
Radiation Embrittlement Archive Project: Web Application User's Guide

Prepared by
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Oak Ridge National Laboratory

Prepared for
U.S. Nuclear Regulatory Commission

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H. B. Klasky, P. T. Williams and B. R. Bass

ABSTRACT

The Radiation Embrittlement Archive Project (REAP), which is being conducted by the Probabilistic Integrity Safety Assessment (PISA) Program at Oak Ridge National Laboratory under funding from the U.S. Nuclear Regulatory Commission's (NRC) Office of Nuclear Regulatory Research, aims to provide an archival source of information about the effect of neutron radiation on the properties of reactor pressure vessel (RPV) steels. Specifically, this project is an effort to create an Internet-accessible RPV steel embrittlement database.

The project's website, <https://reap.ornl.gov>, provides information in two forms: (1) a document archive with surveillance capsule(s) reports and related technical reports, in PDF format, for the 104 commercial nuclear power plants (NPPs) in the United States, with similar reports from other countries; and (2) a relational database archive with detailed information extracted from the reports.

The REAP project focuses on data collected from surveillance capsule programs for light-water moderated, nuclear power reactor vessels operated in the United States. Additionally, REAP contains data from surveillance programs conducted in other countries. REAP is presently being extended to focus on embrittlement data analysis, as well. This document guides readers on the use of the REAP database web application.

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ABBREVIATIONS

ASM	Analysis Service Module
BWR	boiling water reactor
EFPY	effective full-power years
EOL	end-of-licensing
ORNL	Oak Ridge National Laboratory
NRC	United States Nuclear Regulatory Commission
REAP	Radiation Embrittlement Archive Project
PWR	pressurized water reactor
RPV	reactor pressure vessel

.

1. Introduction

1.1 Background

From the earliest days of commercial nuclear power generation, it was recognized that over time, neutron irradiation hardens and embrittles the steel from which a reactor pressure vessel (RPV) is constructed. Eventually, embrittlement may degrade an RPV's mechanical properties to a point at which the RPV's steel becomes unacceptable from a regulatory perspective, requiring nuclear power plant operators either to make a significant economic investment in replacing or annealing the RPV, or to shut it down. Current regulatory practice for RPV lifetime prediction relies primarily on information gained from Charpy impact testing, tensile testing, and mechanical testing of other small specimens as part of in-reactor surveillance programs. However, this information is limited to the following: a) materials currently in use (by definition, surveillance information is restricted to the types of materials that are in service today), and b) neutron exposures not greatly exceeding the licensed lifetime. Given that the initial 40-year design life of RPVs are now routinely extended to 60 years, the above-stated limitations can produce real restrictions on the operational lifetimes of the nuclear plants.

Neutron embrittlement of RPV steels is known to be a complex phenomenon. The magnitude of embrittlement depends upon the interplay of a number of environmental variables (e.g., fluence, flux, temperature) and compositional ones (that is, the proportions of copper, nickel, manganese, phosphorus, silicon, etc., in the steel). There are considerable amounts of data regarding the effects of neutron embrittlement on both the mechanical properties (e.g., strength, hardness, impact energy, fracture toughness) and the microstructural properties of RPV steels. However, because working on irradiated materials is an expensive undertaking, individual datasets tend to be limited, rarely including complete information on both mechanical and microstructural properties for the same material exposed in both test and power reactors. Both of these factors (i.e., the complexity of the phenomena that create neutron irradiation damage and the lack of comprehensive datasets to quantify its effects) have inhibited progress toward the development and validation of a comprehensive, physically based model sufficiently robust to enable confident prediction of future embrittlement trends.

1.2 Radiation Embrittlement Archive Project at ORNL

The NRC commissioned the PISA Program at ORNL to develop a web-based database for US surveillance reports and other data related to embrittlement. With that commission came a proposal that the new database should (as a research tool, not a licensing tool) have the following characteristics:

- Web-based
- able to trace the origin of any information contained in the database
- able to maintain a log of changes of values
- able to reflect and describe what individual data values mean (e.g., how the irradiation temperature is measured)
- able to provide the capability to store documents that show legal permission to make the data and document public
- able to produce information that the NRC can use to post on the data.gov website
- able to define the columns of each table
- able to describe the process of entering data from new citations
- capable of downloading citation data in MS Excel format
- include a feedback form
- able to provide data analysis tools
- searchable

The REAP project provides an important tool for RPV integrity assessment within the NRC regulatory environment, especially as it will constitute a crucial research tool for development of future embrittlement predictive models for light-water-reactor (LWR) RPVs. In addition, the REAP project will assemble disparate data, both un-irradiated and irradiated, from surveillance reports that have been submitted to NRC by the U.S.'s 104 commercial nuclear power plants. Finally, the project will contribute to Reg. Guide 1.99 Rev. 2 (1988) and 10 CFR 50 App. H (2005).

The *Probabilistic Pressure Boundary Integrity Safety Assessment (PISA) Program*, sponsored by the U. S. Nuclear Regulatory Commission (USNRC), is the premier research group responsible for assessing structural integrity of reactor pressure vessels (RPVs) utilized by the fleet of 104 commercial nuclear power plants (NPPs) currently providing 20 percent of electricity production in the U. S. The RPV of a NPP provides secure containment for nuclear fuel undergoing fission in an elevated pressure/temperature environment; thus, integrity of the RPV is critical to the public safety and to the well-being of the U. S. electrical grid.

During FY 2013, the PISA Program completed the initial release of the *Reactor Embrittlement Archive Project (REAP)*; funding was from the USNRC Office of Research. For the first time at a single location in the U. S., *REAP* provides the nuclear technology community with a comprehensive, internet-accessible embrittlement database/analytical tool for documenting the effects of neutron irradiation on RPV steels utilized in the U. S. fleet of NPPs. The importance of that information derives from the fact that neutron embrittlement may degrade an RPV's mechanical properties sufficiently to produce real restrictions on the operational lifetime of the NPP (which is currently limited to a total of 60 years). Specific capabilities of *REAP* include (1) a document archive with surveillance capsule reports¹ for commercial NPPs, with similar reports from other countries; (2) a relational database archive with detailed materials data and information extracted from those reports; and, (3) an *Analysis Service Module* (ASM) that provides analytical tools for researchers to interpret the embrittlement data. Currently, the REAP archive web application contains data from the U. S., Taiwan, Switzerland, Sweden, Spain, Mexico, South Korea and Brazil. The website for REAP is found at <https://reap.ornl.gov>; Figure 2 shows the Home Page for that site and Figure 33 an example tool (mechanical test) from the ASM.

