A Global View of Bioenergy Markets and Trends

Don Roberts
CIBC World Markets Inc.

Outline

- The Current Chaos
- The Economics of Bioenergy
- The Global Bioenergy Sector
- Convergence of the "3 Fs"
The Current Chaos

- Significant credit crunch
  - Difficult for even companies with strong balance sheets to operate due to capital rationing
- Many of the offshore economies are now in worse shape than the U.S.
- Initial signs the financial system is starting to function again
  - Global bond issues up ~ 10% year over year in Q1
  - Interbank lending rates have plummeted from their peaks
- Still lots of macro-economic unknowns
  - Could we be facing a “lost decade” of growth like Japan experienced?
  - Historically, peak-to-trough changes in employment & house prices take ~5 years after a severe financial crisis (2012?)

China Purchasing Managers’ Index

- However, there are some bright spots on the horizon.
- China is implementing a $725 billion stimulus package. This is equivalent to 16% of GDP (vs. 6% in the U.S. and 2.5% in the EU).
- The impact is already showing up, with a clear turnaround in the perceived business conditions in China. But is this enough?
Transport costs are typically 20%-30% of the total delivered cost of forest products.

Cost of ocean freight transport has fallen through the floor. Index down from ~3500 in May 2008 to ~250 in January 2009, and back up to ~750 in May.

The world has become smaller – despite the rhetoric that globalization is reversing.

International trade will play a bigger role – but offshore demand has to pick up first.

For non-U.S. shippers, the stronger US$ has offset some of the benefit of lower US$ denominated costs.

Due simply to changes in exchange rates, the cost competitiveness of the Australian and NZ economies has significantly improved on the global stage.

The general strengthening in the US$ has also exerted downward pressure on commodity prices denominated in the US$.

For exporters like AUS/NZ, the benefits of weaker currencies have generally been passed on to the consumer – reflects the weakness in demand.

Source: Baltic Dry Index and CIBC World Markets Inc.
Changes in currencies and demand have caused a downward shift in the global cost curve for woody biomass – the biggest drop in US$-denominated pulpwood costs in over 20 years. The curve is now much flatter, and in two segments.

- Prices in AUS/NZ have fallen about 25%.
- But the largest declines have been experienced in NW Russia ~50% and Chile ~40%.
- Changes within N. America are very uneven: ~30% in W. Can & PNW vs ~5% in the U.S. South.

The cost curve has flattened, and split into two segments - AUS/NZ are in the low cost end.

Global Biomass Financing

The crisis has caused financing in the emerging biomass-based energy segment to plummet – down from almost $3 bln. in Q2/08 to ~$0.5 bln. in Q1/09.

Is this just a short-term drop? We think so.
Global biofuels investments have dropped an order of magnitude in less than a year. From over $5 billion in Q3/08 to ~$0.5 billion in Q1/09.

Asset Finance is clearly the dominant source of financing for the industry … although the Public Markets did play a meaningful role in 2006.

No significant financing has been done in the Australian biofuels industry since Q2/07.

That is also the only quarter in which a deal was done in New Zealand (Khosla Ventures with LanzaTech)
Four key variables drive the economics of biofuel production:

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

At present, all four of these variables are in a state of flux.

As producers of Bioenergy, be careful about wishing for high oil prices. Even if the “Financial Wizards” had not screwed-up, we still would have likely had a global recession.

Source: CIBC World Markets
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. At $70, many forms of bioenergy can be economic (with a reasonable price of feedstock).

Europe dominates the consumption of wood pellets, and Canada is the largest exporter. Biomass and pellet markets have remained surprisingly stable despite the collapse in fossil fuel prices. Due to steadily growing demand for energy wood and a contraction in the supply of readily available sawmill and forest residues.
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 Africa.

Fact: Transportation costs are key to obtaining a competitive delivered cost of biomass.

Case Study: 5,000 BDMT/day biorefinery

- Assume the forest base is a circle, and the biorefinery is in the middle.
- Given yield of 2 BDMT of biomass/acre, the haul distance radius is 58 miles to feed the mill – not economic.
- If you can increase the yield to 10 BDMT/acre, the haul distance falls to 22 miles - economic.

With 10 BDMT/acre, can feed a 10,000 BDMT/day biorefinery with an average haul distance of 30 miles – more economic.

