

Clean Technology  
Industrial Biotech

## Clean Technology

### BIO Conference Highlights Innovation, Opportunities, and Uncertainty

#### Investment Summary

We believe secular trends in favor of cleaner materials and processes could support a range of innovations supporting biofuels, biochemicals, and biobased materials. After a lull in 2H07-1H08, we expect newsflow in the industrial biotechnology sector to pick up in 2H08-2009.

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#### Event

At BIO's industrial biotechnology conference last week, Metabolix, Verenium, and several of their peers highlighted the progress being made in the areas of biobased chemicals, specialty enzymes, and cellulosic ethanol.

#### Key Points

- **Metabolix (MBLX, \$10.62, Hold):** 1) We do not expect the delay in the Telles facility until mid-2009 to impact the pace of signing contracts with potential customers; 2) we would view average selling prices north of \$2.25/lb as incrementally positive--and probably achievable given anecdotal reports that Tianan Biologic Material was selling small quantities of PHBs for \$2/lb last fall, prior to the recent commodity run-up; 3) progress on crop-based PHA production continues as expected, with a study due to be published this summer; and 4) potential near-term catalysts include first customer contracts this summer, progress with the oil seed platform, and potentially additional partnerships. We continue to view Metabolix as a bellwether for the sector, with an attractive entry point later this year once pricing dynamics in the PHA market become clearer.
- **Verenium (VRNM, \$2.94, Hold):** 1) We expect the upcoming earnings call to focus on Verenium's estimates for process economics, which currently imply a theoretical \$0.45/gal cost advantage vs. corn ethanol--excluding the \$1.01/gallon production credit proposed as part of the current Farm Bill; 2) progress with the specialty enzyme business, where we expect Fuelzyme and Phyzyme to do well; 3) initial wins for Purifine, where anecdotally potential customers are seeing 9-12 month potential payback periods on the necessary retrofits; and 4) other potential catalysts besides Q2 earnings include the potential completion of the Farm Bill this quarter with the cellulosic credit intact, results from the initial feedstock field trials, updated process economics from the demonstration plant at Jennings in Q3, and progress assembling the necessary partners for the Gen. 1 cellulosic ethanol plants in 2H08. While we remain cautious on Verenium near-term, we believe the company's head-start establishing a demonstration plant with confirmed process economics should position it well for 2009-2010.
- **Other key takeaways:** 1) more innovation in processes, including processes that can convert biomass direct into hydrocarbons; 2) compelling opportunities in biofuels, bio-based chemicals, feedstocks, and enabling technologies for companies with sustainable competitive advantages; and 3) increased uncertainty vs. last year over the consistency of government policy and the willingness of lenders to finance commercial-scale projects using innovative supply chains.

At BIO's World Congress on Industrial Biotechnology & Bioprocessing conference in Chicago last week, Metabolix, Verenium, and several of their peers highlighted the progress being made in the areas of biobased chemicals, specialty enzymes, and cellulosic ethanol. Attendance was approximately 1,200, up from 350 five years ago. Key points follow:

**Metabolix** (MBLX, \$10.62, Hold): In the near-term, we believe the delay in the Telles facility until mid-2009, flagged by ADM (ADM, \$43.94, NC) last Tuesday, can be partly offset by Metabolix sticking with its prior targets for signing new customer contracts. We expect Metabolix to announce initial contracts this summer. We would view an average selling price north of \$2.25/lb as incrementally positive (management targets \$2.50/lb on average). We note that our estimate for Metabolix's cost of production, after adjusting for higher sucrose prices, remains around \$1.80-\$2.00/lb, which compares favorably with the public reports of Chinese sources of supply (\$2/lb or above, only in quantities of less than 50 tons, and unadjusted for the run-up in commodity and capex costs over the past few months). Separately, presentations on plant-based PHA generation were positive, in our view, highlighting ways to enhance PHA yields (e.g. appropriate light variations can more than double the yield from constant light environments). A study highlighting the yields achieved to date, averaging 1.8%-2.0% in some strains, should be published this summer in Plant Biotechnology. Finally, we expect the final reporting structure for the Telles JV to be set by ADM's structural requirements.

