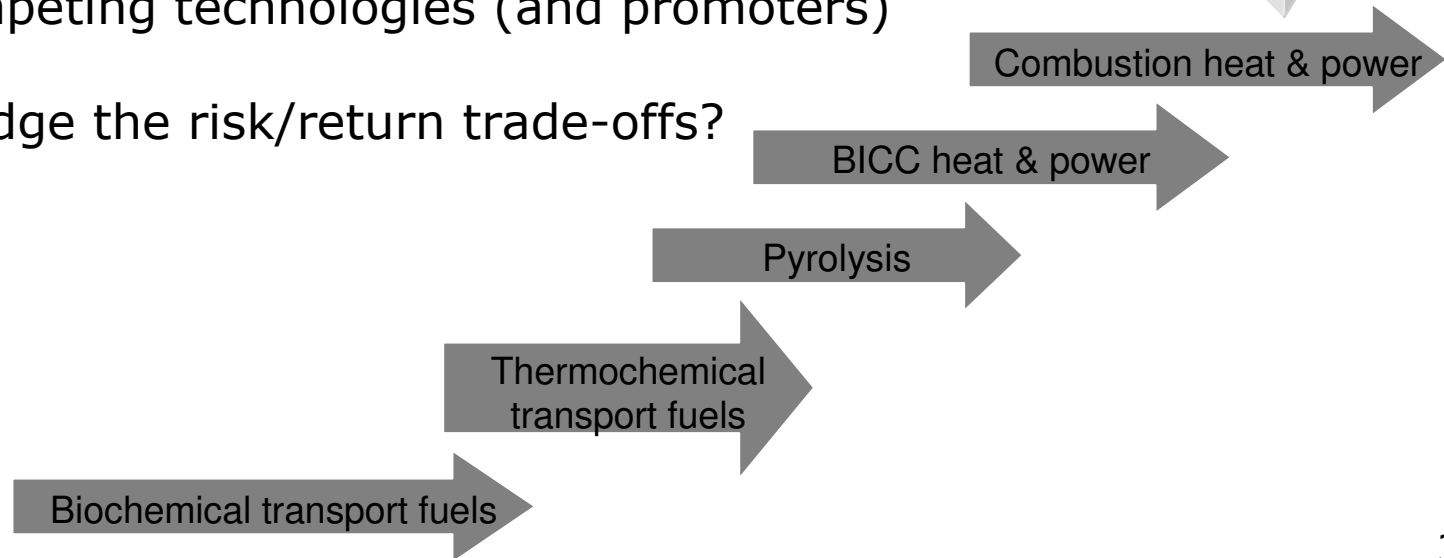


# Analytical Implications

## Current Status of Bio-energy Technologies



- Lots of competing technologies (and promoters)
- Can you judge the risk/return trade-offs?



# Advanced BioFuel Companies

<b>Target Product</b>	<b>Hydrocarbons</b>			<i>Catalytic</i>	<b>Virent</b>		
						<i>Gasification / FT</i>	Choren Syntroleum
						<i>Pyrolysis</i>	Kior UOP
	<b>Alcohols</b>	<i>Biobutanol</i>					
		Gevo DuPont/BP					
		<i>Ethanol</i>					
		logen Verenium Mascoma QTeros	Coskata Ineos	RangeFuels			
		Biological	Non-Biological ThermoChemical & Catalytic				

There are many approaches to producing even just Advanced Biofuels.

Note:

- At different stages of development
- The asserted value propositions vary widely.
- Very few are dealing with forest companies

## Process Technology



# Analytical Implications

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Canada's Future Bio-Pathways study is examining almost 20 emerging bio-energy & chemical products/ technologies. This includes:

- **Thermo-chemical pathways (eg., Gasification-Syngas-FT; Gasification-Lime Kiln):**
  - Torrified pellets
  - Gasification (direct and indirect), Heat and electricity (heat, ethanol), use on site and sell on market.
  - Gasification Synthesis. Hydrocarbon products (diesel, gasoline, ethanol, methanol) – use on site and sell on market.
  - Extraction of bio-products. Lignin (resin, Carbon Black);
  - Pyrolysis oil upgrade for transport fuels; separation of phenols/resins & use remainder for energy
- **Bio-chemical pathways (eg., Acid Hydrolysis; Enzymatic Hydrolysis; Organosolve):**
  - Cellulose and hemicellulose to ethanol
  - Hemicellulose to Lactic Acid (PLA)
  - Sludge to AD biogas to methane
- **Chemical pathways:**

