NABC National Advanced Biofuels Consortium
Biofuels for Advancing America
Developing cost-competitive, sustainable biofuels for today's transportation infrastructure.

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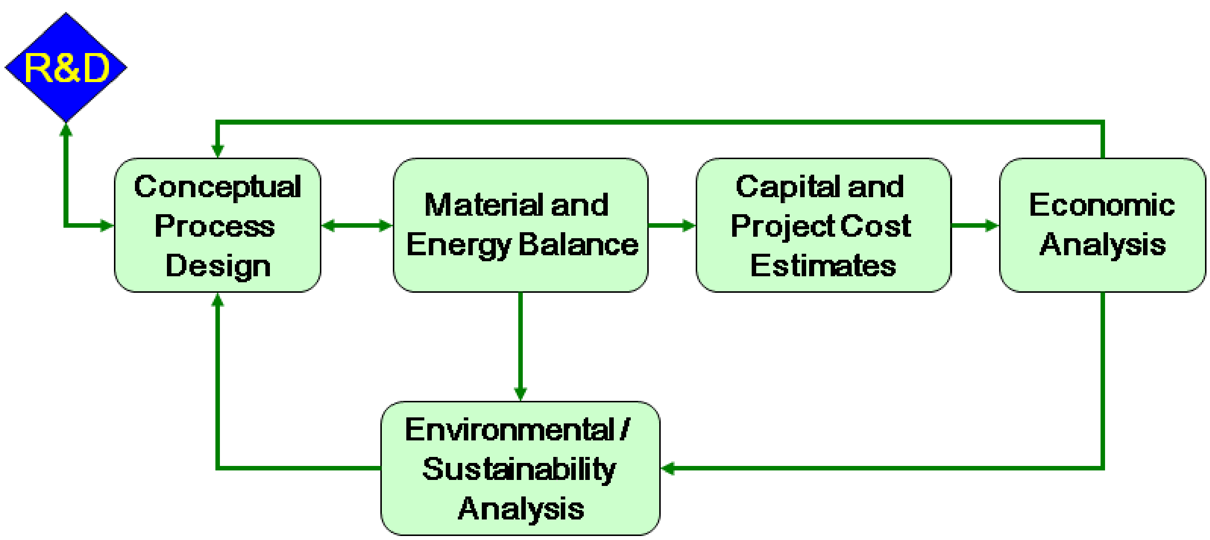
Techno-Economic Analysis: Evaluating the Economic Viability and Potential of the NABC Process Strategies

Stage I of the National Advanced Biofuels Consortium (NABC) entails down-selecting the six process strategies to the most promising near-term biofuel production opportunities. Seven key criteria have been identified for the Stage I down-select, with one of the criteria focused on the variable operating and capital costs of the processes. The techno-economic analysis (TEA) team, led by the National Renewable Energy Laboratory (NREL), will play an important role in the Stage I down-select by evaluating and assessing the current economic viability, as well as the long-term potential for economic viability, of each process strategy.



Flow diagram of NABC techno-economic analysis methodologies

TEA combines process modeling and engineering design with economic evaluation to qualitatively understand the impact that technology and research breakthroughs have on the financial viability of a conversion strategy. The methodologies of the TEAs performed in the NABC are outlined in the above figure. Feedstock composition, processing conditions and parameters, and reactor conversion and yields are all fed into our developed Aspen Plus process models. From the results of the material and energy balance calculations performed in Aspen Plus, the TEA team then estimates the required capital equipment, and the capital and operating costs are calculated based on material flowrates and the required processing conditions.

The importance of the collaborations within the NABC is highlighted in the TEA efforts. The feedstock compositions and costs were provided to the TEA team by the NABC feedstock providers, Catchlight Energy LLC and Iowa State University, and results from experimental analysis on pretreated biomass were provided by NREL. Operating conditions and conversion yields were based on input from the current experimental and pilot scale process results from each process strategy partner. Capital costs were developed using vendor quotes when available, engineering cost estimation software, information provided by the process strategy partners, and literature values. Variable costs were based on data from the literature and public pricing information, as well as input from the NABC collaborators.

In Stage I the primary focus will be on estimating the major capital equipment costs and the yearly operating costs for process inputs. Costs will be reported as a range of values for this preliminary analysis estimate. The impact of uncertainties in key design parameters on the calculated costs will be examined using sensitivity studies. In Stage II, a more detailed process design and economic evaluation will be undertaken, with the final deliverable for the TEA effort being a full design report. This analysis will estimate a minimum fuel selling price for the designed process using a discounted cash flow methodology with a set internal rate of return and other financial assumptions consistent with standard NREL economic analysis.

Development of process models and the economic analysis is ongoing, and the NREL TEA team is working closely with the process strategy teams to build accurate models. PNNL has converted their existing process models into the Aspen Plus software and is providing them along with cost estimations. Modeling teams at Amyris and Virent have collaborated extensively with the NREL TEA team, sharing experience gained in developing their internal models and cost estimations. Both UOP and RTI are currently involved in developing process designs and are lending their design expertise and know-how to create these first of a kind process configurations. BP and Tesoro actively give feedback on refinery integration needs and share their insights around design assumptions for hydrocarbon production facilities.

Results from each of the process strategy models will be supplied to Argonne National Laboratory for their detailed life cycle analysis assessments.