It is widely recognized that *REAP* provides an important tool for RPV integrity assessment within the USNRC regulatory environment, especially as it will constitute a crucial research resource for future development of truly *predictive* embrittlement models for legacy RPV steels. In addition, the project is contributing to development of (1) future USNRC regulatory guides and (2) regulations governing operations of NPPs that become part of the U. S. Code of Federal Regulations.

The success and utility of *REAP* is validated by the world-wide group of organizations that are registered users of the website (as of September 2013): Areva (international NPP manufacturer), Babcock & Wilcox (nuclear industry), Electricite de France (French national utility), Electric Power Research Institute (U. S. nuclear industry), European Commission's Institute for Energy and Transport, Exelon Corporation (U.S. nuclear utility), Imperial College of London, Korea Institute of Nuclear Safety (national regulator), National Institute of Standards and Technology (U.S. government technology), Rolls Royce (U.K. nuclear industry), USNRC, ORNL, South California Edison (U.S. utility), Structural Integrity Associates Inc.

¹ Surveillance capsule reports provide material properties data generated from testing of the many specimens contained in large surveillance capsules that are stored in the RPV of an NPP; up to six capsules are extracted over the lifetime of the NPP. Those capsule specimens are exposed to levels of neutron irradiation similar to the RPV steel wall and thus serve as "surrogates" for irradiated RPV material. Test results are published in surveillance capsule reports that serve as source documents for the embrittlement data entered into the REAP archive; legacy capsule reports extending as far back as the 1960s were used to populate REAP.

(U.S. nuclear industry), Swedish Radiation Safety Authority (national regulator), Transwer Enterprises, Inc., and Westinghouse (U.S. nuclear industry).

2. REAP Web Site

The URL for the REAP web site is <https://reap.ornl.gov>.

In the terminology of the Internet, REAP is a public-facing web-site, but it is not anonymous access. You'll need to be registered first in order to use the web-site.

2.1 Gaining Access

This section describes how to gain access to the REAP web site and how to use each of the functions implemented on it.

2.1.1 How to create an ORNL-XCAMS account to access the REAP Database Web Application

The following steps describe how to create an ORNL-XCAMS account to access the REAP Database Web Application:

1. **Create** an XCAMS account at: <https://xcams.ornl.gov/xcams/> There, you will see the web page in Figure 1 Create ORNL XCAMS account. Select the link: *"I need an account"* and follow the instructions on the screen.

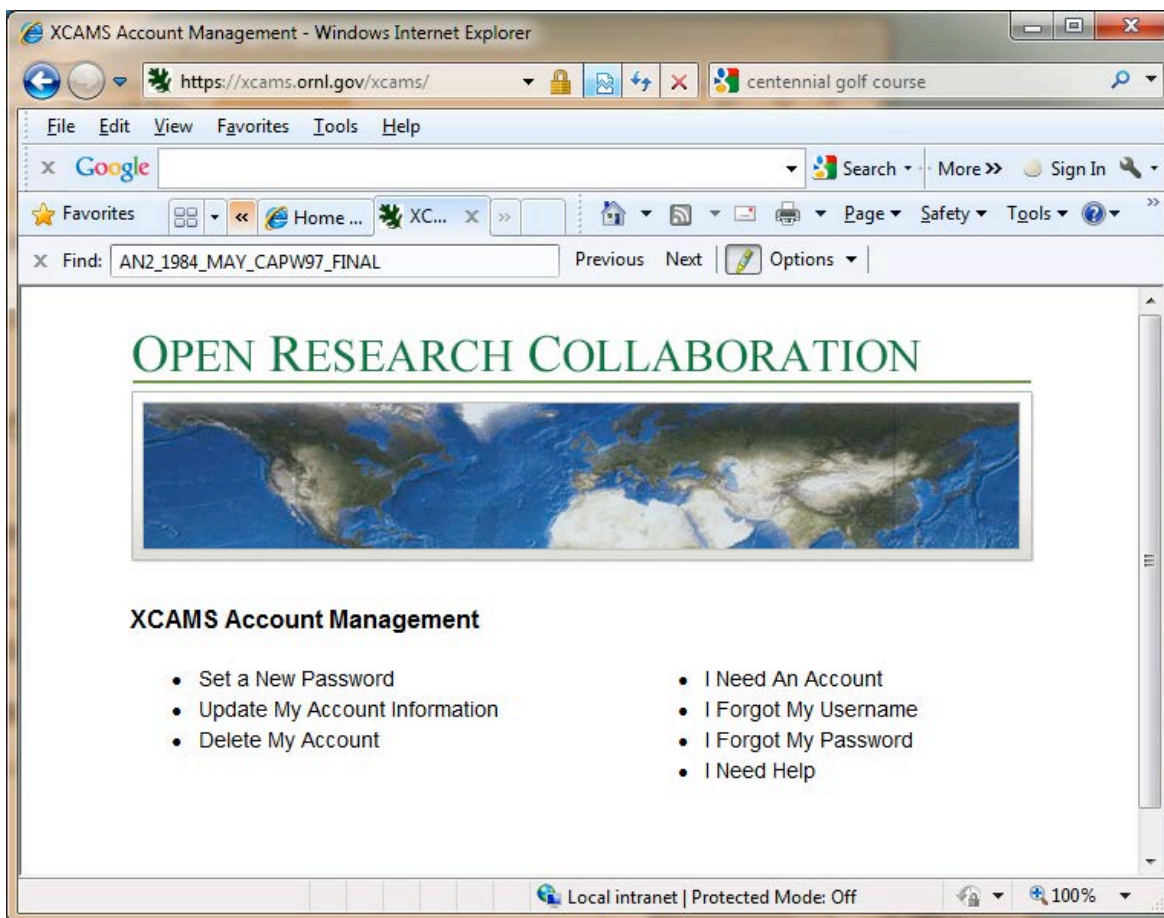


Figure 1 Create ORNL XCAMS account.

2. **Save** your **user name, PIN and password on a safe place**, so you can retrieve it later, when needed.
3. **Request** access to the REAP Database Web Application, by sending an email with your new *User-Name* to Hilda Klasky at klaskyhb@ornl.gov.
4. **Receive** email notification from Hilda Klasky at ORNL when your account has been granted access to the REAP Database Web Application.
5. **Access** the REAP Database Web Application at <https://reap.ornl.gov/>. When prompted, type in the user name the suffix: 'extranet\' followed by your user name. Then, type in your password.
6. If you forget your XCAMS user name, password or pin number, you can retrieve this information at: <https://xcams.ornl.gov/xcams/> or send an email to: helpline@ornl.gov. To obtain a faster response; you can also contact the ORNL helpline at: 865.241.6765.

