

DOE Bioenergy Technologies Office (BETO) 2019 Project Peer Review

6.3.0.2 - Bioenergy Knowledge Discovery Framework (KDF)

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Analysis and Sustainability

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Goal Statement

- The Bioenergy KDF is designed to connect researchers, industry, and sponsors to share information and build on existing knowledge within the bioenergy research community. While making high-value data and information easily accessible (ex. Billion-Ton 2016, Sustainability Standards, Regional Feedstock Partnership, etc.) through an interactive web-based architecture.

Quad Chart Overview

Timeline

- Start: FY2007
- Merit Review Cycle: FY2018 – FY2020
- 75%

	Total Costs Pre FY17**	FY 17 Costs	FY 18 Costs	Total Planned Funding (FY 19- Project End Date)
DOE Funded		\$262K	\$184K	\$450K

• **Partners:** Code Journeymen, NREL, INL, PNNL, ANL, ORNL

Barriers addressed

- At-C Data Availability Across Supply Chain
- At-G. Social Acceptance and Stakeholder Involvement

Objective

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

End of Project Goal

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

1 - 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
- Bring private content to the public
 - Biomass Scenario Model
- Optimize access to high priority data, models, and information
 - Ex. Billion-Ton 2016, Sustainability Standards, Sun Grant Initiative (SGI Data)

2 – Approach (Management)

- Team Structure
 - KDF System Development – ORNL
 - Content Management/Graphics – BCS
 - Media – BCS
- Weekly Meetings
 - KDF Development Team and BCS Graphics, Media, and Content Teams have bi-monthly teleconference to track progress, discuss direction, and strategize for new capabilities
- 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 (Management)

- 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
- Data Access
 - Easy access to critical bioenergy data and information
 - Most relevant data is quickly accessible

2 – Approach (Technical)

- 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 a easy to use functional application
- Challenges
 - User engagement and acceptance of web-based data storage and distribution
 - Identify domain tools and data needed to extend the current state of bioenergy research
 - Information becoming stale or out of date and incomplete or inaccurate metadata
- Success Factors
 - Relevant, up-to-date content
 - Easy access to priority content and data
 - Engagement from user community

3 – Technical Accomplishments/Progress/Results

- Key Topics Page
 - Easier access to key pages
 - Ability for BETO to promote new content and data
 - Common user interface with Billion-Ton Pages
 - Includes:
 - Billion-Ton 2016 Vol 1 and Vol 2
 - High Octane Fuel Study
 - Billion-Ton Update
 - Sustainability Standards
 - Sun Grant Initiative Data

Key Topics

Billion-Ton 2016 Vol 2



The 2016 Billion-Ton Report: Advancing Domestic Resources for a Thriving Bioeconomy (BT16) is the third in a series of national assessments commissioned by the U.S. Department of Energy that quantifies cellulosic and other biomass resources that could potentially be available, at certain prices, for bioenergy and bioproducts.

As with existing agricultural and forest production, environmental outcomes of biomass production are contingent on local decisions and practices. BT16 volume 2 is not a prediction of environmental effects. Rather, this study seeks to enable further analyses and insights, inform future research and development, and facilitate efforts to enhance environmental benefits and minimize negative effects associated with a growing bioeconomy.



Similar to volume 1, the Bioenergy KDF provides online resources including data, chapters, and report information associated with volume 2. Find below chapter descriptions and access to download individual chapters. Data can be downloaded.

Sustainability

Environmental sustainability assessment of bioeconomy Bioeconomy has gained political momentum since 2012 when the European Commission adopted the strategy "Thriving for Sustainable Growth: A Bioeconomy for Europe". Assessing the environmental performance of different bioeconomy value chains (divided in three pillars: food and feed, bio-based products and bioenergy) is key to facilitate solid and evidence-based policy making. The objectives of this work were: (1) to map and analyse accessible LCA data related to bioeconomy value chains in order to identify knowledge gaps; (2) provide a more robust and complete picture of the environmental performance of three bioeconomy value chains (i.e. one per each bioeconomy pillar). This analysis reveals that apart from few products (such as liquid biofuels, some biopolymers and food crops) the environmental assessment of bioeconomy value chains is still incipient and limited to few indicators (e.g. Global Warming Potential and energy efficiency). In this study, a harmonized procedure – the Product Environmental Footprint (PEF), which includes fourteen impact categories – is used to estimate the environmental performance of three exemplary case studies which are inter-related due to the use of sugar as feedstock: sugar (food and feed), bio-based ethanol (bioenergy) and polyhydroxyalkanoates (bio-based product). Results highlight the strong need for methodological harmonisation and coherence for LCA of bioeconomy value chains.

