The Economic Meltdown and its Impact on the Markets for Forest Products and Bio-Energy: What Has (and Has Not) Changed?

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Outline

- Current Chaos
- Impact on the Traditional Forest Sector
- Impact on the Bio-Energy Sector
- Update on Global Bio-Energy Policies
The Current Chaos

- Worst economic slowdown in over 70 years.

- Truly global in nature.

- Historically, peak-to-trough changes in employment & house prices take ~5 years after a severe financial crisis (recovery by 2012?).

- However, we are seeing an unprecedented level of co-ordinated fiscal stimulus in the major economies
  - $325 billion in the European Union – 2.5% of GDP
  - $789 billion in the US – 6% of GDP
  - $725 billion in China – 16% of GDP
The leading indicators in N. America, Europe and China all suggest the economy is recovering from the recession.

The ISM Purchasing Managers Index for the U.S. has strengthened to 52.9 in July. This was the highest level recorded since June 2007, and it appears poised to shift from a contracting indication to an expanding one.

German investors confidence shot past a recent three-year high reached in June at 44.8, and currently stands at 56.1. However, recent reports of strong activity in Germany and France has not eased concerns that economic activity in the European Union may remain weak well into 2010.

The Chinese PMI index came in at 54.0 in August 2009, and continues to point to improving economic conditions. The trough was observed in November 2008, when it bottomed at 38.8.
The U.S. Federal Budget Deficit Outlook is Getting Worse

Source: Federal Reserve

~250% increase in the U.S. Govt deficit from 2009 to 2010. Similar results throughout much of the developed world.

What will happen when the public spending stops, and gov’t debt and deficits must be reduced? Higher taxes? Fewer services? Higher inflation? Return to economic slowdown?
Commodity prices in the forest industry have performed very unevenly, but all were impacted by the crisis.

- Lumber was already unsustainably low, and still bouncing along the bottom.
- Pulp quickly went into free-fall, but then rebounded in March in response to inventory rebuilding in China (due to stimulus package).
- Key paper grades have fallen from their peaks, but have likely now bottomed.

Source: RISI, Random Lengths and CIBC World Markets Inc.
Global Pulp Wood Prices: Before and After the Crisis

On average, global log prices have fallen at least 20% over the past year.

US South is the largest wood consuming region in the world, and remains among the lowest cost producers.

For softwoods, Northern Europe and Eastern Canada are the highest cost regions in the world – both before and after the crisis.

The biggest reductions have been in NW Russia ~50% decline. It is now among the lowest cost producers.

The crisis has caused the global cost curve for pulp wood to fall, and flatten. The relative importance of log prices in driving competitiveness has declined – other costs and general hosting conditions have increased in relative importance.
Looking Out From The Chaos

The financial crisis is causing mayhem throughout the global industry:

- Forced further capacity closures in N. America ~ 6.5 million tonnes of paper capacity in 2008/9;

- Added fury to the "Perfect Storm" that has moved onto Europe after hitting Canada – expect as much as a 1/3 drop in Scandinavian pulp & paper capacity between 2007 and 2015;

- Caused capacity expansions in S. America to slow dramatically;

- Underscored the dependence of Russian log production on international markets, and weakened the debt-based financial empires of many Russian Oligarchs;

- Revealed that the Chinese industry is much more dependent on direct (& indirect) export markets than thought – future capacity expansion likely moderated.

Implication? Markets will be tighter when the recovery does eventually come due to reduced capacity.
Impact on the Bio-Energy Sector

What has changed?

.......and what has not?
What Drives Investment in Bio-Energy?

Four key variables shape the economics of investing in bio-energy:

1. The price of fossil fuels (the main substitute)
2. The conversion technology
3. The cost of the feedstock (50%-80% of the variable cost)
4. Regulations (which stimulate demand)

At present, all four of these variables are in a state of flux—and investors hate this uncertainty.
With oil at $40/barrel, almost no bio-energy is economic.

Don’t confuse the cyclical with the secular move in oil prices. Given the shape of the global cost curve for oil, a “normalized” oil price in the $60-80/bbl range seems reasonable. Some bio-energy makes sense at this level.

Source: CIBC World Markets Inc. Economics & Strategy
The economic crisis has had a major impact on the level of investment in the global bioenergy sector. After exceeding $12 billion in 2008, it fell by ~75% from Q4/08 to Q1/09. Now starting to recover.