*\*Depending on the specific product/process, these will be examined as part of an existing manufacturing complex and/or as stand alone facilities.*



# Analytical Implications

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<b>Economic</b>	<b>Social</b>	<b>Environmental</b>
Revenue/ODMT	GDP Multiplier	Carbon Footprint* (cradle to grave)
EBITDA/ODMT	Employment Multiplier	Others to follow
Return on Capital		

The Canadian Future Bio-Pathways study is looking at a series of metrics, by product/technology



# Organizational Implications

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## **Need to break out of our sectorial silos**

- **At HQ, develop more “virtual” teams that cut across sectors.**
- **For forestry organizations (provided the big picture themes are understood and communicated), move the decision making closer to the land-base.**



# Organizational Implications

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**To deal with these challenges, companies are having to realign the supply chain & play to their relative strengths.**

**Need for strategic alliances across sectors.....**

**.....further driving the convergence between the markets for food, fuel and fiber.**



# Organizational Implications

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## Strategic Alliances: “Upstream” & Feedstock Companies

- Chevron/Weyerhaeuser for transportation fuels
- Neste Oil/Stora Enso for Fisher-Tropsch fuel
- Preem Petroleum/Sodra & Sveaskog for Fisher-Tropsch fuel
- Andritz (Carbona)/UPM-Kymmene for Fisher-Tropsch fuel
- Royal Dutch Shell/Cellana for bio-diesel
- ConocoPhillips/Tyson Foods for bio-diesel



# Organizational Implications

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## Case Study: Catchlight Energy - Weyerhaeuser & Chevron JV

- Formed in February 2008, with a focus on liquid transport fuels.
- Chevron provides expertise in molecular conversion, product engineering and fuel distribution.
- Weyerhaeuser provides land, expertise in resource management, and ability to provide feedstock at scale.
- Feedstock strategy:
  - Inter-cropping: strips of S.Y. Pine & perennial grass
  - Grass must not hurt quantity/quality of S.Y. Pine
  - Grass harvested annually for 9 years before replanting
  - Grass production of 10-20 BDMT/acre/year



# Organizational Implications

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## Case Study: UOP/Ensyn JV

- Formed in Q4/2008 with a focus on “drop-in” transport fuels
- UOP
  - Owned by Honeywell
  - Leading supplier & licensor of process technology, catalysts, absorbents, process plants and technical services to the petroleum refining, petrochemical & gas processing industries
  - UOP technology furnishes 60% of the world’s gasoline, 85% of the world’s biodegradable detergents & 60% of the world’s para-xylene
  - Strong relationships with leading refining and petrochemical customers worldwide
- Ensyn
  - Most experienced producer of pyrolysis oil in the world
  - Seven commercial plants in U.S. & Canada (max. 100 BDMT/day, but about to announce 400 BDMT/day)
  - Operating since 1990



# Organizational Implications

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## UOP/Ensyn JV (cont.)

- “Drop-in” transport fuel means the stabilized pyrolysis oil (bio-crude) can be upgraded and then processed in conventional refineries, moved over conventional pipelines and delivered to customers without blending with non-renewable resources.
  - Build series of 3,000 BDMT/day plants, which feed into existing refineries (hub & spoke model).
    - Scale of plant achieved
    - Address decentralized nature of feedstock
    - Cost-effective movement of the energy & chemicals in biomass
- Feedstock strategy:
- Mixed woods and corn stover
- Expect to be commercial within three years



# Policy Implications

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**It depends – are you a “Focused Fixer” or a “Paradigm Shifter”?**



# Policy Implications

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**If you are a “Paradigm Shifter”, likely emphasize:**

- **Need for dramatic reductions in consumption levels and changes in consumption patterns among the wealthiest 10% of humanity (and altered expectations among most of the remaining populace)**
- **Need to convince voters that the world has gone down the wrong path, and that we have to go back.**