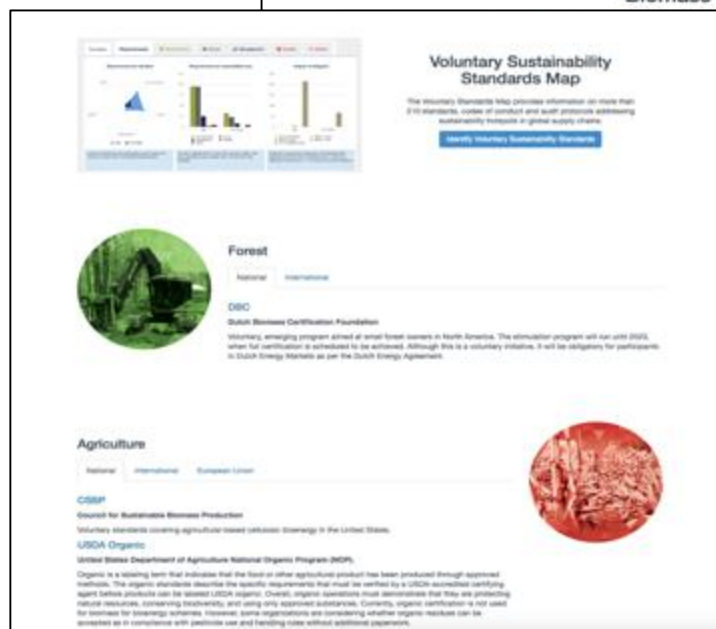
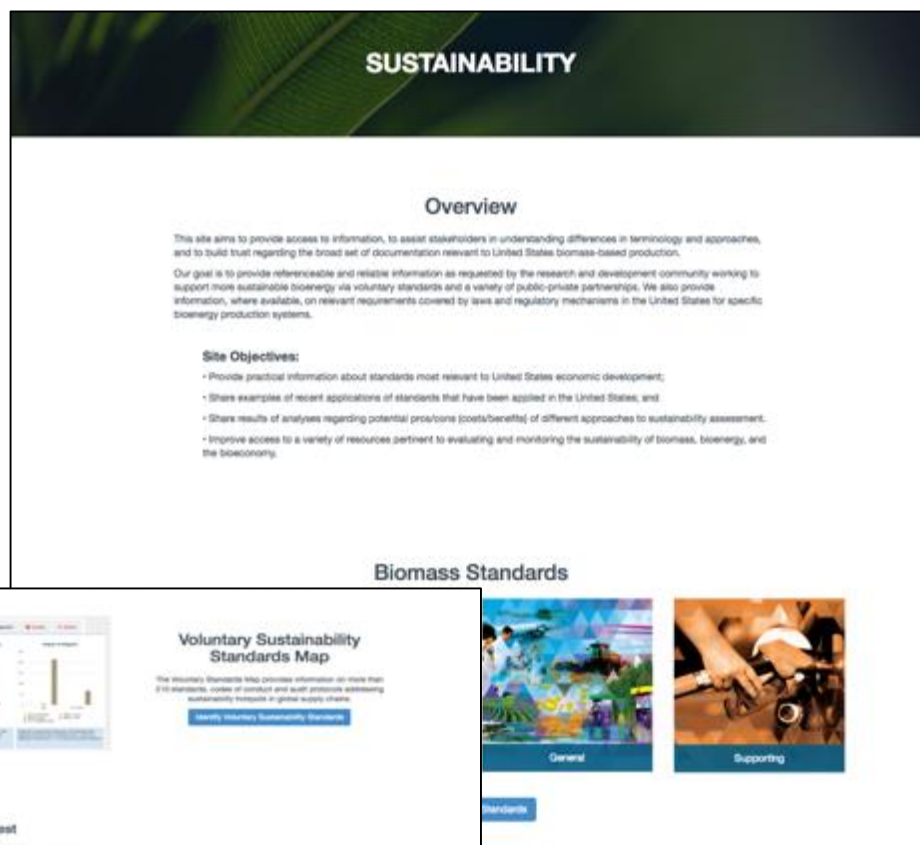


The BioEnergy Technologies Office works with a broad spectrum of government, industrial, academic, agricultural, and nonprofit partners across the United States to develop commercially viable, high-performance biofuels, bioproducts, and biopower made from renewable U.S. biomass resources. BETO provides technical input to standards development but does not endorse any specific standard. BETO encourages interested parties to learn more about standards and their potential costs and benefits and share information as it becomes available from BETO partners.

