An Energy Perspective for the Forest Bioproducts Industry

Tim Lieuwen, Executive Director
Strategic Energy Institute
April 18, 2013
Renewables business totals US $184B in 2012

- Led by wind: averaged 35 GW annual additions since 2008
- Solar – 15 GW of annual additions since 2008
- Biofuel production grew 6X between 2000-2011 –1.9M barrels/day in 2011
Wind A Major Player in 2012

- 50% of new capacity additions in US in 2012
- New additions in China even larger
- 9x cost decrease since 1980
Solar PV Panel Prices Plummeting

- Panel costs down by 60% in past three years
- Balance of Systems/Installation now largest cost component of PV
Significant Increases in Biofuel Production (Ethanol)

- 5% of transportation sector fuel produced from ethanol
- 40% of corn grown in US goes to ethanol
Natural gas prices lowest in a decade

Domestically Produced Petroleum is Up

“American Oil Growing Most Since First Well Signals Independence”

*Bloomberg - December 18, 2012*
Biggest source of world growth since 2000 is coal

2X oil, 3X natl gas, 10X renewables
Fukushima nuclear meltdown

Nuclear Reactor Construction Starts and Total Capacity, 1951-2011
Source: IEA, World Energy Outlook, 2011

(from the World Energy Council’s Nuclear Energy One Year After Fukushima)
Key Energy Challenges Facing US

- **Carbon** Emissions
- **OIL** Imports and Energy Security

Biofuels/ biochemicals offers solutions to both challenges
Important to differentiate between transportation issues from other energy users

- Transportation ~30%
- Electricity ~40%
- Industrial & Commercial ~30%

Source LLNL
Differentiating Power Generation & Transportation

- US is energy independent so far as power generation
- US imports 60% of its oil
  - Energy security issue is coupled to transportation, oil imports
Annual Carbon Dioxide Emissions by Country
Natural Gas – Trends and Drivers
Natural Gas Production Way Up

- US production up 25% over last 5 years

It kind of snuck up on us.....
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Natural Gas Increasingly Fuel of Choice for Power Generation

- Current US power generation capacity ~25%
- Dominant source of new capacity additions over last decade
Current Prices Are Encouraging Looks at Natural Gas for Transportation

Crude oil-to-natural gas spot price ratio, January 3, 2000 - April 11, 2012
ratio of Brent crude oil ($/bbl) divided by Henry Hub natural gas ($/MMBtu)
Transportation movement to Natural Gas?

- Freight Movement
  - Happening today!
- Automobiles
  - Longer term, ~$12K upfront
- Displacing 100% of gasoline and diesel in US today equivalent to roughly 85% of 2012 natural gas production
- NG vehicles reduce CO$_2$ by about 15% (gasoline), 25% (diesel)
Gas Prices are Motivating Interest in Exports

Source Washington Post
Natural Gas to Chemicals

- Chemicals Industry in US: $720 Billion in 2010
  - Exports - $226B, 10% of US exports

- New NG-chemicals plants
  - Royal Dutch Shell - $2B plant near Pittsburgh
  - ConocoPhillips and VX - $5B plant outside Houston
  - Formosa Plastics - $1.7B on Texas gulf coast
  - Exxon Mobil - $1.3B plant
But Prices Seem to be Heading North....

Natural gas spot prices (Henry Hub)

Well Type - Rigs Targeting Gas
United States

Source: Smith Bks, WTRG Economics
www.wtrg.com (479) 293-4081

Source: Natural Gas Intelligence
Concluding Remarks

 “May You Live In Interesting Times”

 Shale oil/gas is reshaping market and drivers for biofuels, stay tuned…