Goal Statement

- Creation and enhancement of geo-spatial, temporal decision support system to connect researchers, industry, and sponsors to share information and build on existing knowledge within the bioenergy research community. Make high-value data and information easily accessible (ex. Billion-Ton)
# Quad Chart Overview

## Timeline
- FY 2008
- FY 2017
- 75%

## Budget

<table>
<thead>
<tr>
<th></th>
<th>Total Costs FY 10 – FY 12</th>
<th>FY 13 Costs</th>
<th>FY 14 Costs</th>
<th>Total Planned Funding (FY 15)</th>
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</thead>
<tbody>
<tr>
<td><strong>DOE Funded</strong></td>
<td>$4,900K</td>
<td>$565K</td>
<td>$509K</td>
<td>$200K</td>
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<tr>
<td><strong>Project Cost Share (Comp.)</strong>*</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

## Barriers
- At-C Data Availability Across Supply Chain
- At-A Comparable, Transparent, and Reproducible Analysis
- St-B Consistent and Science-Based Message on Bioenergy Sustainability

## Partners
- Partners
  — None
- Other interactions/collaborations
  — NREL, INL, PNNL, ANL, ORNL
- Non-technical project management partners
  — BCS

[Managed by UT-Battelle for the Department of Energy]
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
  - Legislative Library, Biomass Scenario Model
- Optimize access to high priority data, models, and information
  - Ex. Billion-Ton Update, Sun Grant Field Trial Data, Biomass Scenario Model
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 an 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
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 weekly teleconference to track progress, discuss direction, and strategize for new capabilities
    - INL (Biomass Resource Library) – Still in development phase

- **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
    - NREL (Biomass Scenario Model) – Released Oct. 2015
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

- **Challenges**
  - Information becoming stale or out of date
  - Incomplete or inaccurate metadata
  - Consistent cycle of new information to help pull users back to the KDF
3 – Technical Accomplishments

- **Redesigned KDF**
  - Researcher focused capabilities
  - Call to action and easy to access how-to
  - Simplified Navigation
  - Improved content organization
  - Integration of Feedback from focus groups and stakeholder meetings
  - Featured Research directly on the Home Page

- **Released Sept. 2013**
3 – Technical Accomplishments

- Bioenergy Legislative Library (Released Feb. 2014)
  - 1,085 page views since release
  - 10th most viewed page on KDF
- Pull from database maintained by BETO
- Information not easily found by researchers and public before being accessible on KDF
3 – Technical Accomplishments

- **Biomass Scenario Model** (Released Oct. 2014)
  - 767 Page Views since release
  - 13th most viewed page

- Collaborating closely with NREL to identify appropriate data and visualizations for display on KDF

- Pull data for existing NREL Open Geospatial Consortium (OGC) Standard Services

- Provide researchers with better understanding of data returned from Biomass Scenario Model
3 – Technical Accomplishments

- DOE-Funded Research Page (Released Oct. 2014) – 91 page views
- Highlighting KDF Content that has been funded by Department of Energy
- Quickly assess search results for DOE-Funded Data
- Coordinated with BETO projects to increase deliverables to KDF as milestones.
3 – Technical Accomplishments

- **Metadata Enhancement and Cleanup**
  - Metadata – information summarizing content on the KDF (Title, Summary, Publication Date, etc.)
  - Ensure content is up-to-date and accurate
  - Reach out to PI if needed
  - Results of this effort will be released July 2015

- **Identified and corrected inaccurate metadata and non-functioning for 150 map layers and 104 documents, publications, and web links**

- **Fixing this data will help researchers find the information they seek and ensure the KDF has the best available data**

- **New sources identified for linking with other archival resources**
3 – Technical Accomplishments

Site Analytics Review

- KDF has a steady user base
- Spikes in Visitors after major releases/updates with new capabilities
- Users stay longer on the site with a purpose (ex. Exploring a new feature)
- 44% found the KDF from a search, 32% went directly to home page, 24% were referred from another site (Referred users tended to stay longer)
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.

- Helps prevent duplication of existing research.

- Allows for transparent, comparable, and reproducible analysis.

- Provides a mechanism for disseminating a consistent science-based message.

- Technology developed and lessons learned from the KDF can be extended to other research domains within the Department of Energy.
4 – Relevance

- **User Growth**
  - 1,260 users
  - Growth of 307 users since last peer review

- **Community Engagement**
  - Average 100 page views/day

- **Cost Savings**
  - Billion-Ton Data Exchange: ~$1,348,000
  - KDF Content in general: Further research required
    - How much does a single page view cost or save?
    - How to quantify difficult vs. easy to find data?
    - How to quantify data quality? Does it cost more if the data is inadequate?
    - Cost savings for other DOE investments into KDF like capabilities?
5 – Future Work

• Software updates and enhancements
  – Initial release July 2015
  – Updated release from user feedback September 2015

• Finalize integration of Digital Object Identifier (DOI) generation
  – DOI is a unique alphanumeric string assigned by a registration agency to identify content and provide a persistent link to its location on the Internet.

• Integration with other data repositories
  – Data.gov, DataONE, etc.

• Biomass Resources Library data integration

• Facilitate release of Billion-Ton 2016 data and visualizations

• Research Return on Investment (ROI) of the KDF
Summary

**Approach**
- Design and develop a robust, collaborative informatics framework

**Technical Accomplishments**
- Legislative Library
- Biomass Scenario Model Tool
- DOE-Funded Resources

**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**
- Architecture Upgrades/Enhancements
- Incorporate new models
- Access to shared data/information
- DOI generation
- Evaluation of ROI for KDF
Additional Slides
Responses to Previous Reviewers’ Comments

- The KDF does not become a silo itself.
  - The KDF has identified new sources of information and is exploring methods for syncing data among different system
  - Ensure methods for users to not just put information into the KDF but also various methods to retrieve (web services, RSS Feeds)

- Additional work needed to enhance ease of use, searchability, and data documentation.
  - The efforts of FY15 are seeking to address these very aspects and resolve issues identified since the last review.

- Adopt a “sustainability plan” for maintaining the KDF past the life of the project
  - Many of the background enhancements in FY15 will support this long term sustainability. Also, developing user engagement and steering committees will help to keep the KDF targeted towards user needs.
• "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 NFST
KDF: Return on Investment

_Billion-Ton Interface_

- **Overview Page:** 18,000 views
- **Dynamic Maps:** 3,350
  - Potential savings: $670,000 (1 hour of scientist’s time @ $200/hr)
- **Canned Maps:** 2,560
  - Potential savings: $128,000 (15 min of scientist’s time @ $200/hr)
- **Full Downloads:** 2,000
  - Potential savings: ~$100,000 (15 min of scientist’s time @ $200/hr)
- **Custom Downloads:** 3,000
  - Potential savings: ~$450,000 (45 min of scientist’s time @ $200/hr)
- **Researcher Time:** reduced to 1 hour per week
- **There have been 9,000 additional views of just the map,** which can be used to generate dynamic maps.

_Potential savings to Program from Billion-Ton Study interface on KDF:_ ~$1,348,000