



At the Biomass Feedstock National User Facility (BFNUF), Idaho National Laboratory (INL) researchers focus on innovative research and development associated with key technical barriers facing the U.S. bioenergy industry.

Biomass Feedstock National User Facility

Solving feedstock challenges today

Biomass, municipal waste and other domestically available reusable carbon sources can be converted into sustainable fuel, chemicals, products and power. Carbon resources beyond biomass can include the nonrecyclable organic portions of municipal solid wastes such as biosolids, sludges, food waste, plastics, CO₂ and manure slurries. Biomass feedstocks can be produced quickly, usually within one growing season, all without depleting earth's natural resources. Even those non-recyclable waste sources like plastic and CO₂ can have a new life when processed correctly.

At the Biomass Feedstock National User Facility (BFNUF), Idaho National Laboratory (INL) researchers focus on

innovative research and development associated with key technical barriers facing the U.S. bioenergy industry. Researchers collaborate with industry to develop advanced feedstock supply logistics, post-harvest quality management, material handling, preprocessing, scale-up and advanced fractionation and separation technologies to produce conversion-ready feedstocks from woody and herbaceous biomass, wastes and other reusable carbon sources.

The BFNUF Characterization Laboratory is equipped with analytical instruments to develop a fundamental understanding of feedstock variability and critical material and quality attributes to support process development efforts. Such research and

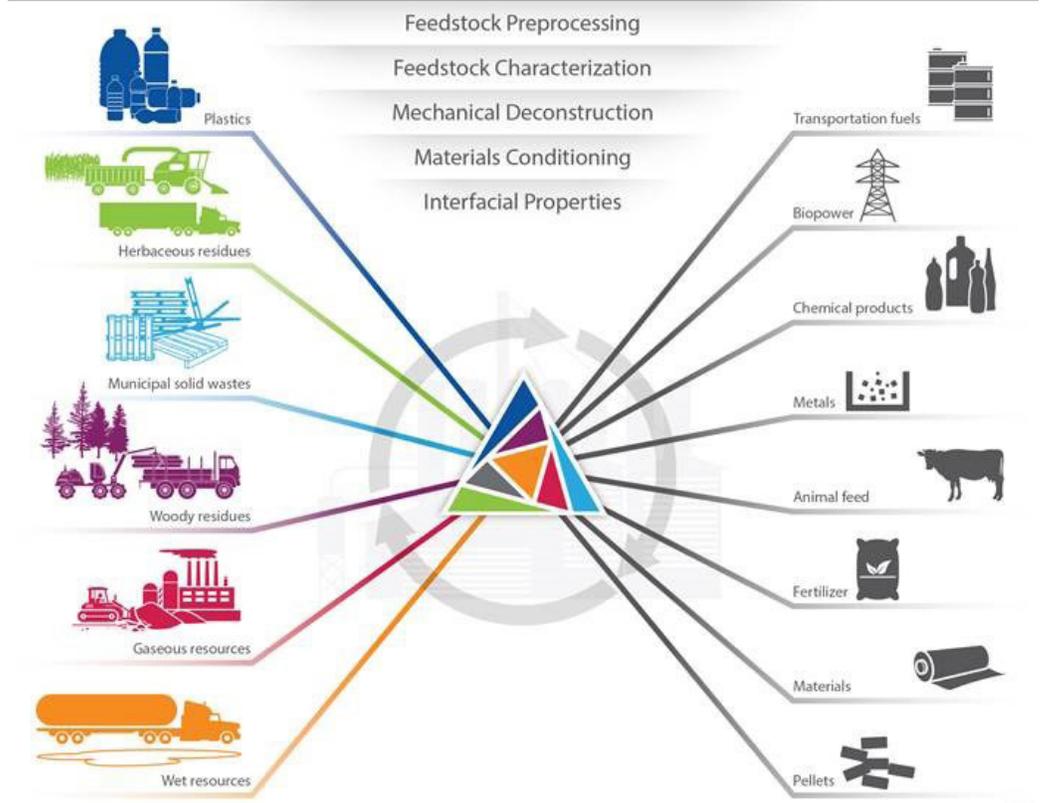
development will help create intellectual property for U.S. companies, enabling them to license these technologies. The BFNUF is one of the most versatile feedstock preprocessing research and development facilities in the world.

WHO DO WE HELP?

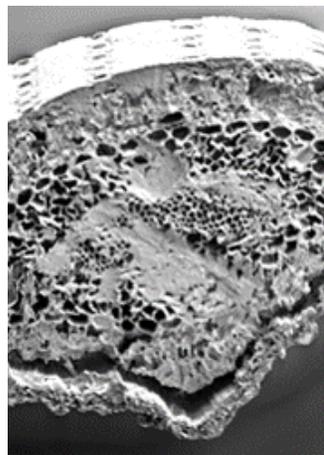
The BFNUF has provided customized, technical research and development to dozens of leading U.S. feedstock, bioenergy and technology companies as well as universities and national laboratories. The BFNUF has processed more than 1,000 tons of raw materials, producing a variety of products from diverse sources ranging from forest and agriculture feeds to municipal solid waste.



