

ADVANCED DEVELOPMENT AND OPTIMIZATION



PROGRAM AREA



ADVANCED DEVELOPMENT AND OPTIMIZATION OVERVIEW

The Advanced Development and Optimization (ADO) Program develops, tests, and verifies engineering-scale, integrated biorefinery process performance to reduce technology uncertainty and to enable industry-led, subsequent scale-up activities. In addition, ADO develops novel methods to expand end-user acceptance of biofuels and bioproducts and identifies new, robust market opportunities.

ADO conducts integrated systems research by combining technology components, unit operations, or subsystems; testing those under integrated operations; and verifying the integrated process at the engineering scale. Engineering scale refers to production systems that employ new process technologies to produce small volumes of products, learn about the performance of new technologies, and accelerate robust system optimization. Engineering scale, in general, offers the first view into continuous operation at a scale where components or unit operations are assembled and operated together in an integrated environment. Integration at the engineering scales provides data and process capability learning that enable private stakeholders to subsequently scale up process technologies. Engineering-scale verification data are critical to evaluating research-and-development (R&D) techno-economics and sustainability progress.

ADVANCED DEVELOPMENT AND OPTIMIZATION SUPPORT OF OFFICE STRATEGIC GOALS

The strategic goals of the ADO Program Area are to:

- Develop and test bioenergy production technologies through verified proof of performance in engineering-scale systems and relevant environments
- Research ways to enhance scaling and integrate bioenergy production processes
- Identify innovative end uses.

ADVANCED DEVELOPMENT AND OPTIMIZATION SUPPORT OF OFFICE PERFORMANCE GOALS

The performance goals for the ADO Program Area are as follows:

- **By 2022**, verify integrated systems research at the engineering scale for hydrocarbon biofuel technologies that achieve a mature modeled minimum fuel selling price (MFSP) of \$3/gasoline gallon equivalent (GGE) with a minimum 50% reduction in emissions relative to petroleum-derived fuels.
- **By 2030**, verify integrated systems research at the engineering scale for hydrocarbon biofuel technologies that achieve a mature modeled MFSP of \$2.50/GGE with a minimum 50% reduction in emissions relative to petroleum-derived fuels using economically advantaged feedstocks to produce renewable fuels and bioproducts.

ADVANCED DEVELOPMENT AND OPTIMIZATION APPROACH TO OVERCOMING CHALLENGES

The ADO approach to overcoming challenges and barriers generally falls into three broad categories:

1. Technology and program interfaces
2. Systems research and integrated testing
3. Co-optimization of fuels and engines.

The ADO Program Area's approach is based on research, development, and testing through cooperative partnerships with private industry and academia, national laboratories, and other U.S. and international agencies and organizations.

The U.S. Department of Energy (DOE) Bioenergy Technologies Office (BETO) has identified the following technical challenges and barriers to be addressed by ADO to achieve its strategic and performance goals:

- Process integration
- Feedstock supply-chain infrastructure
- First-of-a-kind technology development
- Technology uncertainty of integration and scaling
- Codes, standards, and approval for use
- Codevelopment of fuels and engines
- Coprocessing with petroleum refineries
- Materials compatibility and equipment design and optimization.