2.2 Logging onto web site

To access the REAP Database Web Application open a browser window at: <https://reap.ornl.gov/>.

When prompted:

- A) type in the user name the suffix: 'extranet\' followed by your user name.
- B) Then, type in your password.

2.2.1 Preferred browsers

We have tested the production release REAP Changeset (i.e. revision number): 17535 on the following browsers:

- Microsoft Internet Explorer 9 and newer
- Firefox 20.0 and newer
- Google Chrome 26.0.1410.65 and newer

Other browsers and/or previous versions of the above have not been tested, thus are not recommended for use of the REAP Changeset: 17535 or newer builds.

2.3 Navigating the Home Page

After login in, users can see the REAP home page.

This project, conducted by the Oak Ridge National Laboratory (ORNL) under funding from the United States Nuclear Regulatory Commission's (NRC) Office of Nuclear Regulatory Research, aims to provide an archival source of information concerning the effects of neutron radiation on the properties of reactor pressure vessel steels. This website provides access to information in two forms:

1. A Document Archive, which provides access to files in PDF format of original source documents (e.g., technical reports), and
2. A Data Archive, which provides access, in a relational database format, to information extracted from the document archive.

This initial release of REAP focuses on data collected as part of surveillance programs for light-water, moderated, nuclear power reactor vessels operated in the United States. This includes data on Charpy V-notch energy, tensile properties, composition, exposure temperature, flux, and fluence. Additionally, REAP contains some data from surveillance programs conducted in other countries. Depending on the availability and accessibility of data, REAP may be expanded to include the following:

- Data from accelerated irradiations performed in test reactors,
- Fracture toughness data,
- Hardness data, and/or
- Microstructural data.

The document archive and the data archive can both be accessed via the Search/Download Single Citations & Data link under the Search & Analyze Data section to the left. Here, copies of individual documents can be downloaded from the document archive, and the data from each document can be downloaded into a separate Excel workbook.

The Analyze Data section is currently under construction. When completed users, will be able to access data from multiple documents at the same time. Additionally, by using the advanced analysis methods, users will be able to perform calculations using data (e.g., Charpy transition temperatures can be calculated from Charpy V-notch energy vs. temperature transition curves).

Please Read Cautionary Notice!

Caution: REAP is still under development and the information in the data archive is still being checked. This version is provided to users for review and comment. Users are cautioned to not use the data in the data archive without first checking its accuracy relative to the information in the document archive. Users assume full responsibility for the use of any information found on this website.

The left navigation panel is the starting point for your searches of the database.

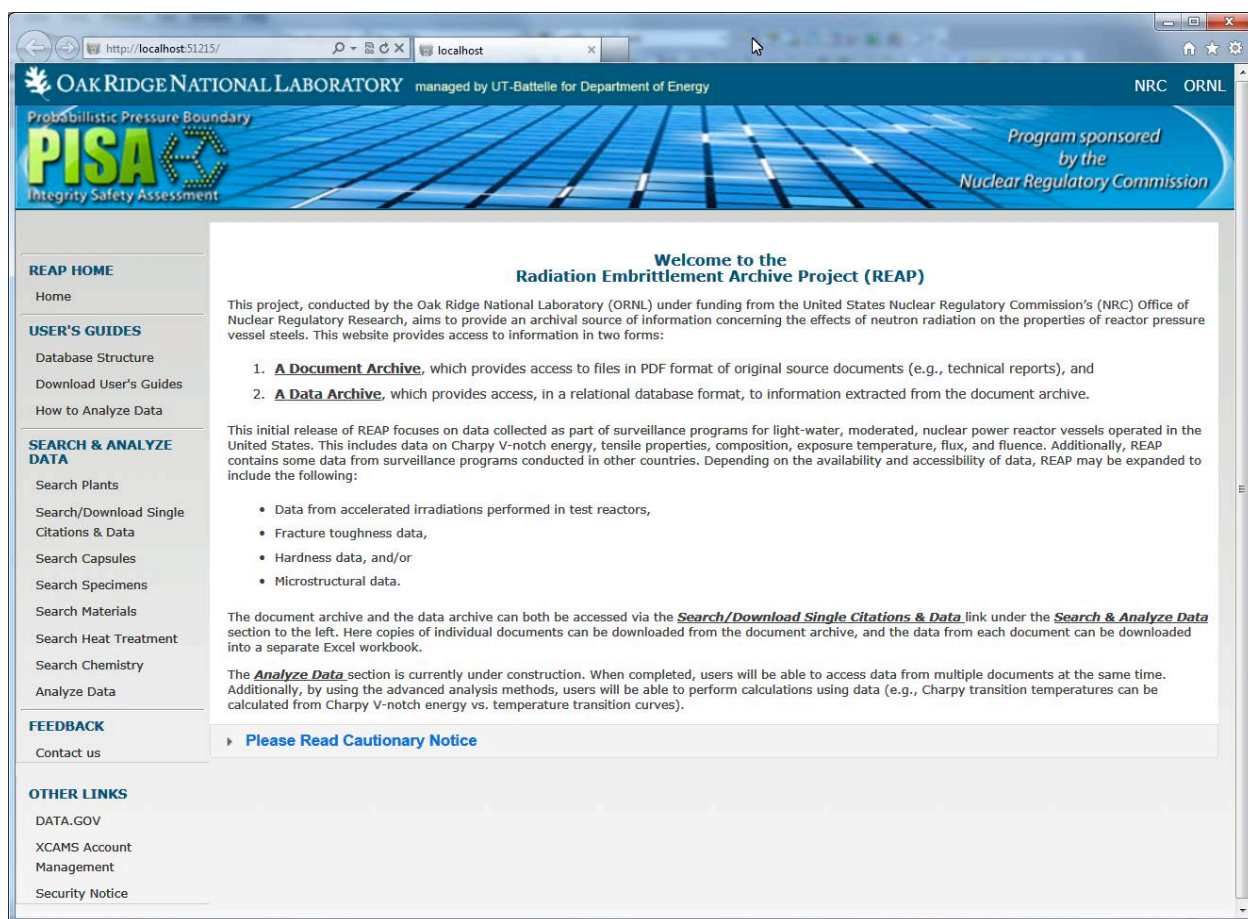


Figure 2 REAP home page

2.4 Providing Feedback

We welcome your feedback! Please select from the subjects below (Figure 3), enter your message, and then press the Send Email button.

