Commercialization of Cellulosic Ethanol Facilities: A Financial Perspective
By Roy Torkelson*

The US Department of Energy expends significant amounts of government money conducting extensive research into biomass technologies in cost sharing arrangements with private sector industries and at National Laboratories. A high level of frustration has been mounting over the inability to deploy proven research and development biomass technologies into the commercial markets.

Among the non-technical barriers to successful deployment is the financial marketplace, which has great difficulty in accepting the real or perceived risks of commercializing a new technology. Financial barriers may in fact be the most challenging of the non-technical barriers to address. Although capital is critical to accomplishing the R&D for a biomass technology, those costs are miniscule compared to the financial requirements for testing and construction.

Figure 1 was prepared by the Office of Biomass Program (OBP) in the U.S. Department of Energy (DOE) to illustrate the increasing financial burdens that confront a project developer in deploying a new biomass technology.

OBP expanded its efforts to address the deployment problem by bringing together a number of finance, policy and industry experts

* Roy Torkelson is an independent contractor to JP Morgan.
to discuss the barriers from their points of reference and also to suggest ways to improve deployment success. The following represents the collective thinking of the group regarding the financial barriers facing developers of new technologies.

Financially, the most critical stages of the deployment process are pilot-testing, and building and operating commercially viable demonstrations. At the pilot-testing stage developers typically try to validate the technology. However, at the demonstration stage the developer wants to prove technology feasibility and profitability in a realistic setting. Ideally, the demonstration should indicate that the technology could cover its capital costs and provide a moderate margin of return on investment. However, during these stages capital requirements are high while investment is relatively low. Typically when constructing a commercially viable demonstration, capital costs are uncertain and contingency funds need to be available because the technology is not proven. At this stage investors are skeptical of the technology’s market viability because it has yet to be proven. In addition, investors typically prefer a multitude of tests to ensure that the given technology will work under a variety of circumstances. Therefore, the ability of developers to progress from the R&D stage to commercialization is difficult, and thus the group recommended that DOE could serve a critical role in these stages.

If the DOE were to help finance and oversee a limited number (2-5) of similar projects from pilot-scale tests through commercially viable demonstrations through their program budget, developers could more quickly attain private capital and begin deployment. The pilot and demonstration scale plants must emulate the entire process being considered for a facility. They must also be able to be measured both in terms of technical efficiencies and economic viability. The most efficient and cost effective way of demonstrating the new technology would be by collocating on the grounds of an existing refinery for ethanol offtake or other ethanol production facilities rather than at a greenfield site. This would allow utilities and other common operations to be leveraged. It can also have an immediate positive effect on the existing plant’s bottom line. Furthermore, with its understanding of investor expectations, DOE could ensure that
entrepreneurs have the right people involved in developing test protocols to validate their technologies. Therefore, testing will be conducted in line with contractor and investor expectations of the technology's functionality, thereby reducing time and costs. Through the OBP budget, DOE could financially assist developers in this stage of the deployment process, helping them to overcome a major hurdle.
Once a commercially viable demonstration facility is proven to work, the next stage is to embark on the deployment of the first commercially viable plant. This is the stage at which developers need to secure an investment-grade EPC (Engineering, Procurement and Construction) contractor, finance engineering and construction (assuming non-recourse financing), finalize input and offtake contracts for the life of the facility debt, and have secured appropriate equity commitments from investors. It is the point at which capital demands are typically highest because investors still see high construction risk even for a demonstration-proven technology that is now being scaled up. By the construction stage, financing needs to be secured through an investor or private bank.

A modified loan guarantee program run by DOE to cover the construction period and the early years of operation was discussed among the experts and deemed to be ineffective unless it met certain criteria. First, any loan guarantee program must be limited to a finite period of time that will only provide guarantees during the project’s riskiest periods. This time period must be set prior to the distribution of the loan. The loan guarantee must be gradually reduced and expire prior to the loan’s payoff. In addition, the loan guarantee should be contingent on the review and approval of a team of independent engineers and financial consultants. The purpose of the review is to assess the technology and business plan to ensure that the loan will in fact help guarantee the successful and profitable launch of the technology. Furthermore, financial information needs to be reviewed to ensure that the project’s cost has not been escalated solely to reduce entrepreneurial risk. The loan should account for only the construction and startup costs of the technology in accordance with good engineering practices. The objective of the loan guarantee should be to ensure the technology meets its performance criteria. Ultimately, the loan should cover approximately the first one to two years of the technology’s deployment, following successful attainment of the performance guarantees, and should then gradually decrease in its coverage ratio over time. It is anticipated that the coverage ratios would shrink to zero at sometime between five and ten years following the passage of the performance criteria.
Another feasible solution would be for DOE to create a last resort risk mitigation pool for biomass technology developers, looking to other successful Federal programs, like the Transportation Infrastructure and Innovation Act (TIFIA), as a model. This would allow DOE to provide incremental financial guarantees during the commissioning and performance acceptance stages of the project through the first year of operation, thereby enabling developers to raise the necessary capital to proceed with development of their new biomass technology. This program could only be accessed when all other remedies have been exhausted and when the corrective action will result in a successful commercial launch. It was felt that a risk mitigation pool coupled with a successful demonstration project would be adequate to ensure successful deployment of the technology. However, a risk mitigation pool can also be used with a loan guarantee program to further accelerate technological deployment.

DOE would assess the level of severity of a given deployment barrier, assess the worthiness of the recipient, and issue financing. The developer would be required to pay a fee for the insurance guarantee including repayment of any draw on that insurance policy by a given period of time (typically following deployment). The money from the insurance premiums would be recycled back into the insurance program. Developers who apply to access the insurance program would first have to be approved by a team of independent engineers who determine whether the technical problem was unavoidable and then outline a cost estimate. Assistance would only be provided after a solution has been identified and reviewed by independent engineers.

Due to the considerable time, money and effort already invested in most of these projects, it is in the best interest of all parties (entrepreneurs, investors, contractors, markets, etc.) to overcome these hurdles and deploy these technologies. These suggested federal insurance guarantees should allow developers to successfully deploy their product and begin realizing revenue streams that not only support operations, pay debt service but also provide solid equity returns to their investors.
The recommendations in this document outline some logical steps to facilitating biomass technology deployment. Although DOE invested $93.9 M in biomass technology R&D in 2004, it is the fundamental objective of OBP to see that these technologies are ultimately deployed and “directly contribute to the creation of a new bioindustry to help reduce U.S. dependence on foreign oil by supplementing the use of petroleum for fuels and chemicals.” Research and development issues have traditionally been the primary focus of DOE assistance and funding. However, it is clear that focusing on R&D alone will not lead to successful deployment.

The need to diversify the U.S. energy portfolio and to create a bioindustry as a means to this end is the reason these financial barriers must be addressed. Biomass clearly represents a viable option for displacing U.S. petroleum reliance, and these recommendations could be the next steps to ensuring its successful integration into the U.S. energy market.

**Note:** The information contained in this paper was derived from a white paper which was developed by members of USDOE’s Office of Biomass Program and outside professionals, including the author, with expertise in project finance.