



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

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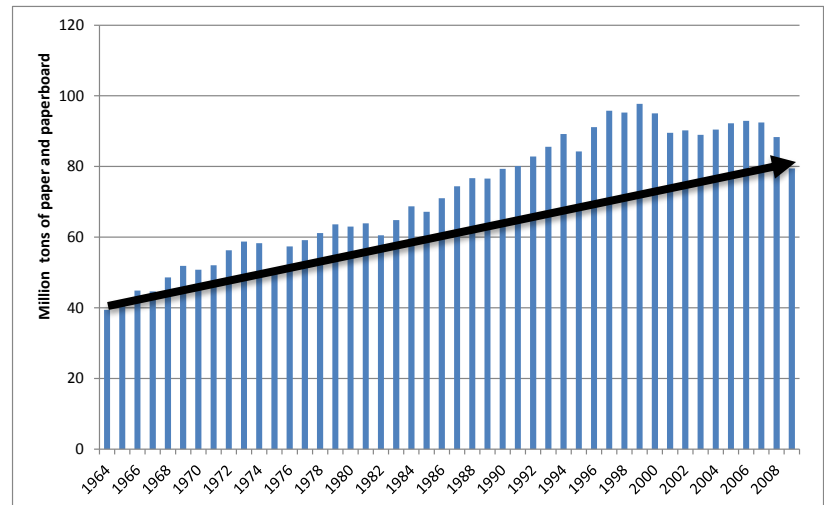
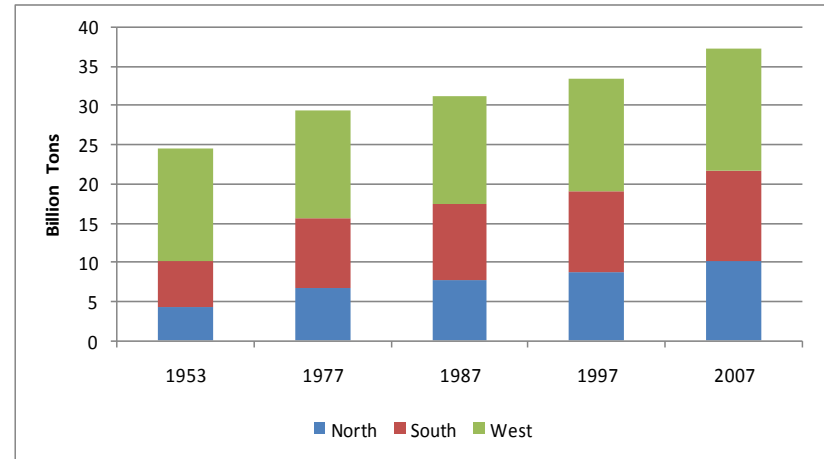
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About Forisk Consulting

- 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.