Our postal mailing address is Oak Ridge National Laboratory, P.O. Box 2008, Oak Ridge, TN, 37831 (USA). Please mark "Attn: Ms. Hilda Klasky." If you're sending mail by carriers other than the U.S. Postal Service, replace the "P.O. Box 2008" with "One Bethel Valley Road."

The screenshot shows a web browser window with the URL <http://localhost:51215/Feedback1/Create>. The page header for the Oak Ridge National Laboratory (managed by UT-Battelle for the Department of Energy) includes the PISA logo (Probabilistic Pressure Boundary Integrity Safety Assessment) and a note that the program is sponsored by the Nuclear Regulatory Commission. The main content area is titled 'Feedback' and contains the following text: 'Thank you for visiting REAP; we welcome your feedback. Please select from the subjects below, enter your message, and then press the Send Email button. Our postal mailing address is Oak Ridge National Laboratory, P.O. Box 2008, Oak Ridge, TN, 37831 (USA). Please mark "Attn: Ms. Hilda Klasky." If you're sending mail by carriers other than the U.S. Postal Service, replace the "P.O. Box 2008" with "One Bethel Valley Road."' Below this text is a form with the following fields: 'User ID' (value: Paul), 'User Name*' (empty), 'Date' (value: 1/16/2013 2:19:38 PM), 'Email Address*' (empty), 'Affiliation*' (empty), 'Phone No.' (empty), 'Subject*' (dropdown menu with 'Please select a subject'), 'Attachments' (button: Select...), and 'Message*' (large text area). At the bottom of the form are buttons for 'Send Email' and 'Cancel', followed by a red asterisk indicating required fields. A sidebar on the left contains links to 'REAP HOME', 'USER'S GUIDES', 'SEARCH & ANALYZE DATA', 'FEEDBACK', and 'OTHER LINKS'.

Figure 3 Feedback Form

2.5 Searching the Database for Nuclear Power Plants

The left navigation panel is the starting point for any searches in the REAP database. The left-navigation panel provides users with other methods of accessing information in the REAP database. Searching the Plants data is shown on Figure 4.

The Plant's table contains information from all Nuclear Power Plants in the world, either active, no longer active or in construction. Information contained in this table comes from the original Embrittlement Database Project EDB [2] (predecessor of REAP), the International Atomic Energy Agency (IAEA) 2006 Nuclear Power Reactors in the World [3] and the US NRC NUREG-1350, Volume 22, Information Digest 2010-2011[4].

Search Capabilities: By Plants

Plant	Plant Code	Reactor Type	Designer	Status	Country
Angra Dos Reis Unit 1	AD1	PWR	Westinghouse/EBE		Brazil
Almaraz Unit 2	AL2	PWR	Westinghouse	active	Spain
Arkansas Nuclear One, Unit 1	AN1	PWR	Babcock & Wilcox		USA
Arkansas Nuclear One, Unit 2	AN2	PWR	Combustion Engineering		USA
Asco Unit 1	AS1	PWR	Westinghouse		Argentina
Asco Unit 2	AS2	PWR	Westinghouse		Spain
Braidwood Unit 1	BD1	PWR	Westinghouse		USA
Braidwood Unit 2	BD2	PWR	Westinghouse	active	USA
Browns Ferry Unit 3	BF3	BWR	General Electric		USA
Big Rock Point Reactor	BR	BWR	General Electric		USA
Beaver Valley Unit 1	BV1	PWR	Westinghouse		USA
Beaver Valley Unit 2	BV2	PWR	Westinghouse		USA
Brunswick Unit 1	BW1	BWR	General Electric		USA
Brunswick Unit 2	BW2	BWR	General Electric		USA
Byron Unit 1	BY1	PWR	Westinghouse		USA
Byron Unit 2	BY2	PWR	Westinghouse		USA
Beznau Unit 1	BZ1	PWR	Westinghouse		Switzerland
Beznau Unit 2	BZ2	PWR	Westinghouse		Switzerland
José Cabrera Nuclear Power Station	CAB	PWR	Westinghouse		Spain

Figure 4 Search By Plants

Search Capabilities: By Plants – Online Help

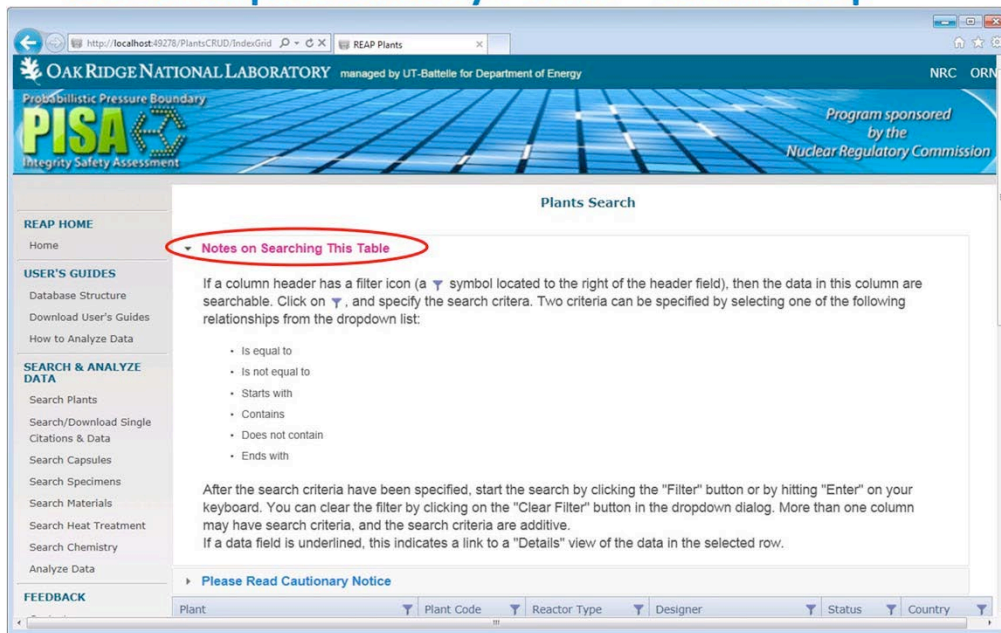


Figure 5 Online Help Features

Figure 5 is an example of some of the online help features that are provided through the REAP web application.

When clicking on the “Notes on Searching This Table” bar, the bar opens up and details on how to use the individual search filters in the Plants table are provided. Users can toggle off or collapse the online help page just by clicking again on the bar.