**Does demanding such fundamental change divert attention from practical solutions? Is this possible, at least without a major crisis first?**



# Policy Implications

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**If you are a “Focused Fixer”, likely emphasize:**

- **Bio-engineering, especially to increase productivity and “robustness”**
- **Agro-forestry-energy interface**
- **Pasture improvements**
- **Yield gaps between private and public lands.**

**Given the complexity of the issues, worth actively supporting the development of formal markets to address as many of the historical externalities as possible (eg., water, carbon, bio-diversity, etc).**



# Policy Implications

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## The Sustainability Issue

- **The sustainability debate was originally focused on biofuels and their impact on food security and biodiversity.**
- **Indirect land use change (ILUC) is now the leading issue. European regulators are developing the methodologies, audit and certification systems necessary to track life cycle emissions of all the different biofuel feedstocks.**
- **The California Air Resources Board (CARB) has just approved the U.S.'s first Low Carbon fuel Standard.**
  - **Required the carbon intensity of transport fuels to be reduced by an average of 10% by 2020, with declines starting in 2011.**
  - **Traditional corn ethanol is at a large disadvantage vs cellulosic ethanol.**
  - **Likely model for other U.S. states.**



# Policy Implications

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## The Sustainability Issue (cont.)

- **It is only a matter of time before regulators shift their focus from biofuels towards the biomass used for heat and power.**
  
- **The GHG emissions of the biomass increase if it is :**
  - **Transported for long distances**
  - **Grown intensively with high levels of fertilizers**
  - **Established after ploughing up grassland or converting natural forest**



# Policy Implications

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**When allocating publicly owned timber,**

- **Be aware of the differences in Employment and GDP multipliers across end uses.**
  - **For a given volume of wood, pulp & paper generates a GDP multiplier 8x and Employment multiplier 13x that associated with pure energy (but also consider distributional differences)**
- **Keep your tenure arrangements flexible to allow inter-cropping (eg, Chevron/Weyerhaeuser model)**
- **Pyrolysis technology is attractive, but “hub & spoke” model may result in the bulk of the value-added getting siphoned out of the forest sector.**



# Policy Implications

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**In structuring our tenure and marketing arrangements we need to:**

- 1. Match the specific quality of fiber to a specific application in a specific market.**
  - 2. Facilitate the cost efficient collection of biomass?**
- At the same time, the tenure system should be sufficiently flexible in accommodating new technologies (and players).**
  - Is the “integrated forest model” becoming obsolete?**



