

NAVIGANT

ENERGY

Biomass without Borders: Lessons from International Ventures

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Presented at:

Biomass 2012: Confronting Challenges, Creating Opportunities

July 10, 2012

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A brief introduction of Navigant

- » Navigant is a global professional services firm.
- » In the energy practice we assist energy producers, and utilities address critical business risks and opportunities in a complex market.
- » Our comprehensive portfolio of service for the energy industry includes:

- Regulatory processes and litigation support
- Energy market modelling and economics
- Customer strategies
- Fuel services
- Resource procurement
- Operations and performance improvement
- Asset transaction support



- Energy technology and technology management
- Business planning and strategy
- Renewables
- Energy efficiency and sustainability
- Greenhouse gas/climate change
- Clean energy
- All aspects of generation and transmission

Purpose: Recent developments and lessons to be drawn

Idaho Statesman, July 6, 2012: The little power plant that couldn't.

"A company called Yellowstone Power was planning to open a biomass plant in Emmett to produce steam for power turbines by burning woody material... Idaho Power agreed in 2004 to buy power from the 17.5 megawatt plant. That project didn't meet deadlines. Idaho Power later agreed to a smaller project producing 11.5 megawatts."

"What happened? Yellowstone Power didn't meet its December 2011 deadline for the smaller plant, either. Emerald Forest Products, the planned source of the biomass fuel, ceased operation in April 2011."

Key challenge: Reliable access to feedstock

Pike Research (now part of Navigant) released the Biopower Markets and Technologies Report in 1Q 2012

- » “Biopower market growth is tied to the ability of facilities to access a continuous and consistent supply of feedstock,”
- » “Cost and logistics associated with sourcing, aggregating, and transporting these resources are likely to continue to inhibit growth in the biopower industry.”

Cross-reference Brazil: Some relevant facts to begin with

- » Brazil installed power capacity: 67% hydro, 12% renewable (7% biomass), natural gas (6%), oil and diesel (6%).
- » Brazil's most abundant biomass feedstock is sugarcane (Sao Paulo-southern center of the country)
- » There are also abundant forest residues, mostly pine and eucalyptus. Abundant in Bahia state (Northeast) .
- » Brazil has a complete value chain for at least three clean energy technologies (biofuels, biomass & waste, small hydro).

Sources: Research and Markets, Biomass Industry in Brazil, June 13, 2012. Multilateral Investment Fund (IDB), Climate Scope 2012 Preview.

Additional but key consideration: BNDES as catalyst for biomass development

“800 pound gorilla”: responsible for 62% of all clean energy financings in Brazil in 2011

» *Press release: “BNDES finances 1st eucalyptus biopower project”*

The board of Banco Nacional de Desenvolvimento Economico e Social (BNDES) approved financing of R\$ 210.7 million [USD 105 million] for the construction of a cogeneration steam and electricity plant using eucalyptus chip. This is the first project approved by the Bank for this type of biomass and will have total generating capacity of 1,148 tons of industrial steam and 125.7 MW of electricity per year.

(...)

The project concept involves, besides the environmental benefit of replacing steam produced from natural gas by steam produced from biomass for the Dow industrial units in Brazil, the verticalization of the production chain of biomass as fuel for power generation. Investments include the planting of 227,800 tons / year of eucalyptus in an area of 9700 hectares [24,000 acres] required to meet expected generation.

Source: BNDES aprova R\$ 210 mi para cogeração de energia a partir do cavaco de eucalipto, BNDES press release, July 2, 2012

BNDES and feedstock reliability

“The choice of eucalyptus at the expense of other sources of biomass such as pine and sugar cane bagasse, focuses on security in supply. Eucalyptus has a history of cultivation of more than 90 years and is planted in the northern coast of Bahia since the 70's, there are now over 130,000 hectares of forests in the region. Currently, these forests are among the most productive of Brazil. Unlike other biomass, eucalyptus can be harvested year-round.”