Biomass Feedstock National User Facility Centers



The capabilities housed in the BFNUF transform many waste streams into a wide array of valuable products.



Scanning electron microscopy image of a dimethyl ether dried pine needle.

PROCESS DEVELOPMENT UNIT

The biomass feedstock Process Development Unit is the flagship of the BFNUF. The unit's innovative design — modular and reconfigurable — helps bioenergy companies find the best way to convert wastes into feedstocks for their process.

The pilot-scale preprocessing system is located in a 27,000-square-foot high bay at INL's Energy Systems Laboratory. The unit can process and characterize specialty materials in gram quantities and scale up many processes to industrial-grade bales at 1 to 5 tons per hour

using a variety of techniques, including sorting, segregation, feeding, hammer/knife/shear mill size reduction, rotary and solvent drying, pelleting, blending, cubing and multiple packaging options. The unit offers great versatility and addresses a variety of sorting and processing needs.

THE BIOENERGY FEEDSTOCK LIBRARY

The Bioenergy Feedstock Library is a resource available at the BFNUF containing characterized samples used to understand the impact of feedstock type and quality on their unique process. The library is a living archive continuously updated with



Using the fractionation capabilities at the BFNUF, natural sources like corn cobs can be broken down into varying fractions or sizes based on physical size, density or other factors.

new tools and feedstock samples. It is designed to help researchers and industry evaluate feedstock quality characteristics and formulation.

SUPPLY CHAIN DEVELOPMENT

The research team at the BFNUF combines supply and logistics experience with feedstock characterization and modeling to support collaborations in feedstock supply chain development.

The BFNUF Characterization Laboratory analyzes feedstock variability, critical quality attributes and storage performance to aid development of high-quality products. Researchers evaluate the physical properties of material to help determine the most profitable conversion pathway. Physical and chemical material evaluations are entered in the Bioenergy Feedstock Library database

to provide fundamental data on feedstock characteristics for public benefit. BFNUF researchers also conduct feasibility studies, techno-economic assessments, characterization of feedstock resources and supply chain designs to direct products where they need to go.

Our understanding of cost, quality and risk trade-offs helps the industry establish a successful supply chain.

FEEDSTOCK DEVELOPMENT, SCALE UP AND INTEGRATION

The BFNUF is uniquely suited to help develop feedstock quality specifications because of our integrated preprocessing system, the Process Development Unit, and our in-house Characterization Laboratory. Whether preprocessing feedstock to customer's specifications or collaborating to develop

custom specifications, the BFNUF provides a complete suite of services:

- Sourcing common and distinctive feedstocks.
- Identifying critical material and quality attributes and associated critical process parameters.
- Developing physics-based models for flow performance prediction and validation.
- Process development, design, testing and validation.
- Processing feedstocks to specifications.
- Characterizing feedstock characterization data sheets.
- Packaging and shipping for testing.

The capabilities at the BFNUF include simple machinery that has been innovated to meet fractionation needs



These capabilities provide industry collaborators with quality feedstocks along with fundamental knowledge, data and analytical tools for testing and validating their conversion processes. INL researchers' efforts to improve feedstocks extend to a variety of projects:

Biofuels projects: Our sorting, milling, fractionation and drying processes produce high-fidelity feedstocks at ideal specifications for handling reliability conversion and performance for various processes.

Biopower projects: Our pelleting and cubing systems supply quality feedstocks

for test burns, while our pilot-scale torrefaction systems provide biopower producers an effective means to evaluate this option.

Waste-to-energy projects: Our sorting, segregation, milling, pelleting and cubing systems are capable of sorting and separating municipal solid waste and other reusable carbon sources for desired processes. The BFNUF's ability to characterize and inform feedstock specifications allows customers to develop custom feedstocks that improve feed-handling performance, conversion performance and generally inform industry-

relevant preprocessing equipment designs. The BFNUF also offers lab- and pilot-scale testing, validation, scale-up and system integration. For the customer, this means accelerated commercialization and fewer costly delays during commissioning and startup.

*About Idaho National Laboratory
Battelle Energy Alliance manages INL for the U.S. Department of Energy's Office of Nuclear Energy. INL is the nation's center for nuclear energy research and development, and also performs research in each of DOE's strategic goal areas: energy, national security, science and the environment. For more information, visit www.inl.gov. Follow us on social media: [Twitter](#), [Facebook](#), [Instagram](#) and [LinkedIn](#).*

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