Search Capabilities: By Plants – refining the search

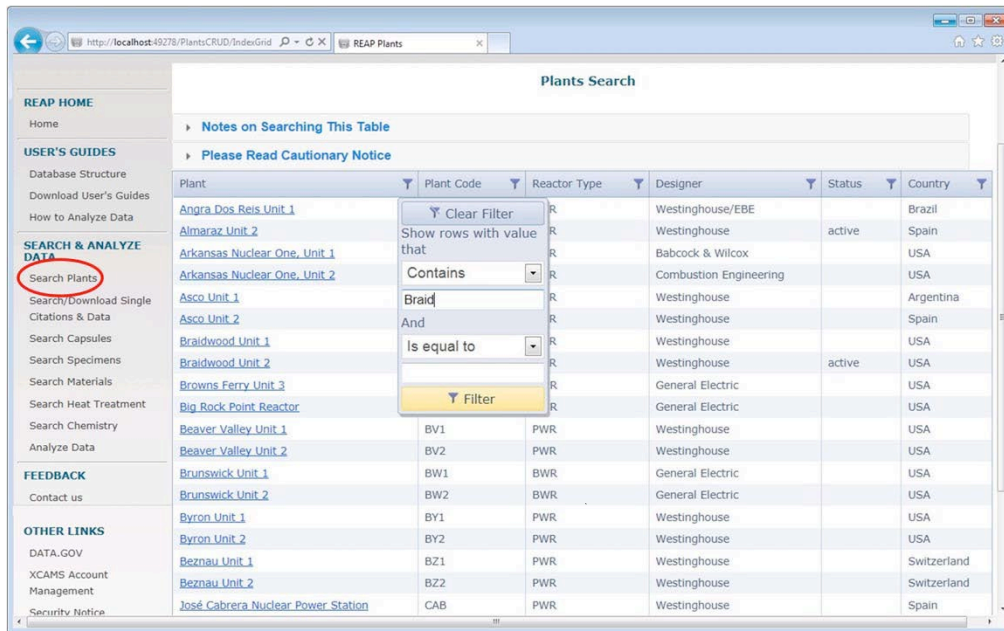


Figure 6 Refining The Search

The little filter symbol on the right side of the column headers of the Plants Table indicates that users can set up a compound search criterion for that column. Figure 6 shows information on the Braidwood plant.

If a column header has a filter icon (a symbol located to the right of the header field), then the data in this column are searchable. Click on the filter icon, and specify the search criteria. Two criteria can be specified by selecting one of the following relationships from the dropdown list:

- Is equal to
- Is not equal to
- Starts with
- Contains
- Does not contain
- Ends with

After the search criteria have been specified, start the search by clicking the "Filter" button or by hitting "Enter" on your keyboard. You can clear the filter by clicking on the "Clear Filter" button in the dropdown dialog.

These search filters are additive and more than one column may have search criteria. Thus, users can set up a filter on the Plant column and then add another search filter for designer or country. The search filters work the same for all REAP tables.

Moreover, note that if a data field is underlined, this indicates a link to a "Details" view of the data in the selected row.

2.6 Searching the Database for Cited Reports

REAP website provides access to information in two forms:

- A Document Archive, which provides access to files in PDF format of original source documents (e.g., technical reports), and
- A Data Archive, which provides access, in a relational database format, to information extracted from the document archive.

This release of REAP focuses on data collected as part of surveillance programs for light-water, moderated, nuclear power reactor vessels operated in the United States. This includes data on Charpy V-notch energy, tensile properties, composition, exposure temperature, flux, and fluence. Additionally, REAP contains some data from surveillance programs conducted in other countries. These reports can be searched by several search criteria as shown in Figure 7.

The document archive and the data archive can both be accessed via the Search/Download Single Citations & Data link under the Search & Analyze Data section to the left. Here copies of individual documents can be downloaded from the document archive, and the data from each document can be downloaded into a separate Excel workbook.

Search Capabilities: Looking for Reports

The screenshot shows a web browser window with the URL <http://localhost:49278/Citation/SimpleQuery>. The page header includes "NATIONAL LABORATORY managed by UT-Battelle for Department of Energy" and "Program sponsored by the Nuclear Regulatory Commission". Below the header, there is a "Please Read Cautionary Notice" link. The "Search Options" section contains the following fields:

- Title contains:
- Plant:
- Country:

There are also "New Search" and "Search" buttons. Below the search options, a list of search criteria is displayed:

- Citations can be located by
 - Plant name
 - Words in the title
 - Country

Figure 7 Searching for Reports

Users will be provided with some search options such as words contained in the title or a particular plant or country of interest.

In Figure 8, we are looking for all reports (which are usually referred to as citations in REAP) that have the word beaver valley in the title. So we are looking for reports for the Beaver Valley plant.

Users who would like to work with the data from this report in a spreadsheet form, you can click on the Excel icon in the left-most column to download a Microsoft Excel workbook. To download the data in spreadsheet format, click on the link “Search/Download Single Citations & Data”. See Figure 8 below.

Download an Excel workbook with all data.

Search Options

Title contains: Plant:
Country:

