Wood Bioenergy and Fun House Mirrors: Where are Liquid Biofuels?

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About Forisk Consulting

• Forisk provides management consulting and educational services to senior management and investors in the forest products, wood bioenergy and timberland investing sectors.
• Founded in 2004.
• Published products include:
  – Wood Bioenergy US
  – U.S. Timberland Owner List
  – Forisk Forecast
  – Wood for Bioenergy: Historical Context and a Practical Path Forward
    • Book published by the Forest History Society in 2012
Facts: Forestry & Wood Bioenergy

- **Forest supplies**
  - US grows more wood than 50 years ago (nationally).

- **Pulp & paper industry**
  - Investment is up; sector 2x bigger than 50 years ago.

- **Wood bioenergy**
  - 461 announced/operating bioenergy projects in US.
  - Max capacity of 133 million tons/year by 2023.
Bioenergy Projects: Screen for Success

• **Technology**
  – Does the project rely on proven or unproven technology?

• **Status**
  – Is the project under construction or operating?
  – Is the project on hold or is the plant shut down?
  – Has the project received/secured/signed **two or more** of:
    • Financing
    • Air quality permits
    • EPC contracts (Engineering, Procurement & Construction)
    • Power purchase agreements for electricity facilities
    • Interconnection agreements for electricity facilities
    • Wood supply agreements
    • Location
Bioenergy Demand: US

- Projects: 461 → Expected: 296 (64%)
- Wood demand: 132.8 MM → Expected: 76.4 MM (58%)

Sources: Forisk Consulting, as of January 2013
In 2011, Forisk evaluated 36 liquid fuel projects across three US regions.

- Estimated commercial timeline for 12 technology types
Where are these 36 projects today?

- Cancelled: 12
  - Includes one demonstration plant and 11 commercial plants
- Still in planning stages: 8
- Still under construction: 4
- Shut down: 3
- Operating pilot plants: 6
- Operating demonstration plant: 1
  - KiOR: not operating at full capacity yet
- Operating commercial plant: 1
- Sold and in the planning states: 1
  - LanzaTech purchased Range Fuels plant
What observations can be made regarding the current crop of liquid biofuel projects?

![Graph showing projected million green tons of wood from 2010 to 2023. Two projections are shown: one for 2011 and another for 2013. The graph indicates a steady increase in the projection for the years 2010 to 2015, followed by a plateau in 2016 and beyond.](image-url)
How do timberland investors and wood users allocate capital?

• Separate short-term volatility from long-term trends.
• Communicate relative competitiveness to decision-makers.
• Understand – REALLY UNDERSTAND – local situations.