Centralized Used Fuel Resource for Information Exchange (CURIE) – 14656

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ABSTRACT

The Centralized Used Fuel Resource for Information Exchange (CURIE) is a web-based resource being developed at Oak Ridge National Laboratory (ORNL) to provide a comprehensive database for archiving information related to the storage, transportation, and disposal of used nuclear fuel (UNF) and high-level radioactive waste. The development of CURIE was initiated and supported by the Department of Energy (DOE) to address needs for data and document management and access within their radioactive waste management programs and activities. Although the primary mission of CURIE is to support the DOE radioactive waste management programs, a large fraction of the content within the CURIE website is openly accessible, providing a valuable national resource to national and international stakeholders and interested parties. Leveraged from previous work to support DOE's Bioenergy Science Center on the Knowledge Discovery Framework (https://www.bioenergykdf.net) [1,2], CURIE has been expanded to maintain an up-to-date calendar highlighting UNF-related events and conferences, a UNF-related image gallery, used-fuel-related featured documents, and external links to databases and websites. It also maintains reactor- and site-specific information, which is spatially displayed using a map, related to dry and wet storage in the United States. Most of CURIE is publicly accessible, with over 1700 documents currently available for viewing. These documents can be found using an open-source search capability (Apache Solr) that provides intuitive search results based on a faceted search method (similar to Amazon.com®) and ensures finding documents and data is straightforward. Another useful feature of CURIE is the option to create and maintain private groups, which can share, manage, and edit documents with restricted access. CURIE also maintains and provides access to the Siting Experience Database, which consolidates the experiences and relevant documentation produced in previous efforts related to site nuclear waste facilities in the United States and abroad, and was developed in response to a Blue Ribbon Commission on America's Nuclear Future recommendation. As CURIE has successfully fulfilled user needs, more and more users have started to share documents and data, as evidenced by the increase in users and private groups. Moving forward, CURIE is expected to be a reliable, expanding, and indispensable resource for data and document access and related collaboration within the used fuel and waste management community in general, and the DOE programs in particular. CURIE is available at http://curie.ornl.gov.

INTRODUCTION

From its inception, the Nuclear Fuels Storage and Transportation Planning Project (NFST) of the Department of Energy's (DOE's) Office of Nuclear Energy recognized the need for an effective tool for managing and sharing documents and data. Because many of the previous document management and sharing tools have been terminated (or are inaccessible), a new tool, the Centralized Used Fuel Resource for Information Exchange (CURIE), was developed and launched on March 1, 2013 at http://curie.ornl.gov. In addition to supporting the DOE used nuclear fuel (UNF) programs, this website is a national resource, accessible to industry, vendor, Federal, and laboratory partners as well as other stakeholders and provides usable, collaborative document and data access. It is leveraged from previous work to support DOE's Bioenergy Science Center on the Knowledge Discovery Framework (https://www.bioenergykdf.net) and has been expanded to maintain an up-to-date calendar highlighting UNF-related events and conferences, UNF-related image gallery, NFST featured documents, and external links to databases and websites. The site uses an open-source search capability (Apache Solr) that

provides intuitive search results, based on a faceted search method (similar to Amazon.com®), and ensures that finding documents and data is straightforward and effective.

CURIE currently maintains 1700+ documents including the Siting Experience Database (SED), which was a Blue Ribbon Commission (BRC) on America's Nuclear Future near-term recommendation. Most of these documents are publicly accessible; however, CURIE also maintains private groups, which can share and edit documents privately without documents becoming publicly available.

CAPABILITIES

As described below, CURIE has a number of capabilities useful to the UNF and waste management communities.

Home Page

The CURIE Home Page (Fig. 1) serves as a hub from which the user can reach any of the site's main modules and quickly access the core document search capability. Module access is governed by tabs across the top of the page and/or icons on the left-hand side. The Home Page also contains a section dedicated to highlighting important documents (Featured Content), a real-time news feed focused on UNF, a list of the documents added most recently by community members, an event calendar, and links to important areas on the website, including the document repository, photo gallery, the SED, and an interactive map showing significant locations related to UNF.

Fig. 1. CURIE Home Page.