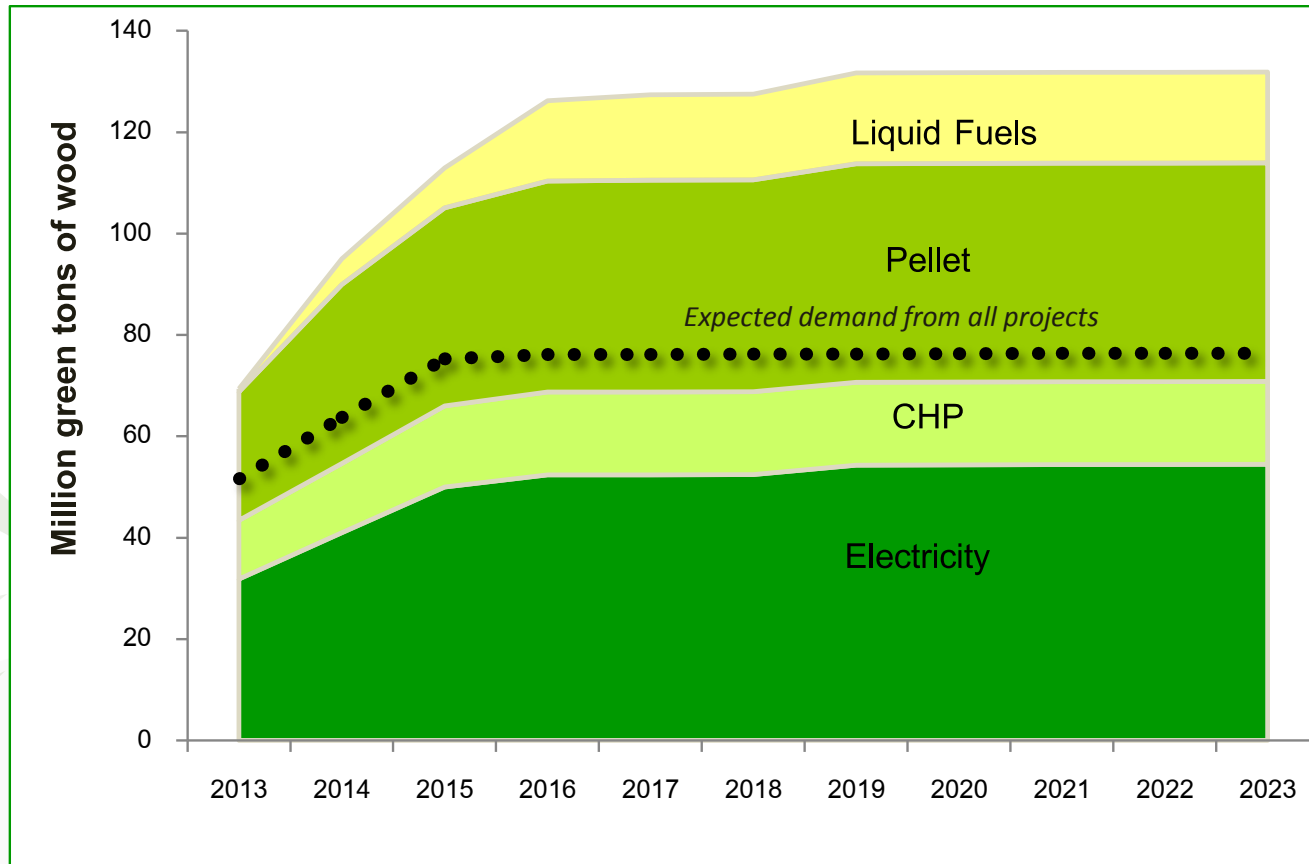


Bioenergy Projects: Screen for Success

- 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



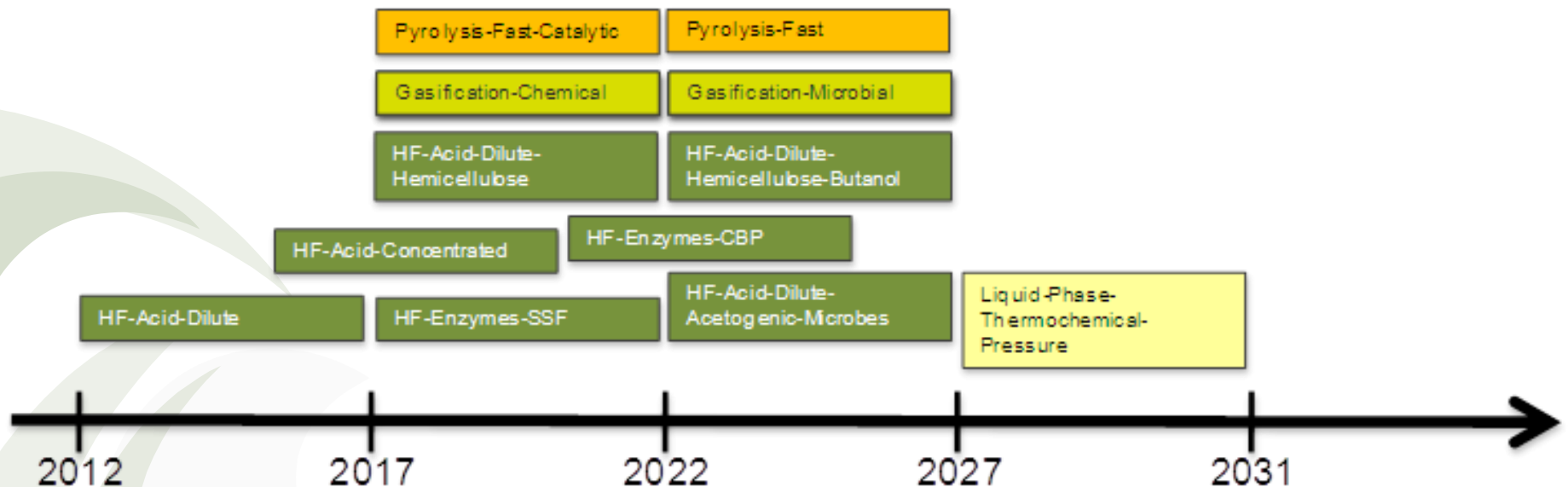
Bioenergy Demand: US



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

In 2011, Forisk evaluated 36 liquid fuel projects across three US regions.

