OAK RIDGE National Laboratory

DOE Bioenergy Technologies Office (BETO) 2021 Project Peer Review

6.3.0.2 – Bioenergy Knowledge Discovery Framework (KDF)

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Analysis and Sustainability

Aaron Myers

Oak Ridge National Laboratory

ORNL is managed by UT-Battelle, LLC for the US Department of Energy

U.S. DEPARTMENT OF ENERGY

Project Overview

- *Provide access to bioenergy knowledge, data, and tools via a single access point*
- *Build on an open-source, customizable, and scalable infrastructure*
- *Bring bioenergy researchers and stakeholders together*
- *Optimize access to high priority data, models, and information*
  - *Ex. Billion-Ton 2016, Marine Biofuels, Sustainability Standards, Sun Grant Initiative (SGI Data)*

1 – Management

- Team Structure
  - KDF System Development – ORNL
    - Aaron Myers
    - Lee Walker
  - Content Management/Graphics – BETO
  - Media – BETO
- Pre-Release Weekly Meetings
  - KDF Development Team and and Content Teams have weekly teleconference to track progress, discuss direction, and strategize for new capabilities as new capabilities are available for release
- Quarterly Updates
  - BETO Check-Ins: Quarterly conversations with BETO about project status, recent updates and deliverables
  - Reports: KDF Development Team summarizes progress, issues, challenges overcome, and upcoming focus in Quarterly Report
- Collaboration
  - Work with other labs to facilitate new capabilities

2 – Approach

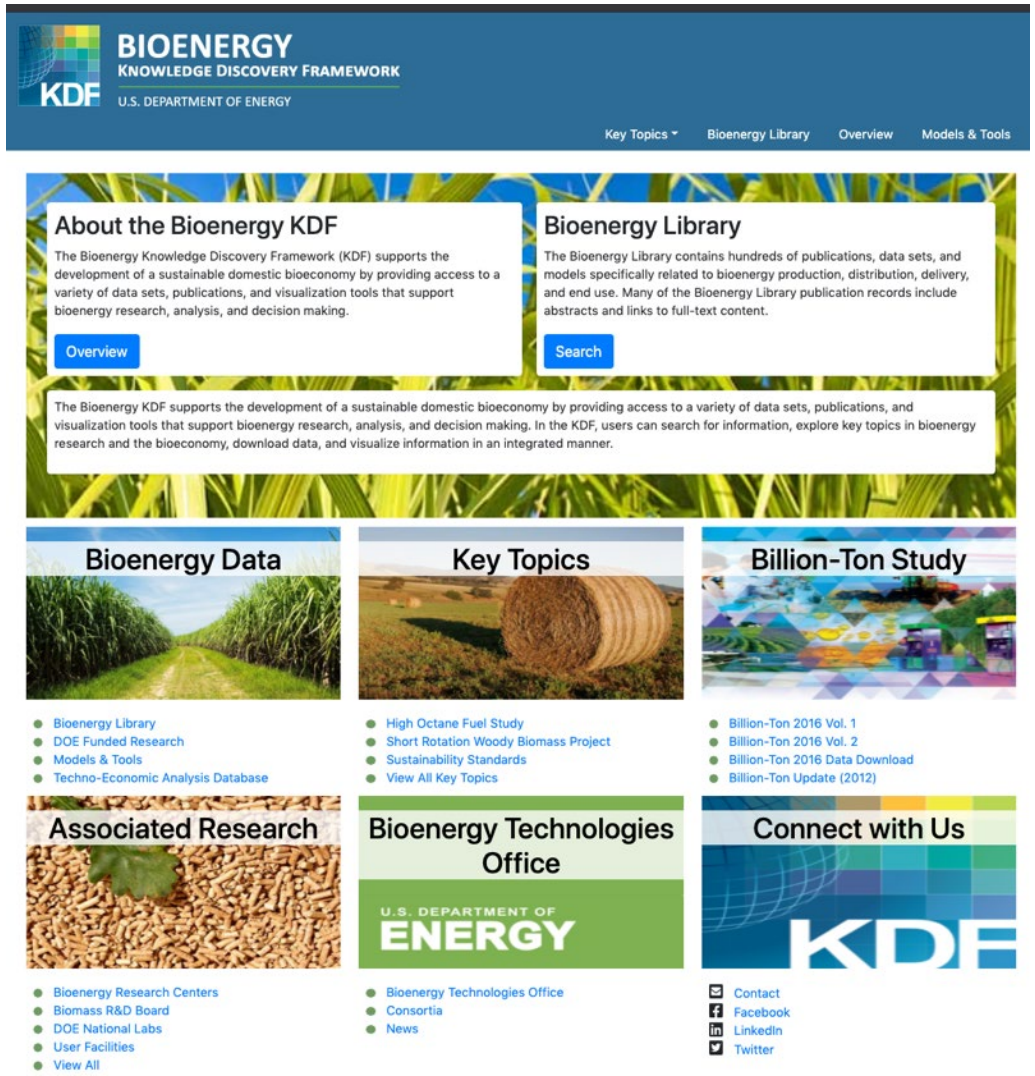
- Building from and customizing existing open-source software to create a Government owned web-based collaboration framework for knowledge management and data visualization
- Using well established software development paradigms to collect user requirements and implement them in an easy-to-use application
- Data Access
  - Easy access to critical bioenergy data and information
  - Most relevant data is quickly accessible
- Community Engagement
  - Interacting with the KDF team to develop novel capabilities and ensure access to data
  - Establishment of stakeholder engagement plan and focus groups to guide technical development tasks and priorities
- Success Factors
  - Relevant, up-to-date content
  - Easy access to priority content and data
  - Engagement from user community