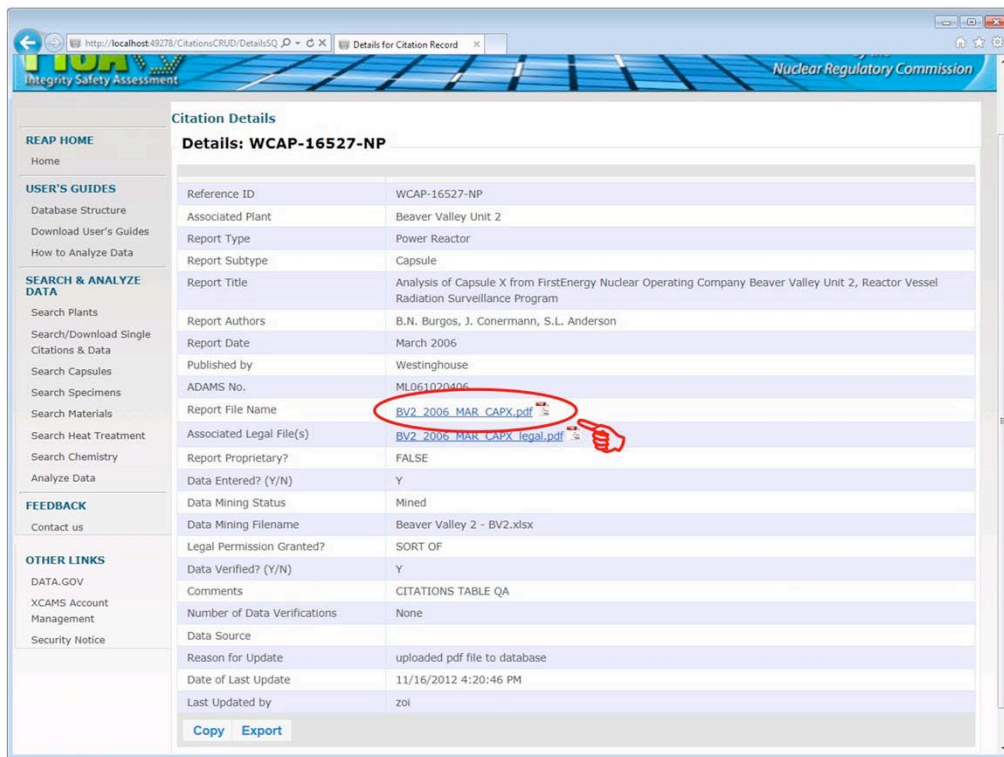
Citations List: Your search

Show 10 entries
Showing 1 to 10 of 12 entries

[Download Excel Workbook if available](#)

Ref ID	Specimen Table	Cherry Table
WCAP-15571-NP	WCAP-15571-NP, Analysis of Capsule Y from FirstEnergy Nuclear Operating Company Beaver Valley Unit 1 Reactor Vessel Radiation Surveillance Program, Revision 1	WCAP-15571-NP, Analysis of Capsule Y from FirstEnergy Nuclear Operating Company Beaver Valley Unit 1 Reactor Vessel Radiation Surveillance Program, Revision 1
WCAP-15571-NP/R1/S1	WCAP-15571-NP, Analysis of Capsule Y from FirstEnergy Nuclear Operating Company Beaver Valley Unit 1 Reactor Vessel Radiation Surveillance Program, Revision 1	WCAP-15571-NP, Analysis of Capsule Y from FirstEnergy Nuclear Operating Company Beaver Valley Unit 1 Reactor Vessel Radiation Surveillance Program, Revision 1
WCAP-15675	Analysis of Capsule W from FirstEnergy Nuclear Operating Company Beaver Valley Unit 2 Reactor Vessel Radiation Surveillance Program	Analysis of Capsule W from FirstEnergy Nuclear Operating Company Beaver Valley Unit 2 Reactor Vessel Radiation Surveillance Program
WCAP-16527-NP	Analysis of Capsule X from FirstEnergy Nuclear Operating Company Beaver Valley Unit 2, Reactor Vessel Radiation Surveillance Program	Analysis of Capsule X from FirstEnergy Nuclear Operating Company Beaver Valley Unit 2, Reactor Vessel Radiation Surveillance Program

Figure 8 Download Report's Data In Spreadsheet format



Citation Details
Details: WCAP-16527-NP

Reference ID	WCAP-16527-NP
Associated Plant	Beaver Valley Unit 2
Report Type	Power Reactor
Report Subtype	Capsule
Report Title	Analysis of Capsule X from FirstEnergy Nuclear Operating Company Beaver Valley Unit 2, Reactor Vessel Radiation Surveillance Program
Report Authors	B.N. Burgos, J. Conermann, S.L. Anderson
Report Date	March 2006
Published by	Westinghouse
ADAMS No.	ML061020406
Report File Name	BV2_2006_MAR_CAPX.pdf
Associated Legal File(s)	BV2_2006_MAR_CAPX_legal.pdf
Report Proprietary?	FALSE
Data Entered? (Y/N)	Y
Data Mining Status	Mined
Data Mining Filename	Beaver Valley 2 - BV2.xlsx
Legal Permission Granted?	SORT OF
Data Verified? (Y/N)	Y
Comments	CITATIONS TABLE QA
Number of Data Verifications	None
Data Source	
Reason for Update	uploaded pdf file to database
Date of Last Update	11/16/2012 4:20:46 PM
Last Updated by	zoi

[Copy](#) [Export](#)

Figure 9 Citation Details

After clicking on Search, we find that there are 12 reports in the REAP database that meet this criterion. As an example, see **Figure 9**. Let's look at the WCAP-16527-NP report. We click on the link WCAP-16527- NP. Clicking on that link takes us to the Details page for this citation. We can see the title of the report, the list of authors, publication date, and who published the report.

Note that in the Citation Details page, Figure 10, there is a link to the stored PDF file that can be conveniently opened in your browser.

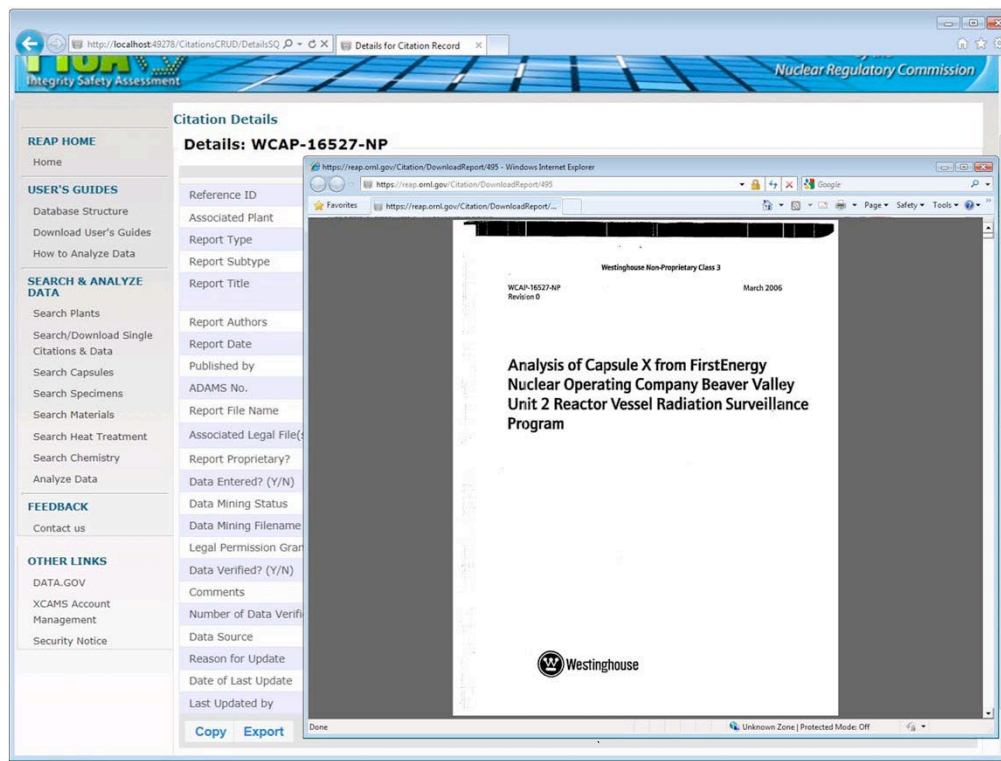


Figure 10 Link To The Report In PDF Format.