# Appendix : Bio of Don Roberts

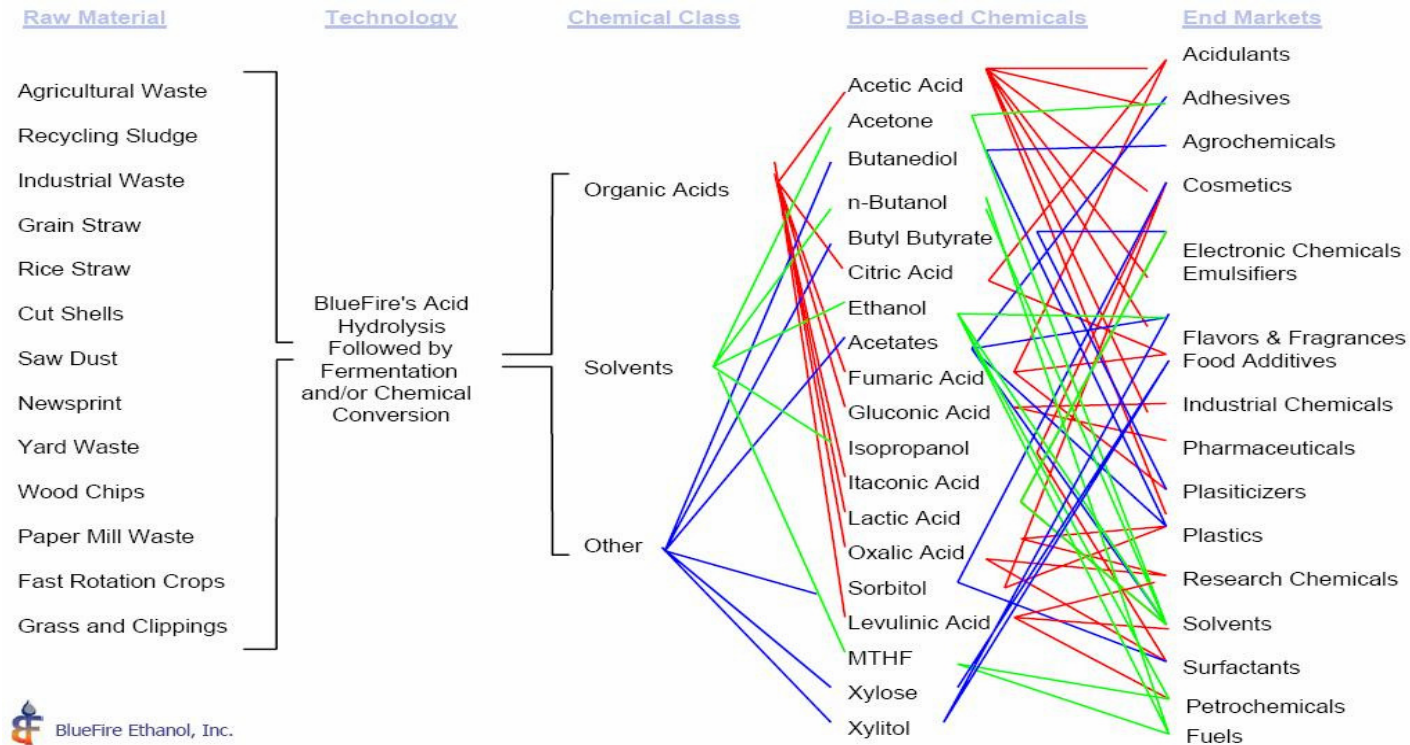
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- Mr. Roberts is a Managing Director with CIBC World Markets Inc., an investment bank with 23 offices around the world and over 2,600 employees. He leads CIBC's Paper & Forest Products Research Team, and is also responsible for the bio-fuels sector. His primary responsibility is to lead a team of analysts in advising financial institutions (e.g., pension/mutual funds) on their investments in the global paper & forest products industry. He is consistently ranked by institutional investor surveys as one of the top equity research analysts covering the forest products industry.
  
- Mr. Roberts specializes in international commodity markets, and has collaborated with a number of international forestry organizations to gain a global perspective on the paper & forest products sector. He has over 30 years of experience related to various aspects of the forest products sector. Prior to joining the investment business, he was Chief Economist with the Canadian Forest Service.
  
- In 2009 Mr. Roberts is on a sabbatical from his regular duties at CIBC World Markets: During this period he is focused on two key initiatives:
  - Developing a business plan to establish an Alternative Energy practice for CIBC.
  - Leading a national study on behalf of the Forest Products Association of Canada and the Government of Canada which is developing transformational strategies for the Canadian forest sector.
  
- In addition to his work with CIBC World Markets Inc., Mr. Roberts is also
  - An Adjunct Professor in the Department of Forest Resource Management at the University of British Columbia (Vancouver);
  - On the Board of Executives of the Sloan Center for Paper Business and Industry Studies at the Georgia Institute of Technology (Atlanta, Georgia);
  - On the Board of Directors of the Rights and Resources Institute (Washington, D.C.) and
  - Serves in an advisory capacity for a range of government, industry, and NGO groups.
  
- Mr. Roberts has a Bachelor's degree in Agricultural Economics from the University of British Columbia, a Master's degree in Forestry Economics from the University of California at Berkeley, and both an MBA and doctoral studies in International Finance and Economics from the University of Chicago.



# Higher Value Products

**Technologies Already Exist Which Can Provide Competitive Entry into Bio-based Chemicals and Target Market Segments**



Source: BlueFire Ethanol Inc.

- **If biomass is expensive, need to produce higher valued products.**
- **Many bio-chemicals can be produced, but the production and marketing is quite complex - need partners.**