High Octane Fuel Study

3 – Technical Accomplishments/ Progress/Results

- Sustainability Standards Page
 - Provide access to information, to assist stakeholders in understanding differences in terminology and approaches, and to build trust regarding the broad set of documentation relevant to United States biomass-based production.
 - Highlight Related Tools
 - 2,200 page views since June 2018



3 – Technical Accomplishments/Progress/Results

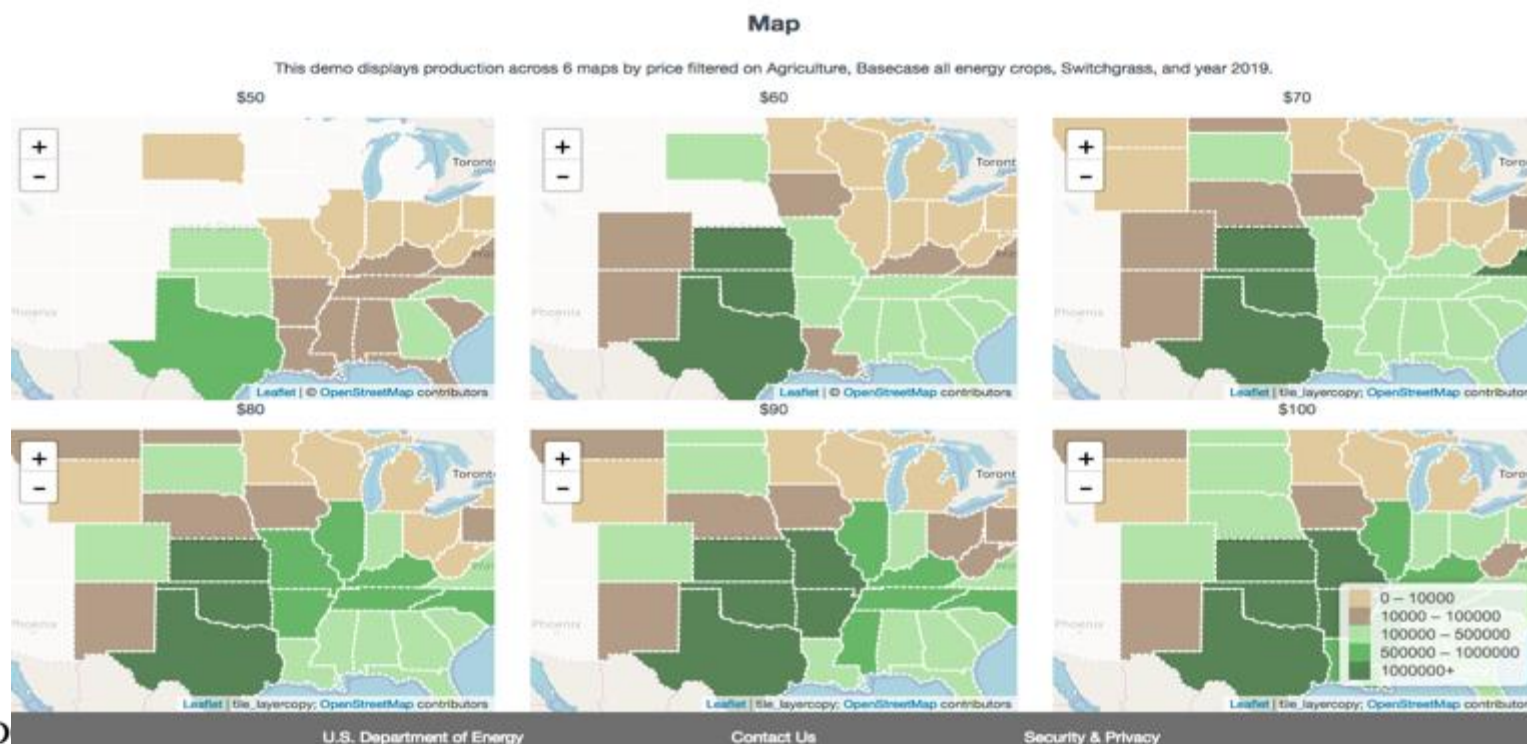
- Sun Grant Initiative Data
 - Data exploration and download
 - Access to raw and summarized data
 - Link with INL Biomass Library
 - Released January 2019

Sun Grant Initiative Data

Crop Type Location Growing Season								
- Any - - Any - - Any -			Apply					
ID	Crop Type	Location	Growing Season Type	Harvest Date	Entry	Rep	N_Rate	Dry Biomass
1	Switchgrass	AL	2009			1	0	
2	Switchgrass	AL	2009			2	0	
3	Switchgrass	AL	2009			3	0	
4	Switchgrass	AL	2009			4	0	
5	Switchgrass	AL	2009			1	56	
6	Switchgrass	AL	2009			2	56	
7	Switchgrass	AL	2009			3	56	
8	Switchgrass	AL	2009			4	56	
9	Switchgrass	AL	2009			1	112	
10	Switchgrass	AL	2009			2	112	
11	Switchgrass	AL	2009			3	112	
12	Switchgrass	AL	2009			4	112	
13	Switchgrass	IA	2009			1	0	
14	Switchgrass	IA	2009			2	0	
15	Switchgrass	IA	2009			3	0	
16	Switchgrass	IA	2009			4	0	
17	Switchgrass	IA	2009			1	56	
18	Switchgrass	IA	2009			2	56	
19	Switchgrass	IA	2009			3	56	
20	Switchgrass	IA	2009			4	56	
21	Switchgrass	IA	2009			1	112	
22	Switchgrass	IA	2009			2	112	
23	Switchgrass	IA	2009			3	112	
24	Switchgrass	IA	2009			4	112	
25	Switchgrass	NY	2009	2009		1	0	6.74
26	Switchgrass	NY	2009	2009		2	0	7.62
27	Switchgrass	NY	2009	2009		3	0	6.26
28	Switchgrass	NY	2009	2009		4	0	6.3
29	Switchgrass	NY	2009	2009		1	56	6.49