Document Repository

At the heart of CURIE is a document repository that is flexible and secure enough to support contributions from multiple communities, some of which may require role-based access control. For example, in a given community, there could be standard group members who are able to contribute and edit documents as well as group administrators who can add and remove users from the group and revert documents to previous versions. Standard document file types are supported (e.g., .doc, .docx, .pdf), as well as links to externally hosted documents (e.g., journals, reports, and news articles).

Siting Experience Database

Since June 2013, CURIE has maintained the SED (Fig. 2), which was originally developed by Sandia National Laboratories in response to a recommendation by the BRC. It consolidates the experiences and relevant documentation produced in previous efforts to site nuclear waste facilities in the United States and abroad. The main page for the SED contains links to a BRC summary, a summary of international programs, as well as a list of previous siting experiences from around the world. Most sections of the SED contain a list of selected readings, which are smaller subsets of the entire siting document database that has been fully incorporated into CURIE and is accessible through its search engine.

Fig. 2. Siting Experience Database.

Search Engine

CURIE relies on a powerful open-source search engine known as Solr (http://lucene.apache.org/solr/), which uses a faceted search approach (similar to shopping on Amazon.com®). When a user enters one or more search terms, the results are presented in traditional search engine fashion, but the series of options available on the left-hand side of the screen provides more sophisticated control over viewing those results (Fig. 3). Not only can the results be sorted by major categories (e.g., relevance, title, author, date, and document type), but the results can also be filtered/limited by one or more document types, countries of origin, or keywords. Clicking on a search result will route the user to the full entry for the associated document.

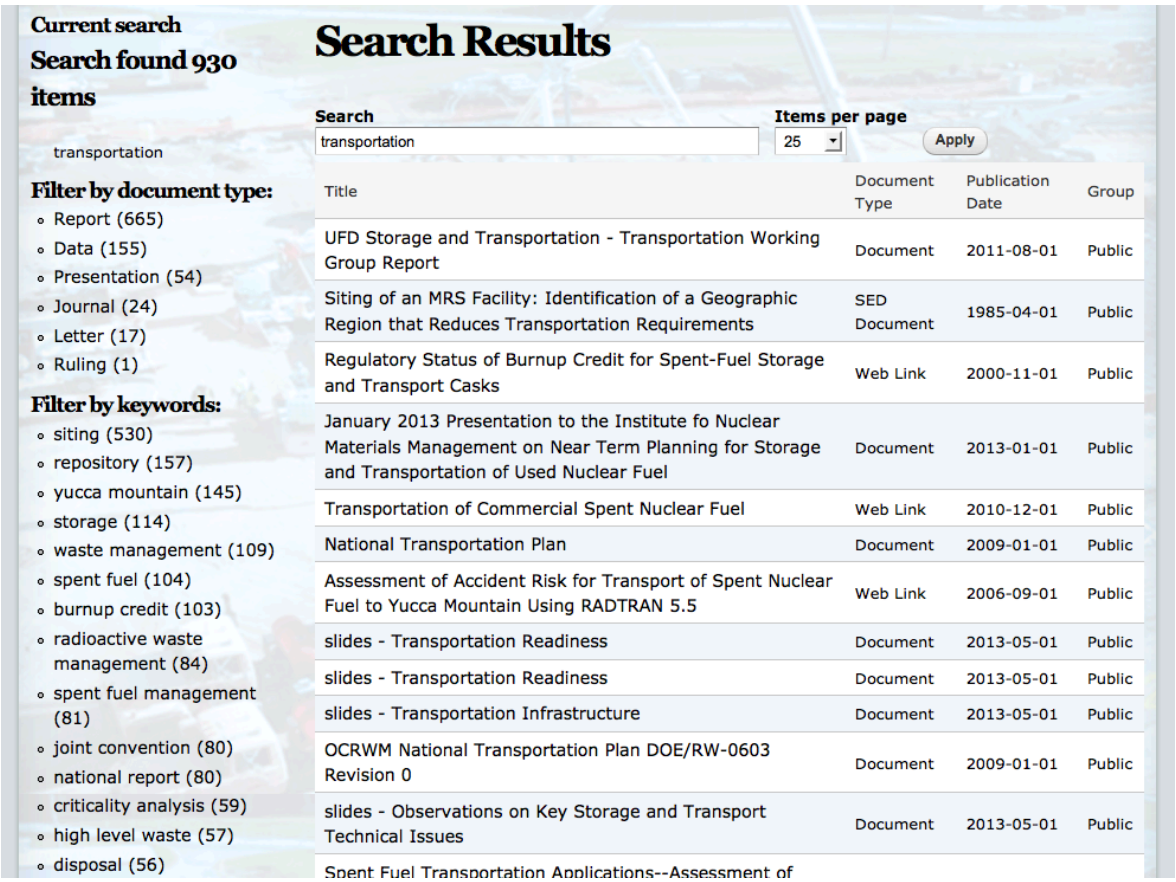

Fig. 3. Example of faceted search results.