Bio-energy can be split into two types: biofuels (i.e., liquids) and biomass (solids and gases). In 2008, the split was roughly 45/55.

Going forward, we expect the proportion of the investment made in the biomass segment will increase. The growth in the biofuels segment is now mostly in the form of second-generation (cellulosic) capacity, but mostly from agricultural residues.
Different regions focus on bioenergy in different forms.

Brazil’s focus on sugar-cane based ethanol continued to be the single biggest source of bio-energy investment.
The bulk of the biomass-based investment has taken place in the E.U. and China. Going forward, we expect the share of the E.U. and U.S. to rise.
### Global Biofuels Financing (By Region, 2008)

- **S. America (esp. Brazil)** has been capturing almost 3/4s of the global investment in biofuel. It is clearly the low cost producer.

- Countries with significant “first-generation” biofuels have a distinct cost advantage in moving into “second-generation” cellulosic ethanol

### Global Biofuels Financing, By Region (2008)

<table>
<thead>
<tr>
<th>Region</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>U.S.</td>
<td>20%</td>
</tr>
<tr>
<td>E.U.</td>
<td>1%</td>
</tr>
<tr>
<td>Canada</td>
<td>3%</td>
</tr>
<tr>
<td>South America</td>
<td>72%</td>
</tr>
<tr>
<td>Asia (excl. China)</td>
<td>1%</td>
</tr>
<tr>
<td>Rest of World</td>
<td>3%</td>
</tr>
<tr>
<td>China</td>
<td>0%</td>
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<tr>
<td>China</td>
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</table>

Source: New Energy Finance, CIBC World Markets Inc.
Convergence Of The Markets For Fuel, Food And Fiber

A key feature of the growing bio-economy is the convergence of the markets for food, fuel and fiber. It is occurring for a range of reasons, but all related to security (and driven by anxiety):

- Environmental Security: i.e., combat climate change
- Political Security: i.e., secure political support at local level by rural development
- Economic Security: i.e., protection against the rising real price of fossil fuels
- National Security: i.e., diversification of energy supply
- Food Security: i.e., access to food at reasonable prices

The financial crisis has caused the relative importance of these forces to change.

The last 3 may be less important in N. America than was the case – but for how long?
• Convergence of the “3F” markets in the sense that the feedstocks will trade on the basis of their energy equivalency.

• The price of oil is expected to become a support price for cereals, oilseeds and lower-quality wood.

• Prices of all of the major feedstocks rose significantly, especially from 2006 to Q2/08 – outpaced gasoline & ethanol. The feedstock with the greatest US$ price increase has been pulpwood in Brazil.

• The financial crisis caused all of the biofuel and feedstock prices to fall, and now they are starting to rebound. This is consistent with the convergence thesis.
Most bio-energy investments would not be undertaken without government support.

The following is a quick update on bio-energy policies in 3 key regions:

• United States
• China
• European Union
• President Obama has committed to make Health Care and Clean Energy his top priorities.

• During the campaign he pledged to invest $150 billion in the Clean Energy Sector over 10 years to create 5 million “green collar jobs”. However, he will find himself handcuffed by challenging economic times and a massive federal deficit.

• Key legislation on the agenda:
  • National Renewable Portfolio Standard;
  • Carbon cap-and-trade scheme (but with relatively weaker requirements and lower targets than many desire.)
United States

- Renewable Fuel Standard in the Energy Bill requires 36 bln. gallons of renewable fuels by 2022 (vs ~13 bln in 2009)......including 21 bln. gallons of “advanced” (non-corn starch) biofuels.

- Given the announced projects to date, it will be almost impossible for the U.S. to meet its interim targets in 2010-12.
  - 100 million gallon target by end of 2010, but less than a dozen pilot and small-scale demonstration plans are operational, with annual output of ~ 4 million gallons.

- The unavailability of private debt, and spiraling developer capital cost estimates due to the financial crisis have been a major hurdle.

- Federal and State governments are responding with significant subsidies.
The American Recovery and Reinvestment Act

Key new measures applicable to bio-energy projects include:

• The Dept of Treasury’s temporary new grant program, intended to spur renewable project growth by offering developers cash in lieu of tax credits.

• Committed to issuing funds representing 30% of a project’s qualifying capital costs within 60 days of that project’s commissioning.