**Verenium** (VRNM, \$2.94, Hold): Verenium recently provided significantly greater granularity on how it views the likely trajectory for cellulosic ethanol economics using its current and expected processes. We expect these process economics to be a key issue on Verenium's upcoming conference call. Importantly, Verenium expects its Generation 1 facilities to have an all-in cost of \$1.89/gallon, well below recent corn economics of \$2.35/gallon, based on \$0.44/gallon feedstock costs, \$0.64/gallon variable costs, \$0.26/gallon fixed costs and SG&A, and \$0.55/gallon for debt service (assuming a 9% cost-of-debt). In effect, Verenium's base case forecast for a Generation 1 project currently implies a 13% target IRR without the RFS mandate, or 37% with the mandate--excluding the \$1.01/gallon production credit that could be part of the current Farm Bill. Separately, elevated crop prices have led to attractive payback periods for Purifine (9-12 months), suggesting that projects to validate the technology could be announced shortly.

**DuPont** (DD, \$49.86, NC): DuPont's presentation focused on its 100m lb/year bio-PDO project with Tate & Lyle. DuPont estimates that using a biological route to produce 1,3-propanediol reduced its manufacturing cost 25%, and both its capital costs and environmental footprint by 50%. DuPont appears to have run into less customer resistance than anticipated, and overall the company appears pleasantly surprised by the pace of new product development. Importantly, the company remains confident that butanol will be recognized as an "advanced fuel" under the 2007 RFS mandate.

#### Cellulosic ethanol:

- 1) Several speakers highlighted the difficulty involved in cellulosic ethanol enzyme cocktails (more than 200 different enzymes involved in reducing biomass);
- 2) For the most part, speakers assumed the existing RFS mandate (implying more than 20bn gal/year of cellulosic ethanol by 2022) remains intact, but several pointed to areas of ambiguity (e.g. what metric would be used to ascertain a "20% reduction in GHG gases" as part of the mandate?);
- 3) Logistics appears to be emerging as the key bottleneck for process economics, with several companies citing targets of 10 t of feedstock/acre around a plant as a requirement to make the collection economics work (e.g. shifting from 6 t/acre to 12 t/acre reduces collection costs by roughly 40%). For the most part, companies expect to avoid tying up capital in the trucks, etc. required to collect material and manage logistics--which may prove too optimistic, in our view, at least for the initial projects.
- 4) Several new technologies were discussed, included a combination pyrolysis/fermentation process that feeds the organisms syngas (demo plant starts up April 2009) and one that used a catalytic process to convert C5 and C6 sugars into hydrocarbons, including aromatics, rather than ethanol.
- 5) Compared to prior years, we noticed more companies discussing process metrics such as total mass balance conversion, \$/BTU in vs. \$/BTU out, and % of solar energy captured in the final project, as opposed to highlighting yields at one particular step along the way. With more pilot and demonstration facilities coming onstream over the next 18-24 months, we expect companies to focus more on relative process economics than narrow technical achievements. In particular, we expect the industry to converge on metrics that quantify the value proposition for end customers, including all-in costs of production and sensitivities to feedstock volatility, as companies stake out their positions on the relative cost curve.

**Forestry:** Unlike prior conferences, this conference was marked by a significant presence of companies speaking directly to the potential to use forests, rather than dedicated energy crops, as cellulosic feedstocks. Newpage, for example, argued strongly that new technologies need to be significantly derisked (e.g. relying on one "never been done" step, but not two), scalable (to benefit from the skills developed on an initial demo plant), and with a sustainable

relationship to feedstock suppliers (can one secure five-year supply agreements in an industry marked by decades of quarterly contracts?). Our overall impression was that for forestry companies the value-added from industrial biotechnology would come from ways the sector can deliver "more wood, less land", whether through improvements in rotation cycles, timber value (i.e. timber quality & processability), and yields, as well as ways the sector can help the pulp & paper companies protect their core franchises while reducing hydrocarbon risk.

**Bridging the financing gap:** While for the most part the conference discussions focused on the secular themes of improving agricultural productivity, shifting fuel and chemical supplies to sustainable sources, and reducing environmental impacts, a recurring theme concerned how the industry can bridge the funding gap from pilot facilities and demonstration plants to full commercial-scale projects, particularly if Congress signals that federal policy could become more volatile going forward. For example, while the clarity associated with a carbon tax might facilitate financing, the consensus appears to be that some form of cap-and-trade could arrive next year (in line with our view), which would provide less visibility for potential lenders.

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Jefferies makes a market in Metabolix, Inc.

Jefferies makes a market in Verenum Corporation.