Map

CURIE also maintains a map that displays the shutdown and operating reactors as well as waste management locations of interest. The map has updated dry and wet storage inventory information, along with general site characteristics, for each reactor site, as shown in Fig. 4.

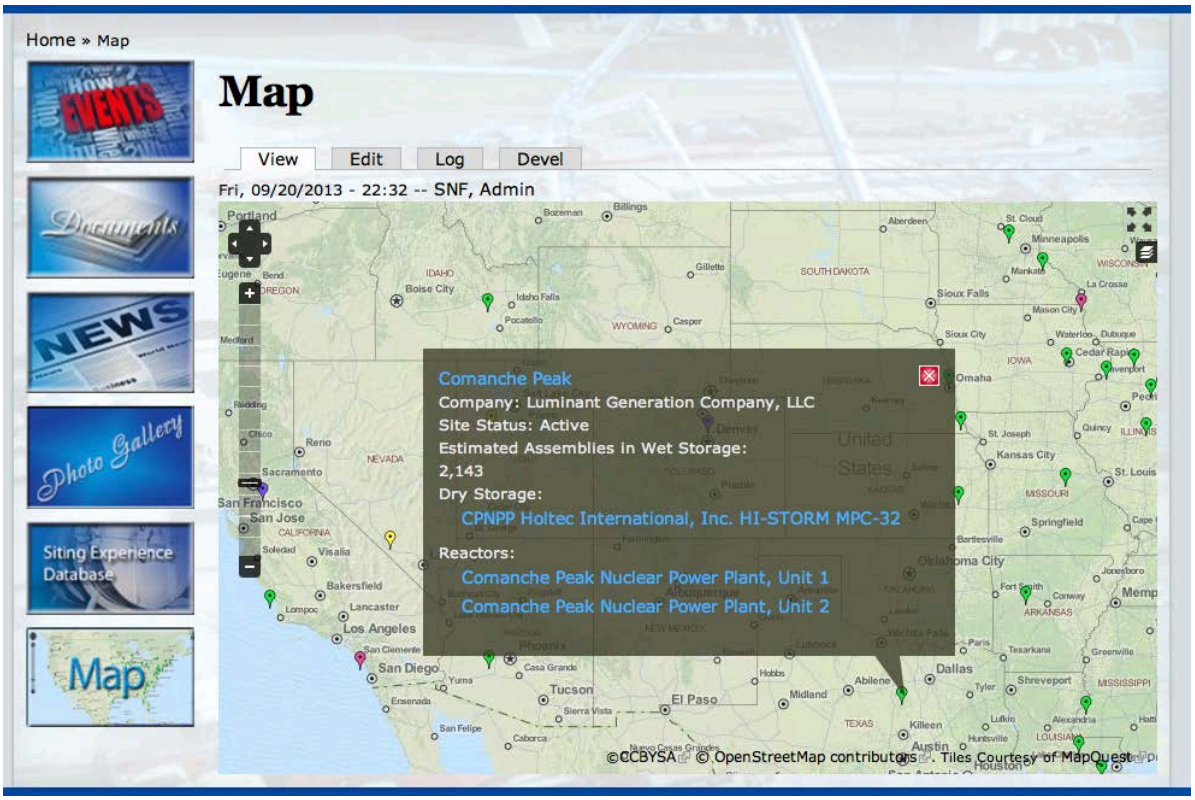

Fig. 4. The Comanche Peak reactor on CURIE's map shows the estimated assemblies in wet storage, the dry storage system, as well as information about the operating reactors.