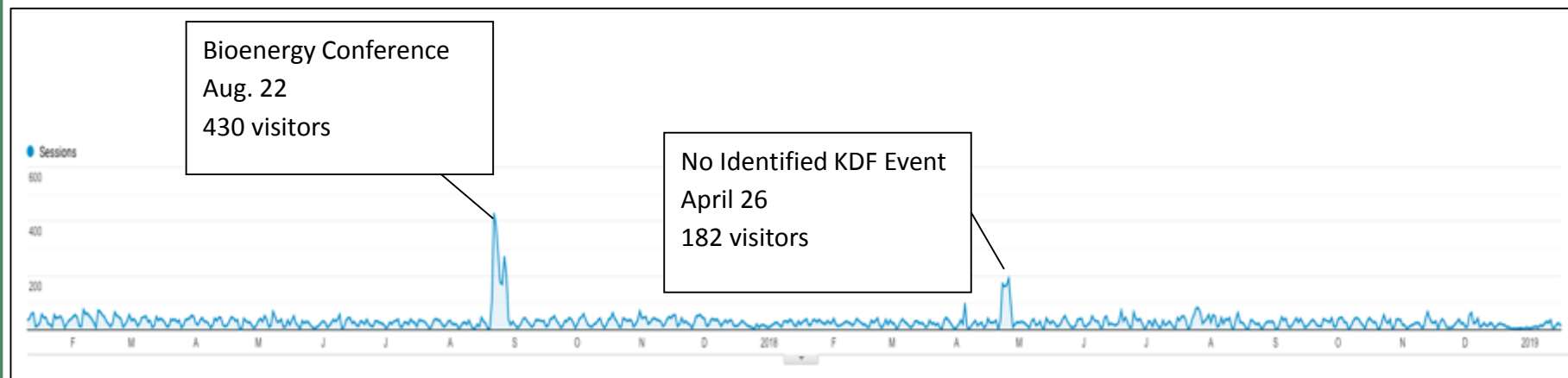
3 – Technical Accomplishments/Progress/Results

- Focused Map Based Visualizations
 - Lessons learned from current Map
 - Focus capabilities to allow user to dive into specific data
 - Not trying to recreate GIS



3 – Technical Accomplishments/ Progress/Results

- Site Analytics Review
 - KDF has a steady user base
 - Spikes in Visitors after major releases/updates with new capabilities
 - 34% (-5%) found the KDF from a search, 40% (+13%) went directly to home page, 26% (-6%) were referred from another site (Direct users tended to stay longer vs Referred Users)



4 – Relevance

- 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
- Quick access to Key Topics (Sustainability Standards, High Octane Fuel Study, Sun Grant Data and other BETO funded research and analytics results)
- Technology developed and lessons learned from the KDF can be extended to other research domains within the Department of Energy

5 – Future Work

- Software updates and enhancements
 - Released regularly
 - As capabilities become production ready
 - Upgrade to Drupal 8 to reduce operations and maintenance costs
- Provide capability for BETO and other researchers to moderate and curate data
- Finalize SGI and Biomass Resources Library data link
- Update and release map capabilities as standalone tools
- Integration of BioSTAR Tool
- Increase Community Engagement Activities

Summary

- **Approach**

- Design and develop a robust, collaborative informatics framework

- **Technical Accomplishments**

- Sustainability Standards
- System Upgrades
- Content Curation
- Initial SGI/Biomass Library Link

- **Relevance**

- Providing access to most up-to-date Bioenergy Data

- **Success Factors**

- Most relevant publication/data are accessible
- KDF is stable, dynamic and updated
- Active user communities

- **Future Work**

- Create new standalone map tools
- Access to shared data/information
- Increase Community Engagement
- Link SGI and Biomass Library Data

Additional Slides

Responses to Previous Reviewers' Comments

- How valuable the specific tools and information provided by the Bioenergy KDF are to users.
- To understand costs, an assessment of the longer-term maintenance needs and potential options to ensure sustainability would be valuable, including options to scale up the site to be a broader platform across, and potentially beyond, BETO

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