• Some State governments (e.g., Oregon) are topping the grant up to 65% of the capital cost.
United States

On May 8, 2009 President Obama directed the USDA to expedite and increase the production of bio-energy within 30 days.

Five key measures were announced on June 8, but the most significant is the launch of the Biomass Crop Assistance Program.

- Compensation for the collection, harvest, storage and transportation of biomass.
- Biomass must be used for heat, power, bio-based products or biofuels.
- Matching payments will be made up to $45/ton
- Material providers will be eligible for up to two years of payments.

Details are still being finalized. Potential distortive affects for existing biomass consumers are significant.

Once a subsidy is given, it is very difficult to take away.
Cap-and-trade legislation is unlikely to be passed until 2010, and implemented until 2012.

- U.S. Senate bill (Kerry-Boxer) released September 30.

- Unlike the House bill (Waxman-Markey), of the 2 billion offsets allowed for compliance, only $\frac{1}{4}$ (instead of $\frac{1}{2}$) may come from international projects.
  
  - The amount of international offsets could increase by 750 million, if there are not enough domestic offsets available for compliance.
China

- Ambitious target for renewables to account for 10% of all energy consumption by 2010 and 15% by 2020.

- Biomass power targeted to grow from 2.9 GW in 2008 to 4 GW in 2010 and 24 GW by 2020 – largely with agricultural waste.
  - Need to build roughly 850 biomass plants rated at 25 MW by 2020 (~6/month).
  - Huge logistical challenge to fuel a 25 MW biomass power plant. Must collecting 150,000 tpy-200,000 tpy of bulky straw from thousands of small 0.15 ha farms.

- Most biomass power plants are suffering low profits, and not enough are being build at the required pace. Biomass power plant financings have fallen 66% since the start of the financial crisis.

- There could be a possible downward revision of the 24 GW target for 2020. A target of 10 GW appears more feasible.
Fragmented market: Main developers running out of steam and others are inexperienced, while state-owned utilities are not as involved in biomass as in wind and solar.

Feedstock issues: Costs of feedstock and collection have risen substantially.

Revised Targets?: Even a lower 10 GW target in 2020 would require ~$265 m/quarter (vs. current $141 m/quarter).
China’s pellet utilisation forecast, 2008 - 2020: m tonnes

- In 2007 the National Development and Reform Commission (NDRC) identified national wood pellet targets rising from 2 million tpy in 2010 to 50 million tpy in 2020.

- In early 2009, NDRC’s Centre for Renewable Energy Development indicated that China’s biomass feedstock resource is about 60%-70% less than the official numbers initially published.

- Realistic target likely closer to 35 million tpy by 2020.

Source: IEA Bioenergy, New Energy Finance
State Forestry Administration has previously announced a target to develop 13.3 million ha of forests to produce feedstock for biofuel production and power.

- What progress has been made?
- Still a reasonable target?
- Recent policy developments related to woody biomass for energy?
European Union

- The EU-25 has agreed on a binding target to reach a 20% share of renewable energy source in total energy consumption by 2020 (currently ~7%):
  
  - ~2/3 of the renewable energy is expected to come from biomass.
  
  - If enforced, Pöyry/McKinsey study forecasts a 200 million m$^3$/year-260 million m$^3$/year wood deficit in Europe in 2020. (Canada currently harvests ~200 million m$^3$/year)
  
  - If the target is enforced, expect meaningful upward pressure on global wood/biomass prices.
United Kingdom

• GHG emission reduction targets in the UK are amongst the most aggressive in Europe.

• By 2020,
  • Renewable energy’s share to 15% from ~1% in 2006
  • Electricity from renewables to 35% from ~5% in 2007 (if draft target confirmed)

• Twelve projects are already under various stages of development, with the capacity to generate 2.7 GW of biomass energy.
  • Equates to ~12 milion ODMT of wood pellets, or 20 million tpy of green wood chips.
  • Equivalent wood requirements of 4 world-scale pulp mills.
Wood pellets are the fastest growing source of bio-energy in the world, and the market has been driven by European regulations. However, expect rising demand in N. America, Japan, China and S. Korea as well.

Europe sources the bulk of its wood pellets from Canada, but Australia and the U.S. will soon become important sources as well. Three potential sources which we think are underestimated are Brazil, Russia and West Africa.
Case Study: Ontario Feed-In-Tariffs For Bio-Energy

In September 2009, the Ontario Power Authority announced that it will guarantee a long-term price of $C 0.13/kWh for bio-energy.