Communities, Favorites, Events, and Resources

CURIE can support multiple stakeholder communities, each with its own set of user-contributed content that is visible solely to that community, if desired by the community lead. At present, there are ten communities, and additional communities will be online in the near future. Users can flag individual documents as favorites, which adds them to a list that is available from the Home Page as well as at the top of each page. This allows each user to build and quickly access a collection of documents important to them.

CURIE also supports a centralized calendar system that showcases events of interest to the site's various communities. It supports role-based access to the calendar so that users will see events exclusively for the communities of which they are members. Finally, CURIE also features a resource page, which contains links to the site's sponsor (DOE), collaborators (other national laboratories), and additional external reference materials (e.g., the original website for the BRC).

ACCESSIBILITY

CURIE has been developed to benefit all members of the UNF community, including the general public. As such, it is publicly accessible; however, certain features are only available to registered users.

Registration

To access all of CURIE's features, the user must register for an account using the register link in the top right corner of the Home Page. Once the user has provided the requested information and submitted the form, the user will receive an automated notification via email acknowledging the submission. The site administrator will review the application and give the user access to the appropriate content. The user will then receive an automated notification that his/her username has been successfully registered. The user can then log-on to CURIE using the Login link in the upper right-hand corner of the Home Page. Site administrators determine each user's level of access to content, so the user will only be able to see and work within the communities of CURIE for which the user has been approved.

Adding Content

Contributing content to CURIE is a vital part of the website. To contribute content to CURIE, the user should click on the Create Content button near the top of the Home Page or any other site page. The user will be prompted to choose from a list of options that are specific to his/her level of site access. At a minimum, each user should be able to contribute public documents, images, image galleries, and calendar events. Once an option is selected, the user will be prompted to supply several pieces of metadata related to the content of interest. Some metadata are required for each document, including title, keyword(s), document type, and the file itself (or an external link). Other metadata are optional, including summary, names of authors (individuals or organizations), publication date, and associated waste facility site(s). While not required, these optional fields are strongly encouraged to enable more accurate search results and provide additional helpful information to other users.

When creating content, most standard file formats are supported, and collections of files can be uploaded by using the Advanced Upload option. Keywords are an important part of the CURIE search engine, so they should be selected with care. As the user starts to type, the keyword field will automatically populate with matching text if the term(s) has been used previously. If the user provides a word(s) that is unknown, it is automatically added to the list for future use. Keywords are not case sensitive and should be separated by commas for maximum effectiveness.

Revising Content

Another key feature of CURIE is the check-in/check-out capability, which allows document revision by multiple users in a clean, reversible manner. Each content page has a View screen and an Edit screen (if the registered user has edit permission). This allows the user to lock the document from changes from others by clicking on the Edit button. Banner text across the top of the page appears until the user finishes editing the document and releases it. The revision process consists of the following steps: 1) checking out the document, which prevents other users from being able to edit the file and/or associated metadata; 2) downloading the document locally to the user's machine to edit; 3) updating the file locally and uploading it back to CURIE (with the option to "overwrite" the original). Once the document has been saved, the lock is released and other users are able to edit the document. It should be noted that even "overwriting" the document does not actually delete the original. The site administrator can revert back to any revision of a document.

CONCLUSIONS

CURIE is a web-based resource being developed at ORNL to provide a comprehensive array of resources related to the storage, transportation, and disposal of used nuclear fuel and high-level radioactive waste. The development of CURIE was initiated and supported by the DOE to address needs for data and document management and access within its radioactive waste management programs and activities.

Although the primary mission of CURIE is to support the DOE's radioactive waste management programs, a large fraction of the content within the CURIE website is openly accessible, providing a valuable resource to national and international stakeholders and interested parties.

CURIE currently maintains technical reports related to UNF characteristics, UNF and cask transportation issues, previous nuclear facility siting experiences, interim storage of UNF, and system analyses, as well as UNF and cask inventory data and access to the NRC NUREGs related to used fuel. In the future, CURIE will allow additional access to UNF inventory and characteristic data and tools, which could be used for a number of purposes, including routing logistics, cask management planning, and various other fuel cycle assessments and corroborating calculations.

As CURIE is successfully fulfilling user needs, more and more users are sharing documents and data, as evidenced by the increase in users and private groups. Moving forward, CURIE is expected to be a reliable, expanding, and indispensable resource for data and document access and related collaboration within the used fuel and waste management community in general, and the DOE programs in particular.

REFERENCES

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