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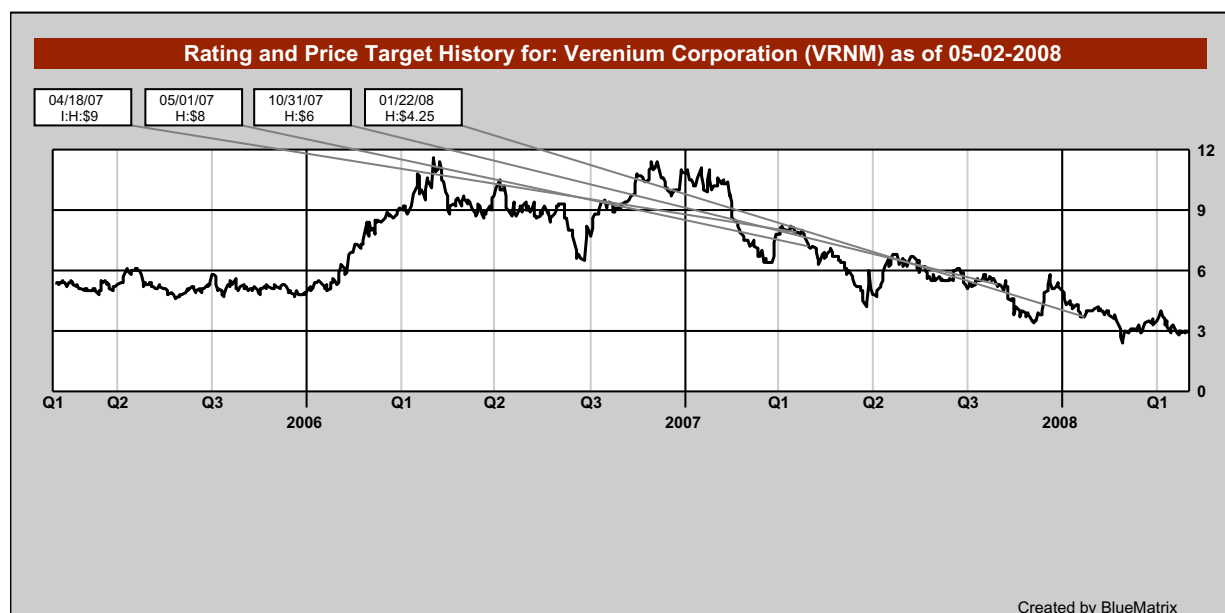
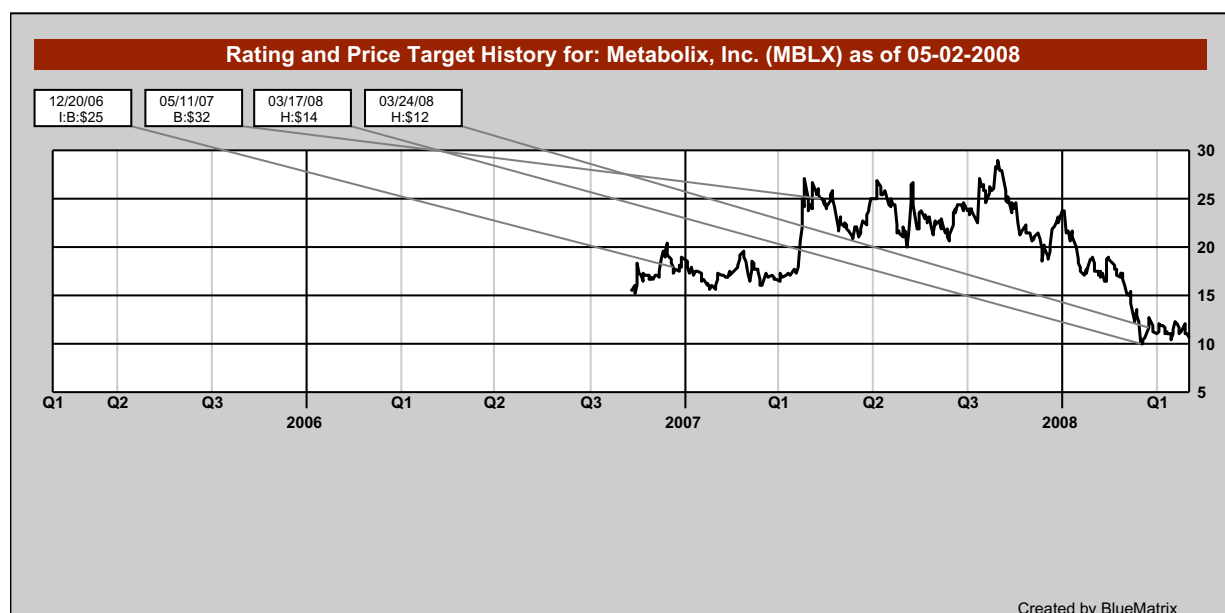
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