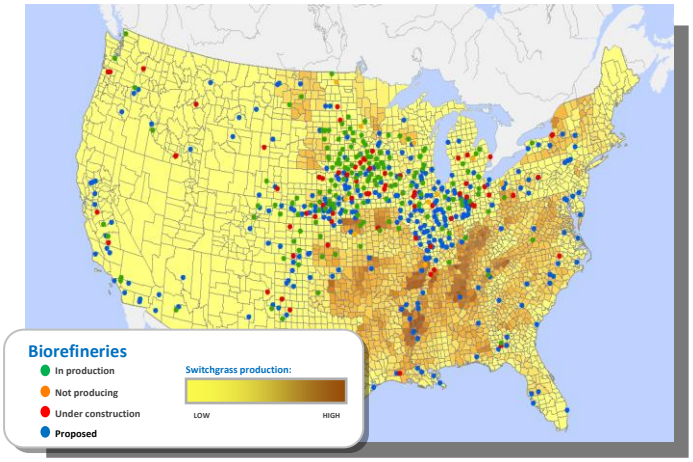
OAK RIDGE NATIONAL LABORATORY
MANAGED BY UT-BATTELLE FOR THE DEPARTMENT OF ENERGY
FACT SHEET

Biofuel Supply Chain Infrastructure

Optimizing the Evolution of Cellulosic Biofuel

The Infrastructure Challenge of Moving to Cellulosic Ethanol

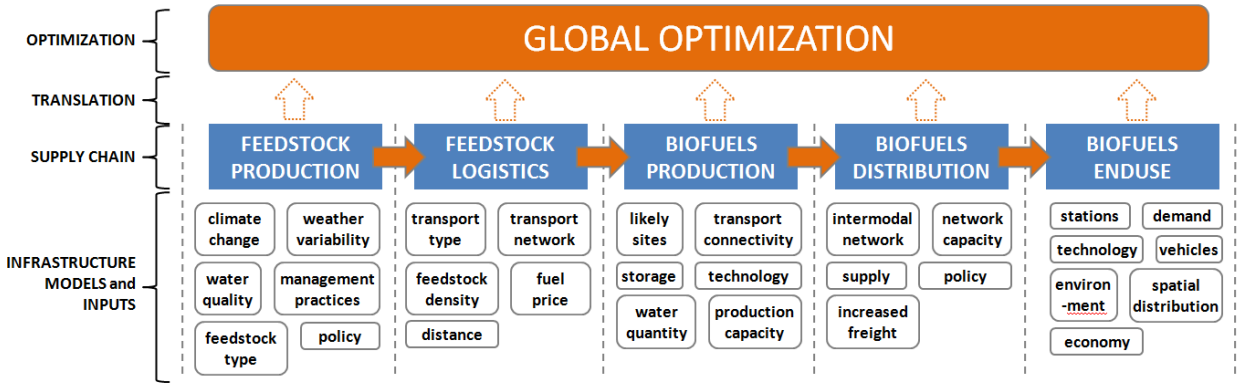
The rapid growth of the corn-based ethanol industry leveraged the long-established corn processing infrastructure. Cellulosic-based advanced biofuel has a target of 21 billion gallons by 2022 and requires almost all new infrastructure for a new commodity concentrated in a different region. The transition requires not only advances in agricultural engineering and chemistry, but also in modeling and optimization. Combining the best logistic and production options for an economically viable supply chain while considering the geographic and transportation limitations requires new tools and fundamental new approaches.



Cellulosic biomass relocates the demand for infrastructure.

Modeling the Supply Chain

Leveraging expertise across the laboratory, ORNL developed a prototype optimization model, capable of simultaneously specifying infrastructure for the entire supply chain, including selection of biomass, transport, location and capacity for preprocessing and refinery facilities and distribution. Current approaches must significantly reduce data resolution to examine an entire supply chain, compromising the critical processes that drive each infrastructure component and ignoring realistic demand predictions and transportation architecture. Results from detailed models and studies will provide the inputs for the supply chain options and constraints.



The supply chain is modeled through a mixed integer linear program, a technique ideally suited for problems with multiple complex and contradictory objectives and constraints including the economic collaboration between entities. The MILP approach can be effectively parallelized for high performance computing, allowing the global optimization model to solve difficult problems and scale up for nationwide analyses. The model is being integrated into a national economic model of biofuel sustainability.

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