Clicking on the link to the PDF file, the system opens a new window containing the report itself where you can either read the report online, or download it to your computer.

2.6.1 Reference ID Formatting

In REAP, a citation's reference id must be a unique character string, typically the internal report number. For example, a report issued by Battelle Columbus Laboratories would have a reference ID starting with the prefix "BMI" (Battelle Memorial Institute) and ending with the unique report number, BMI-0584. A report prepared by Westinghouse Corporation would have a report number starting with "WCAP" and ending with its unique report number; therefore, the corresponding citation's reference id should be, for example, WCAP-10086.

2.6.2 ADMAS Accession Number Formatting:

At the NRC's ADAMS web site <http://adams.nrc.gov/wba/> , there are two libraries that can be searched.

1. Public Library: the accession numbers are formatted with an ML prefix, e.g., ML061020406
2. Public Legacy Library: the accession numbers are formatted without an ML prefix, e.g. 9510230407 or 018480

For the Public Legacy Library, any leading zeroes must be included in the accession number.

2.6.2.1 Notes on Searching for Documents in the NRC ADAMS Database

When searching for documents using the ADAMS accession numbers, under the Content Search or Advanced Search tabs, choose Property: Accession Number, and the Operator field can be set to "is equal to", "is not equal to", "starts with", or "not starts with", The Accession Number prefix conventions cited above must be adhered to.

For example, if you try to search for 061020406 in the Public Library, the search will not return a document; however, if you use ML061020406 in the Public Library, the search will be successful. Also, if you use a number with an ML prefix in the Public Legacy Library, you will not have a successful search. The system does not come back with an error message, just no document. For documents in the Public Legacy Library, accession numbers such as 018480 require the leading zero to be a part of the search to have a successful result.

In REAP, if the report is also in the NRC's public ADAMS database, then the ADAMS accession number will be given.

2.7 Searching for Surveillance Capsules

Users can also search for individual capsules and you can refine your search using the individual search filters for each column. Select the Search Capsules link in the left navigation panel as shown in Figure 11 Search for Surveillance Capsules

The CAPSULE table records the exposure information for each capsule described in a particular citation. Each citation will contain this information for (a) the current capsule for which the citation is reporting Charpy and tensile data, and (b) for all previous capsules. The data in the capsule table should be recorded for both the current capsule and for all previous capsules. Thus, if the citation being entered is for the 3rd capsule in the series there will be 3 rows in the CAPSULE table for this citation. The reason for entering the information for previous capsules is that sometimes the data (e.g., fluence) is updated in subsequent reports. The exposure parameters entered in the CAPSULE table characterize the capsule. As such, the rows in which the CAPSULE table data appear should not contain any information available in the CHARPY and TENSILE tables. In some reports, specimen-specific fluence values have been reported. There is a column to record this information in both the CHARPY and TENSILE tables. Such specimen-specific data should not be recorded in the CAPSULE table.

Search Capabilities: By Capsules

The screenshot displays the 'Surveillance Capsules Search' interface. The left sidebar contains navigation links under 'REAP HOME', 'USER'S GUIDES', 'SEARCH & ANALYZE DATA', and 'FEEDBACK'. The 'SEARCH & ANALYZE DATA' section is expanded, and 'Search Capsules' is highlighted with a red circle and a hand icon. The main area shows a table of search results with columns: Plant, Ref. ID, Country, Capsule, EFPY, Fluence x 10⁻¹⁸, and Entry No. A filter dialog is open over the 'Capsule' column, showing a search for 'W300' and a 'Filter' button.

Plant	Ref. ID	Country	Capsule	EFPY	Fluence x 10 ⁻¹⁸	Entry No.
Beaver Valley Unit 1	WCAP-10867	USA	W		540	1
Beaver Valley Unit 1	WCAP-9860	USA	W		550	1
Beaver Valley Unit 1	WCAP-12005	USA	W		490	1
Beaver Valley Unit 1	WCAP-15571	USA	W		170	1
Beaver Valley Unit 1	WCAP-15571	USA	W		500	2
Beaver Valley Unit 2	WCAP-12406	USA	W		990	1
Beaver Valley Unit 2	WCAP-15675	USA	W		250	1
Brunswick Unit 2	WCAP-14774	USA	W300		406	1
Byron Unit 1	WCAP-11651	USA	W		500	1
Byron Unit 1	WCAP-15123/R1	USA	W		300	2
Byron Unit 1	WCAP-15123/R1	USA	W	0.000	24.100	1
Byron Unit 1	WCAP-13880	USA	W	0.000	14.430	1
Byron Unit 2	WCAP-12431	USA	W	0.000	3.960	1
Byron Unit 2	WCAP-14064	USA	W	4.622	12.110	1

Figure 11 Search for Surveillance Capsules

The sub-sections below elaborate on some fields of the Capsules table that REAP users may find confusing.

2.7.1 Entry No. Field

The REAP team added this column to allow us to store multiple records for the same capsule and citation. That is, to allow us to store two or more records for the same plant + capsule name + citation. In this case, capsule records will have the same values for plant_id, citation_id, and capsule_name, but they will have different values for entry_no. The new entry_no column just numbers these entries sequentially. So, if there are three capsule records for the same plant + capsule name + citation, the first will have an entry_no of 1, the second will have an entry_no of 2, and the third will have an entry_no of 3. In Figure 12 the Entry No. field can be seen at the right side of the screen.