4 – Impact

- The fundamental objective of the KDF is to provide researchers with access to the tools, data, and information needed to help further research
- Brings together data from across the supply chain
- Access to Billion-Ton 2016 Data and Visualizations
  - 12,000 Unique Page Views
- Quick access to Key Topics (Sustainability Standards, High Octane Fuel Study, Sun Grant Data and other BETO funded research and analytics results
  - 1,200 Unique Page Views
- Technology developed and lessons learned from the KDF can be extended to other research domains within the Department of Energy

4 – Progress and Outcomes

- Application Upgrade
- Migrated the base software to Drupal Version 8 along with all data and content
- Moved to a curated content model
  - Only users that are contributing curated content can authenticate
  - All other data is publicly accessible
- Ability for real-time content management to reduce blockers from development team



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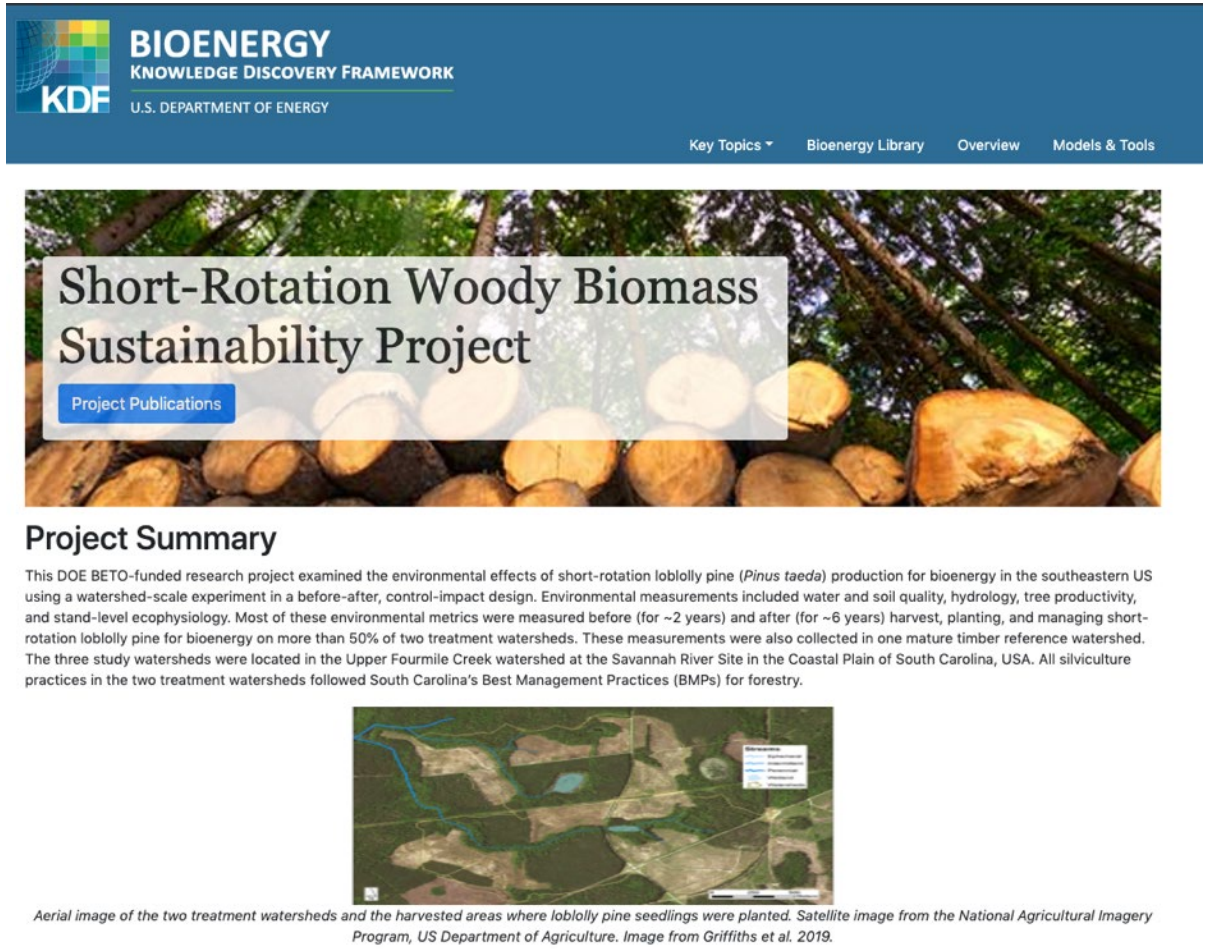
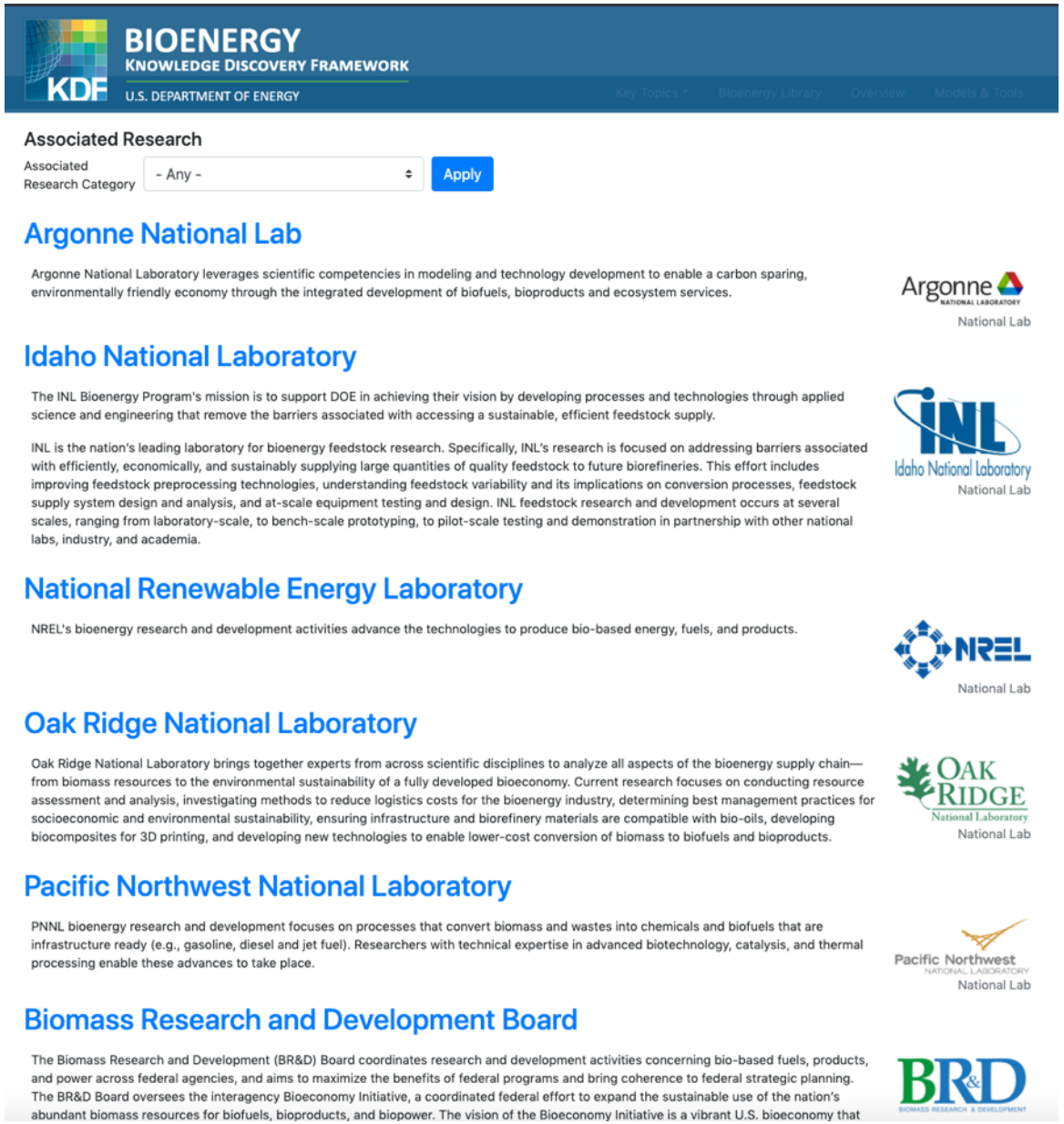
4 – Progress and Outcomes