Message? Increasing yield/acre is key to achieving competitive delivered biomass costs and attaining economies of scale in processing.
Feedstock and Scale

- Does the distributed nature of biomass preclude the achievement of economies of scale needed to profitably convert biomass to fuels & chemicals?
  - Modern pulp & paper mill handles ~2 million BDMT of wood/year.
  - World-scale 100-million-gallon cellulosic ethanol plant requires ~1.2 million BDMT of wood.
  - Large petroleum refineries use as much as 19 million tons of crude oil/year.

- Not necessarily, but it depends on the value of what is being produced.
- There is a distinct cost advantage if the biomass is already at the plant site, and a joint-product can be made.
- The higher the cost of the delivered biomass, the more of an incentive to produce a higher-valued product (e.g., bio-chemicals).

Higher Value Products

- 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.
Big public & private utilities in Europe, U.S. and China dominate the global biomass-based energy scene.

1st generation biofuels producers have a natural advantage in moving into 2nd generation production.
Babcock & Brown is the largest producer of biofuels in Australia, but it is not in the top 30 globally.

LanzTech is New Zealand’s largest player (with the help of Khosla Ventures)
Bioenergy Policies in the Major Markets

A whirlwind global tour of bio-energy policies:

- European Union
- China
- United States

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, Poyry/McKinsey study forecasts a 200 million m³/year-260 million m³/year wood deficit in Europe in 2020.
  - More recent ECE/FAO study forecasts a wood deficit of 320 million m³/year-450 million m³/year to meet both the energy objective and support a growing wood-based industry.
  - If the target is enforced, expect meaningful upward pressure on global wood/biomass prices.
European Union

United Kingdom:

- GHG emission reduction targets amongst the most aggressive in EU.
- 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 million ODMT of pellets, or 20 million tpy of green wood chips.
  - Equivalent wood requirements of 4 world-scale pulp mills.

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 GW in 2006 to 5.5 GW in 2010 and 30 GW by 2020 – largely with ag waste.
- Need to build more than 1,000 biomass plants rated at 25 MW-30 MW by 2020 (~6/month).
- Most facilities are direct combustion plants, but China Holdings is securing approvals to build five 100 MW pyrolysis/gasification plants.
- Huge logistical challenge collecting 150,000 tpy-200,000 tpy of bulky straw from thousands of small 0.15 ha farms to fuel a 25 MW biomass power plant.
China

- 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
  - NDRC’s Centre for Renewable Energy Development has since 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.

- SFA targeting to develop 13.3 million ha of forests to produce feedstock for biofuel production and power – must compete with industrial wood and environmental demand.

United States

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

- Bioenergy demand is being stimulated by:
  - A plethora of renewable energy standards at the state level.
  - The expectation that a national Cap-and-Trade system will be in place for carbon by 2012.

- More than 65 major new wood energy projects identified, with the bulk being cogen, wood pellet, and then cellulosic ethanol.

- Wood energy projects could consume 50 million tons/year of wood by 2012 and 70 million tons/year-200 million tons/year by 2020.
United States

The American Recovery and Reinvestment Act

Key new measures applicable to bioenergy 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 (eg., Oregon) are topping the grant up to 65% of the capital cost.

Convergence Of The Markets For Fuel, Food And Fiber

A key driver of the bio-economy.

Convergence is occurring for a range of reasons, but all related to security (and driven by anxiety):

- Environmental Security: i.e., combat climate change
- Economic Security: i.e., protection against the rising real price of oil
- National Security: i.e., diversification of energy supply
- Food Security: i.e., access to food at reasonable prices
- Political Security: i.e., secure political support at local level by rural development
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. Financial crisis has caused all of the biofuel and feedstock prices to fall, although wood has fallen the least.


Secular rise in fuel, food and fiber prices will trigger changes in land-use patterns.

Historically, land kept under forests for two main reasons:

1. Owners want the production of some non-market good or service.
2. The land can’t make it in agriculture.

Convergence is expected to have the largest impact in the southern hemisphere since they enjoy higher crop yields and have lower land and labor costs.
We think some of the best forest land will be under pressure for conversion to either food or bio-energy crops.

- To palm oil in S.E. Asia
- To dairy in New Zealand

Expect greater land-use conflicts in many regions due to rising demand relative to potential supply.
To deal with these structural changes, 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.

Strategic Alliances:
- 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

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

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

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

Investment Implications

Good quality land will be the scarce resource.

...and access to clean water may be key in influencing the quality.

Owners expected to lobby for flexibility in switching land uses
Central to all bio-energy strategies is a competitive price for delivered biomass....... This is especially true with the current economic turmoil

Thank you.