(Source: BNDES aprova R\$ 210 mi para cogeração de energia a partir do cavaco de eucalipto, BNDES press release, July 2, 2012)

BNDES has supported development of the entire eucalyptus value chain

“....Brazil’s great merit was to have developed its eucalyptus pulp processes, and BNDES proved to be crucial in this field. Nobody in the world—not even here –believed that good quality paper could be made from eucalyptus, since the fiber is short and the wood hard. Pulp was traditionally made from a variety of pine trees with longer fibers and softer woods, and Suzano, in fact, was the first to produce pulp from eucalyptus at an industrial scale. Initially, it was thought that eucalyptus could be useful for mixing with better quality pine tree fibers—at most. But then we went on to develop the technology to make very good quality paper from 100% eucalyptus pulp. “Most of the machinery used for this task was improved over the years, and the work was financed directly by BNDES.””

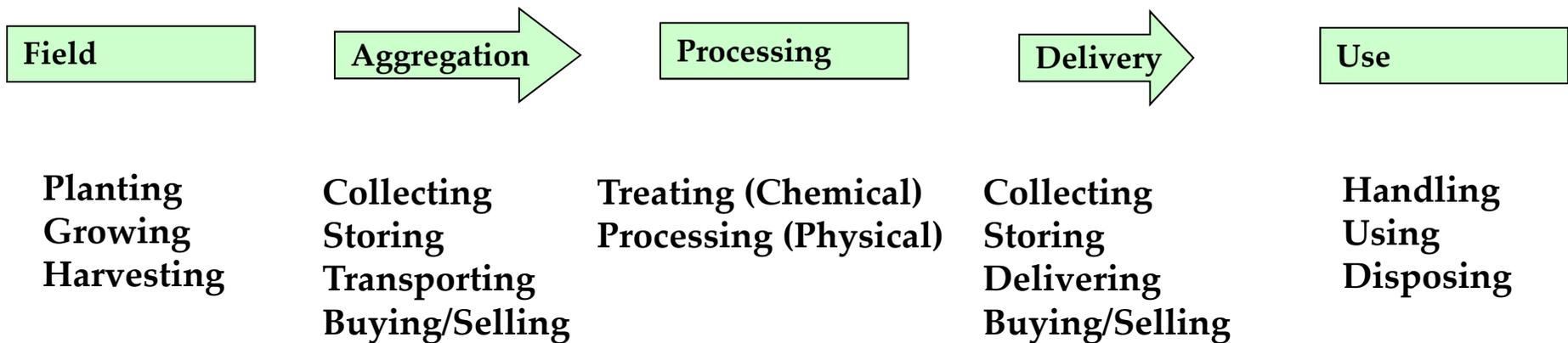
Quote from Boris Tabacof, Entrepreneur, President of the Brazilian Pulp and Paper Association, and Chairman of the Board of Cia. Suzano (BNDES website).

What are some of the lessons from recent developments in Brazil?

- » Continuous and consistent supply of feedstock: eucalyptus can be harvested year-round. Not a food-crop (no fuel vs food).
- » Verticalization of the production chain: planting of eucalyptus was an integral part of the project (increasing self-reliance); reducing price volatility.
- » Feedstock proximity: Eucalyptus was used instead of bagasse, because it is plentiful in the region (Bahia). Lower transportation costs.
- » Government support: BNDES.

Final consideration: Complexity

The biomass supply chain is complex



Final Consideration: Don't Forget Execution

- » Because success will ultimately be based on what happens “on the ground” in country and biomass projects are so complex, full attention must be focused on execution.
- » The biomass value chain can require:
 - Land acquisition
 - Feedstock growing
 - Feedstock harvesting
 - Feedstock aggregating
 - Feedstock storing
 - Feedstock transporting
 - Equipment acquisition
 - Labor recruiting
 - Facility permitting
 - Facility design
 - Facility engineering
 - Facility construction
 - Facility operation
 - Labor management
 - Product transportation
 - Product certification
 - Customer sales
 - Customer billing

Key CONTACTS



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