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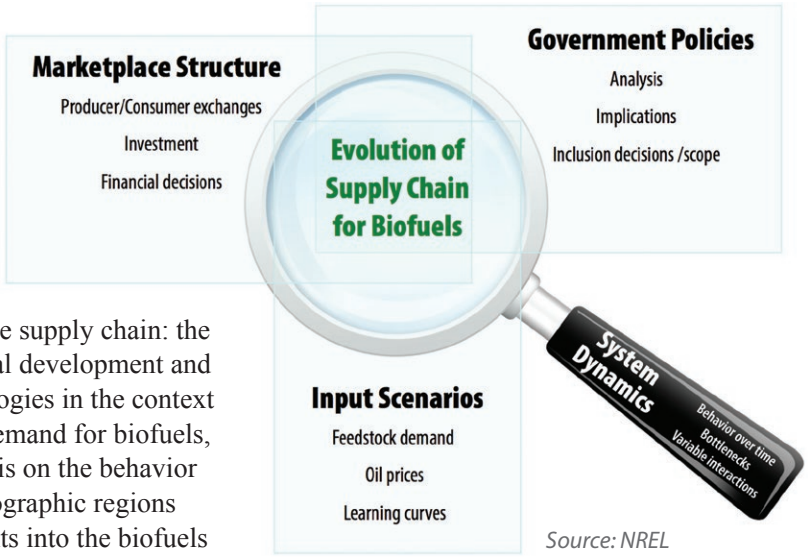
# Biomass Scenario Model



Source: NREL

The Biomass Scenario Model (BSM) is a unique, carefully validated, state-of-the-art dynamic model of the domestic biofuels supply chain that explicitly focuses on policy issues, their feasibility, and their potential side effects. It integrates resource availability, physical/technological/economic constraints, behavior, and policy. The model uses a system dynamics simulation (not optimization) to model dynamic interactions across the supply chain: the BSM tracks the deployment of biofuels given technological development and the reaction of the investment community to those technologies in the context of land availability, the competing oil market, consumer demand for biofuels, and government policies over time. It has a strong emphasis on the behavior and decision making of various agents and resolves 10 geographic regions domestically. The BSM is currently used to develop insights into the biofuels industry growth and market penetration, particularly with respect to policies and incentives (volumetric, capital, operating subsidies; carbon caps/taxes; R&D investment; loan guarantees; tax credits) applicable to each supply-chain element. It is suitable for coupling to vehicle-choice, agricultural, oil-industry, and general economic models.

## Questions the BSM Can Help Answer

1. What points of leverage exist for accelerating the adoption of biofuels?
2. How do particular policies and incentives rank in terms of their effectiveness?
3. What supply-chain bottlenecks slow the growth of high-blend ethanol consumption?
4. How do tipping-point dynamics affect the dominance of particular biofuels pathways?
5. What opportunities exist for coordinating incentives and policies across the supply chain?
6. How naturally inclined is the biofuels supply chain to develop toward meeting targets such as the Renewable Fuel Standard Program (RFS2) volume requirements and percentage standards?
7. How does the achievement of U.S. Department of Energy Bioenergy Technologies Office (BETO) targets through R&D efforts affect the overall success of biofuels?
8. How substantially do BETO demonstration and market transformation investments foster the growth of particular biomass-to-biofuel conversion pathways?
9. What might happen if the RSF2 or its implementation is changed significantly?

## Selected Policy Inputs to the BSM

- Feedstock supply and logistics
- Subsidies
- U.S. Department of Agriculture Biomass Crop Assistance Program
- Biofuels production
- R&D investment
- Production credits
- Capital cost share
- Loan guarantees
- Tax reduction
- "Downstream" of production
- Carbon cap or tax
- Renewable fuel standard (RFS)
- Distribution infrastructure investment incentives
- Dispensing station infrastructure investment incentives
- Fuel taxes and/or subsidies
- Vehicle purchase incentives
- Tariffs

| | Requirements | Review | Project Management | Domain Expertise | Model Development | Data Processing | Analysis |
|---|---|---|---|---|---|---|---|
| DOE BETO | X | X | | X | | | |
| NREL | | | X | X | X | X | X |
| Lexidyne LLC | | | | | X | | X |
| Nat'l labs, federal agencies, universities, subcontractors | | X | | X | | | |