Preliminary estimates suggest that this implies a FOB price of $C 217/ODMT of wood pellets

• Equivalent to ~$C 12/GJ of energy
• Pellets are intended to substitute for coal, and coal currently costs ~$C 4/GJ

• Cost differential of ~$C 8/GJ implies that Ontario energy consumers would pay ~$C 60/tonne of CO2 to make the switch from coal to wood pellets. Compared to CO2 costing:
  • ~$C 20/tonne on the European Climate Exchange and
  • ~$C 3/tonne on the Montreal Climate Exchange

• With the announced feed-in-tariff, pellet producers in Ontario would generate cash of ~ $C 113/ODMT of biomass. In the current economic environment, they could outbid almost all traditional users for biomass.

• Implications for the Ontario tax payer and the existing forest industry?
When assessing the impact of renewable energy policies, remember that biomass is not the only source of clean energy.

Aside from fossil fuels, how does bio-energy compete with:

- Wind?
- Solar?
- Hydro?
- Marine?
- Geothermal?
As of now, Bioenergy is not the low cost source of renewable electricity.

Depending on the circumstances, Geothermal, MSW, Landfill gas & Wind (onshore) can all be cheaper sources of renewable energy.
Bio-Energy Conclusions

- The financial crisis has significantly slowed the development of the bio-energy sector.

- Highly unlikely the U.S. and China will meet their interim bio-energy targets over at least the next three years. The EU will also likely have to reassess its aggressive targets due to the impact on feedstock prices and overall economic impact.

- Given government budget deficits, in the future expect greater emphasis on Renewable Energy Standards than subsidies....there is still a cost, but it is indirect.

- In setting and meeting bio-energy targets, it is important to:
  - Consider both forestry and agricultural feedstocks – break out of your administrative “silos”.
  - Consider the competitiveness relative to other sources of renewable energy. What is the lowest cost way to reduce CO2?
  - Take a “systems approach” to avoid unintended consequences.
Central to all bio-energy strategies is a competitive price for delivered biomass....... True regardless of the current financial turmoil
Appendix A: Woody Biomass Processing Technologies For Energy

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**Thermo-Chemical**
- Combustion
  - Excess air
  - Heat & Power
- Gasification
  - Partial air
  - Fuel Gases (CO + H₂)
  - Heat & Power
- Pyrolysis
  - No Air
  - Char & Liquids
  - Heat & Power

**Bio-Chemical**
- Hydrolysis & Fermentation
  - Heat & Power
- Liquid transport fuels

**Physical**
- Pelletization

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FPAC’s Bio-Pathways study project is examining all routes except (3) and (7).
Solid Energy Products

<table>
<thead>
<tr>
<th>Energy Content</th>
<th>Energy Usage</th>
</tr>
</thead>
<tbody>
<tr>
<td>GJ/odt pellet</td>
<td>GJ/odt pellet</td>
</tr>
<tr>
<td>Pellet</td>
<td>19</td>
</tr>
<tr>
<td>Torrefied Pellet</td>
<td>24</td>
</tr>
<tr>
<td>Biocarbon</td>
<td>30</td>
</tr>
<tr>
<td>Coal (anthracite)</td>
<td>31</td>
</tr>
</tbody>
</table>

Energy Density

- Desireable to increase energy density in order to decrease the effective cost of transportation.
- Biocarbon requires a significant amount of energy in the manufacturing process, however, the delivered product has a much higher energy content.
- Under what conditions does it make sense to use the various types of solid energy products? (eg., when does it make sense to use the energy in the resource to densify the energy in the product?)
The Current Chaos and Exchange Rates

World Currency Movements (Against the US$)
January 2005 = 100

- The lower the number, the weaker the US$ against the foreign currency.
- In the early stages of the crisis (see grey bar), the US$ strengthened rapidly...causing a sudden increase in the competitiveness of Europe/Russia/S. America/Canada – but not China or Japan.
- In most cases, this initial strength in the US$ has been given up. Of the major forest countries, only Russia is still benefiting from a weak currency.
Appendix B: Bio of Don Roberts

- Mr. Roberts is a Managing Director with CIBC World Markets Inc., an investment bank with 23 offices around the world. 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 of Industry and Trade Analysis with the Canadian Forest Service.

- 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 & 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.