CBP-CT: an R&D-driven innovation with potential for disruptive reductions in the cost of cellulosic biofuels

U.S. DEPARTMENT OF ENERGY | Office of Science

Background

- Cost data compiled for the six "pioneer" semi-commercial cellulosic ethanol plants around the world suggest an annualized capital cost exceeding ethanol selling price even when oil was $100 per barrel.
- New upstream (conversion of lignocellulose to fermentable carbohydrate) and downstream (conversion of fermentable carbohydrate to fuels) approaches are needed to improve economics.

Approach

- A new processing paradigm is proposed involving consolidated bioprocessing using thermophilic bacteria combined with co-treatment (i.e., milling during fermentation), or CBP-CT.
- Techno-economic analysis was carried out by a team from Dartmouth, NREL, UCR, and Argonne National Laboratory for corn stover conversion to ethanol via CBP-CT assuming research success, and compared to current technology and two intermediate scenarios.

Outcome

Compared to current technology, the CBT-CT scenario was projected to offer 4.6-fold greater annual revenue (Figure 1), as well as 8-fold shorter payback period, and feasibility at ~10-fold smaller scale (Figure 2).

Significance

- CBT-CT is a potentially disruptive technology and a powerful, though still speculative, example of the potential benefits of including new-paradigm as well as in-paradigm innovation in R&D portfolios.
- Cellulosic ethanol is an important point-of-entry and proving ground for new technologies and co-products.

Figure 1. Operating cost and revenue comparison.

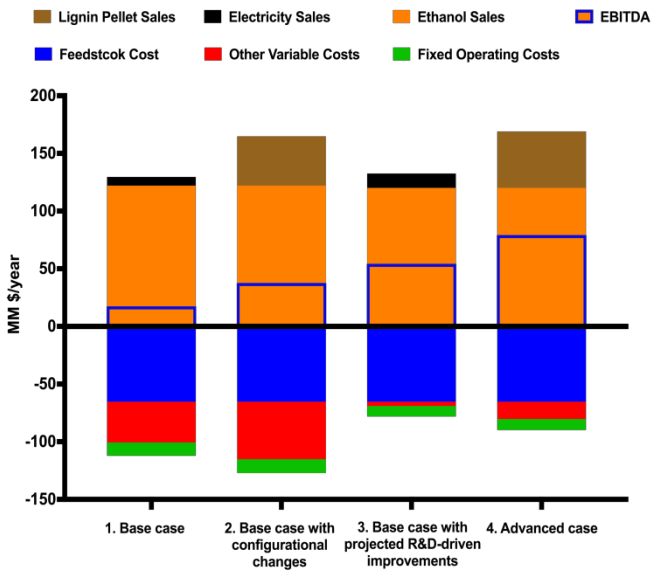
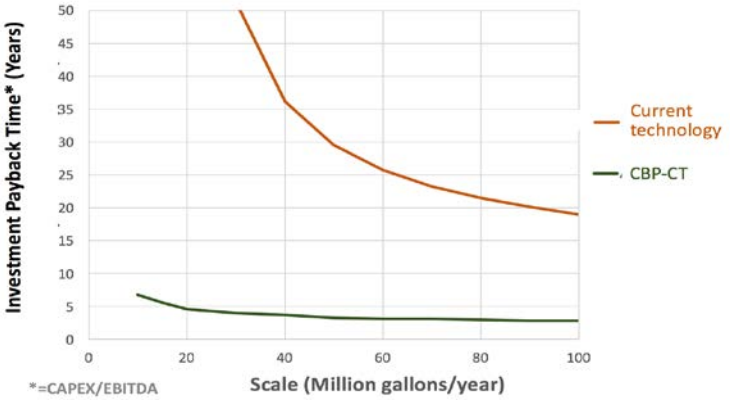


Figure 2. Payback period comparison.



BESC BioEnergy Science Center

Lynd, L.R., X. Liang, M. Biddy, A. Allee, T. Foust, C. Hao, Himmel, M.E., M. Laser, M. Wang, C.E. Wyman. "Cellulosic Ethanol: Status and Innovation," *Curr. Opin. Biotechnol*. (in press)