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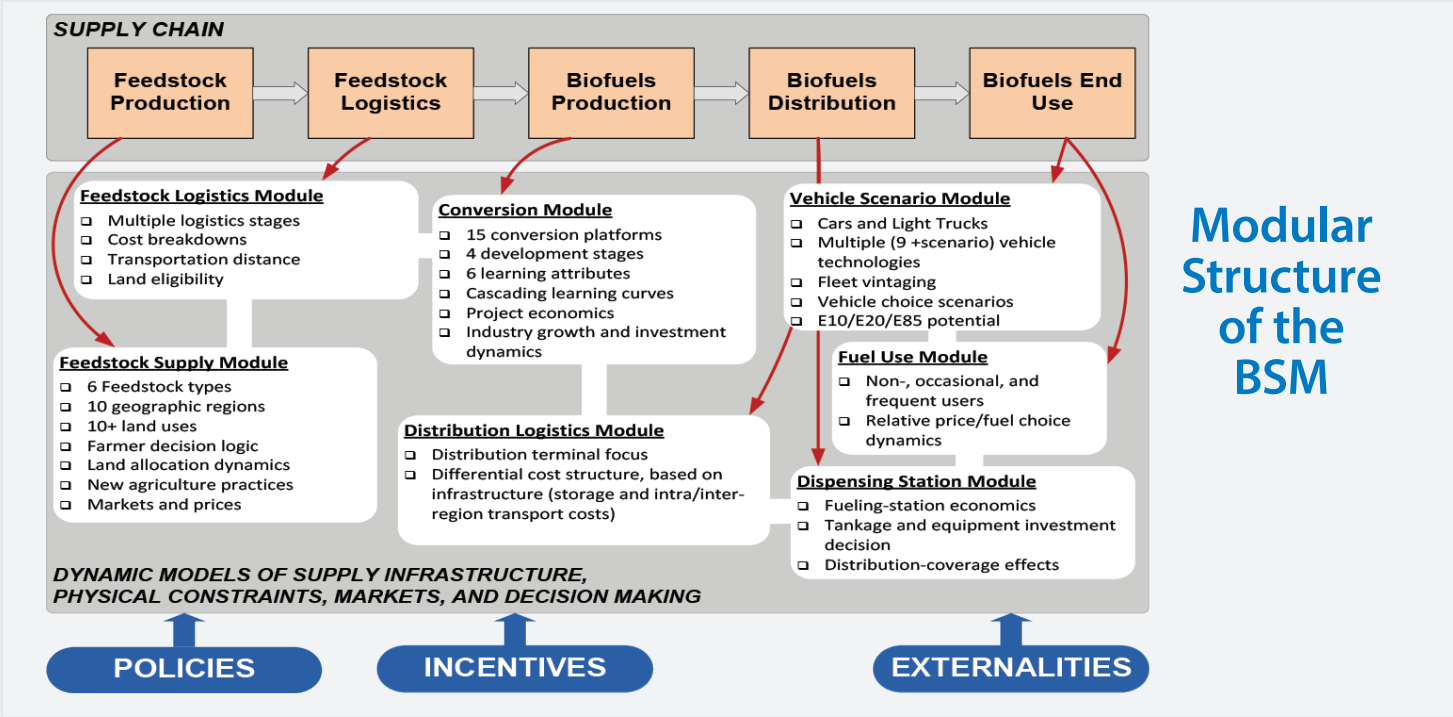


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## Key Insights from Full Supply-Chain Analyses for Biomass-to-Biofuels

**Four keys to industry development:**

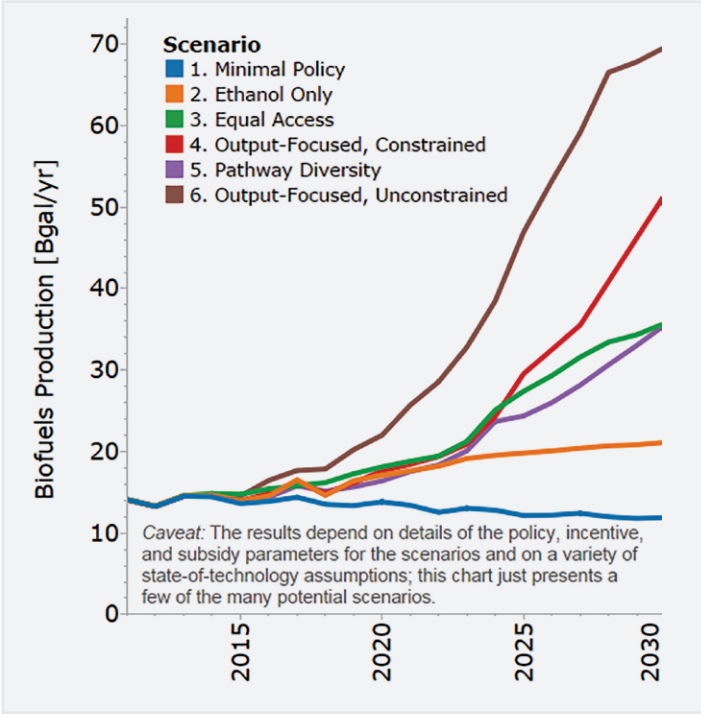
1. Profitability at point of production
2. High rates of industry learning
3. An aggressive start in building pilot, demo, and pioneer-scale plants
4. For ethanol, a high level of infrastructure investment to sustain low enough point-of-use prices

**The "takeoff" is likely to be wild and wooly:**

- Unstable, higher-than-anticipated feedstock prices
- Boom/bust development of production capacity
- Potential for biofuel price instability

**Significant production volumes are feasible:**

- RFS2 targets are achievable in 2030 with heavy start-up subsidies.
- When subsidies are limited to promoting the most economically attractive pathway, production levels can exceed RFS2 levels.
- Technologies with favorable long-term economic cost structures can succeed if subsidies are deliberately designed to overcome initial maturity deficiencies.

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## More Information

For more information on the Biomass Scenario Model, visit www.nrel.gov/analysis/bsm/ or contact bsm@nrel.gov.

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