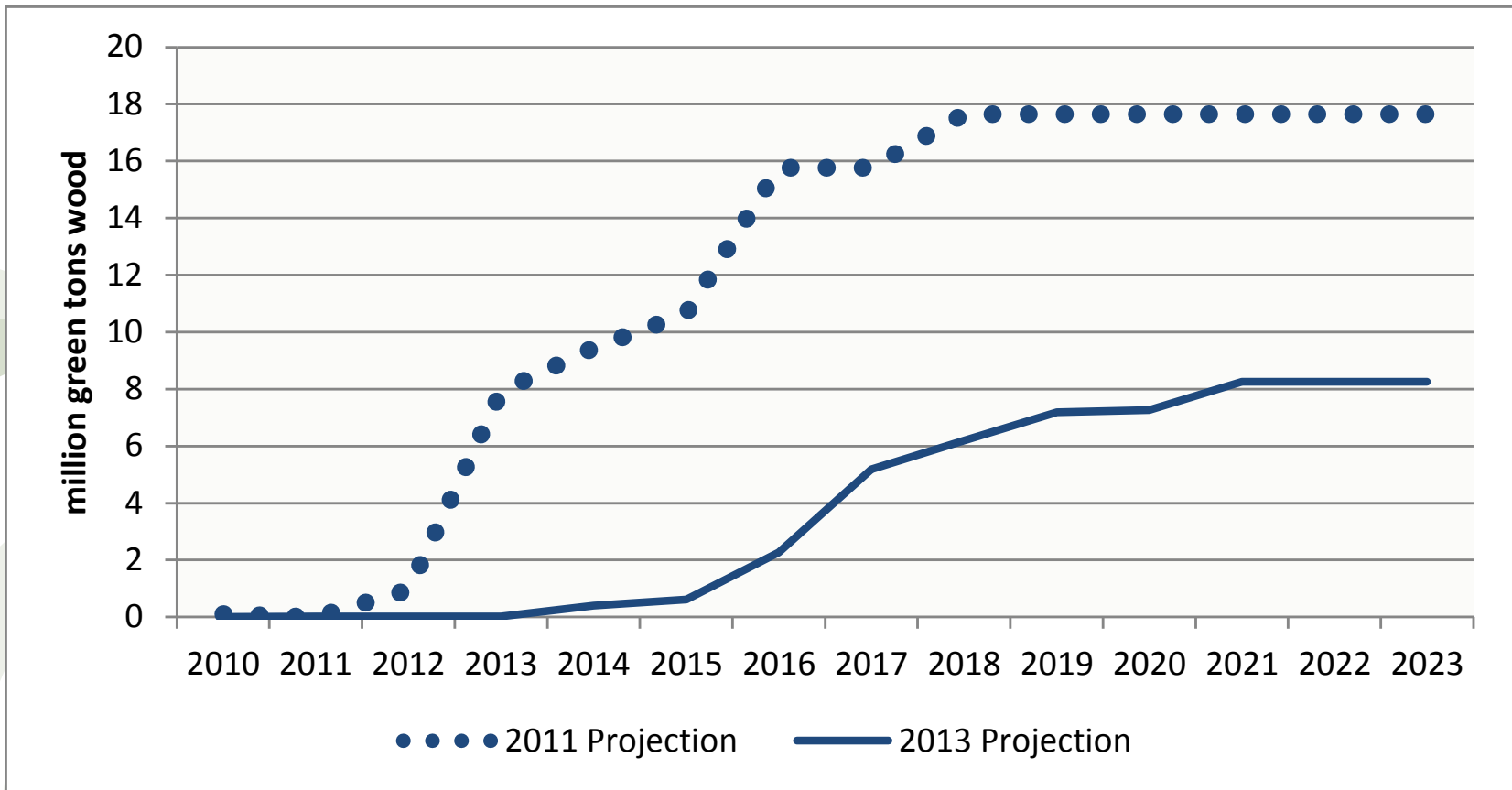
- Estimated commercial timeline for 12 technology types



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
- Operating commercial plant: 1
 - KiOR: not operating at full capacity yet
- 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?



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.