- New Key Topic Pages
  - Short Rotation Woody Crops
  - Aviation Biofuels
  - Marine Biofuels
- Highlight Key Research
- Link directly to existing content within the KDF



4 – Progress and Outcomes

- Associated Research Content
- Grouping of related information to create connections between to KDF and related research that may not exist on the KDF
  - Consortia
  - Biomass R&D Board
  - National Labs
  - User Facilities



Future Work

- Integration of new tools
  - BioSTAR
- Enhanced Geospatial data search
- Identify and create new key topic pages
- Explore integrations for other data
  - Techno-Economic Analysis Database

Summary

- **Approach**
  - Design and develop a robust, collaborative informatics framework
- **Technical Accomplishments**
  - System Upgrade
  - Content Curation
  - New Key Topic Pages
  - Associated Research Content
- **Impact**
  - Providing access to most up-to-date Bioenergy Data

Quad Chart Overview

Timeline

- Start: FY2007
- End: FY2022

	FY20	Active Project
DOE Funding	(10/01/2019 – 9/30/2022)	$200K

Project Partners*

- Include National Lab Partners

Barriers addressed

- At-C Data Availability
- At-A Comparable, Transparent, and Reproducible Analysis

Project Goal

Bring the latest relevant bioenergy data to research community, industry, and the public.

End of Project Milestone

Provide a well maintained, up-to-date, bioenergy data repository for archival and sharing with stakeholders.

Funding Mechanism

Annual AOP Funding

*Only fill out if applicable.

Additional Slides

Responses to Previous Reviewers' Comments

- Question: Relative site analytics (compared to previous years or peer review cycles) would be helpful to see if usage is growing over time.
- Answer: Setting the proper criteria to understand impacts in a web application like the KDF can be difficult. Just looking at number of page views or user accounts doesn't tell the full story. The value of the KDF is easing the access to high value data and exploration tools that were previously difficult to obtain. An example used with the Billion-Ton Update was that in a given year having the data accessible on the KDF saved DOE around $1 million because researchers were no longer having to field requests for data access or to subset the data for their specific needs this was done for them on the KDF.

Responses to Previous Reviewers' Comments

- Question: It was not clear how much guidance there is for users accessing data on the KDF. Also, it appears that the main uses of the KDF are to visualize results from the BT16. KDF developers may want to think about how to expand the use of this resource. Sustainability is one of those topics that everyone has their own take on the concept, so you should probably acknowledge some of the other more established approaches or make clear that the ORNL focus is intentional.
- Answer: The high priority topic areas (Billion-Ton 2016, Sustainability Standards, High Octane Fuel Study, etc.) are the key draw to the KDF. Reviewing user interaction of these areas and how to promote the data better is something the KDF team is aware of and plans to address as the KDF moves forward.

Publications, Patents, Presentations, Awards, and Commercialization

- "Bioenergy KDF: Enabling Spatiotemporal Data Synthesis and Research Collaboration"
  - Second place for best paper at the ACM SIGSPATIAL Conference, November 4–7, 2014 in Dallas, Texas.
- The underlying architecture developed for the Bioenergy KDF is supporting a similar capability for DOE SFWD and for Energy-Water Nexus KDF