Surveillance Capsules Search

Notes on Searching This Table

Plant	Ref. ID	Country	Capsule	EFPY	Fluence x 10 ⁻¹⁴	Entry No.
Oconee Nuclear Station Unit 1	BAW-1421/R1	USA	E	0.847	0.830	1
Oconee Nuclear Station Unit 1	BAW-1436	USA	E	1.644	1.500	1
Oconee Nuclear Station Unit 2	BAW-1432	USA	C	1.205	0.943	1
Oconee Nuclear Station Unit 3	BAW-1438	USA	A	0.945	0.739	1
Three Mile Island Nuclear Station Unit 1	BAW-1439	USA	E	1.290	1.070	1
Arkansas Nuclear One, Unit 1	BAW-1440	USA	E	0.945	0.727	1
North Anna Unit 1	BAW-1638	USA	Y	1.131	2.490	1
Crystal River Unit 3	BAW-1679/R1	USA	B	0.736	1.050	1
Oconee Nuclear Station Unit 3	BAW-1692	USA	B	0.945	0.739	2
Oconee Nuclear Station Unit 3	BAW-1692	USA	B	0.925	2.383	3
Oconee Nuclear Station Unit 3	BAW-1692	USA	B	0.000	3.120	1
Arkansas Nuclear One, Unit 1	BAW-1698	USA	B	0.945	0.727	2
Arkansas Nuclear One, Unit 1	BAW-1698	USA	B	1.024	3.550	3
Arkansas Nuclear One, Unit 1	BAW-1698	USA	B	0.000	4.280	1
Oconee Nuclear Station Unit 2	BAW-1699	USA	A	1.205	0.943	2
Oconee Nuclear Station Unit 2	BAW-1699	USA	A	0.925	2.430	3
Oconee Nuclear Station Unit 2	BAW-1699	USA	A	0.000	3.370	1
Davis-Besse Nuclear Power Station Unit 1	BAW-1701	USA	E	1.024	1.960	1
Rancho Seco Unit 1	BAW-1702	USA	B	0.467	0.529	2
Rancho Seco Unit 1	BAW-1702	USA	B	1.024	3.460	3
Rancho Seco Unit 1	BAW-1702	USA	B	0.000	3.990	1

Figure 12 Capsule Table Search Results

2.7.2 Instructions for WCAP Reports (Westinghouse Reports):

In WCAP reports:

- Table 7-1 typically contains much of the information needed for both the current and the previous capsules.
- Flux and dpa information are usually included in the detailed tables that appear in Chapter 6.

If the specific EFY and azimuthal location are missing from these tables, use linear interpolation to determine the flux and dpa information appropriate to each capsule.

2.7.3 Change in Irradiation Environment Field

The Change in Irradiation Environment Field in the Capsules Table is an indicator for change in irradiation environment, i.e., if a capsule was irradiated in one reactor for a period of time and then moved to another reactor for further irradiation. These records represent cases where a capsule was irradiated multiple times, perhaps in different environments.

2.8 Searching the Database for Specimen Data

In REAP, users can search for details on the specimen data that are in individual capsules. Click in the Search Specimens link as shown in Figure 13.

Search Capabilities: By Specimens

The screenshot displays the REAP Specimens search interface. The header includes the Oak Ridge National Laboratory logo and the PISA (Probabilistic Pressure Boundary Integrity Safety Assessment) program logo, sponsored by the Nuclear Regulatory Commission. The main content area is titled "Specimen Search" and contains a table of specimen data. A filter dropdown menu is open, showing options to filter by "Charpy" and "Tensile" specimen types. The table lists various specimens, including those from Comanche Peak Unit 1 and Crystal River Unit 3, with columns for Plant, Ref. ID, Capsule, Specimen Type, and a link to the detailed view. The "Search Specimens" link in the left sidebar is highlighted with a red circle and a hand icon. The "Details" link in the table is also highlighted with a red circle.

Plant	Ref. ID	Capsule	Specimen Type	Link to Detailed View
Comanche Peak Unit 1	WCAP-15144	Y	Charpy	
Comanche Peak Unit 1	WCAP-15144	Y	Tensile	
Cooper	MDE-103-0986	1	Charpy	
Cooper	MDE-103-0986	1	Tensile	
Cooper	GE-NE-523-159-1292	300D	Charpy	
Cooper	GE-NE-523-159-1292	300D	Tensile	
Crystal River Unit 3	BAW-1679/R1	B	Charpy	
Crystal River Unit 3	BAW-1679/R1	B	Tensile	
Crystal River Unit 3	BAW-1898	C	Charpy	
Crystal River Unit 3	BAW-1898	C	Tensile	
Crystal River Unit 3	BAW-1899	D	Charpy	Details
Crystal River Unit 3	BAW-1899	D	Tensile	Details
Crystal River Unit 3	BAW-2049	E	Charpy	Details
Crystal River Unit 3	BAW-2049	E	Tensile	

Figure 13 Search By Specimens

Charpy Data in Capsule F as cited in BAW-2049

Charpy data from Capsule F

Plant	Crystal River Unit 3
Citation Ref_id	BAW-2049
Capsule Name	F
Steel Grade	A533B1
Specimen Type	Charpy
Specimen SubType	CVN Std
Temperature Units	F
CVE Units	FT-LB
Lateral Exp. Units	MIL
Size	
Position	
TUP Geometry	
Test Standard(s)	
Import ID	9598
Drawing File Name	
Report Location	5-1, 5-4
Data Source	Data were imported from the old PREDB database.
Reason for Update	Imported from old Predb database
Date of Last Update	1/13/2012 2:20 PM
Last Updated by	System

Spec. No.	Product Form	Orientation	Temp.	CVE	Lateral Exp.	Shear %
NN376	HAZ	TL	400.0	64.0	59	100
NN388	HAZ	TL	450.0	66.0	61	100
NN349	HAZ	TL	550.0	64.0	54	100

Figure 14 Sample Charpy Specimen Data

As an example, in Figure 14 users can see the Details page for the Charpy data that was collected from surveillance Capsule F taken from Crystal River Unit 3 as given in the Babcock and Wilcox report, with report number BAW-2049.

The screenshot shows a web browser window with the address bar displaying 'http://localhost:49278/Specimens/'. The page title is 'Charpy Data'. The main content area contains a form with various fields and a table of data.

Form Fields:

- CVE Units: FT-LB
- Lateral Exp. Units: MIL
- Size:
- Position:
- TUP Geometry:
- Test Standard(s):
- Import ID: 9598
- Drawing File Name:
- Report Location: 5-1, 5-4
- Data Source: Data were imported from the old PREDB database.
- Reason for Update: Imported from old Predb database
- Date of Last Update: 1/13/2012 2:20 PM
- Last Updated by: System

Table Data:

Spec. No.	Product Form	Orientation	Temp.	CVE	Lateral Exp.	Shear %
NN376	HAZ				59	100
NN388	HAZ				61	100
NN349	HAZ	TL	550.0	64.0	54	100
NN382	HAZ	TL	20.0	17.0	15	40
NN356	HAZ	TL	70.0	26.0	20	40
NN391	HAZ	TL	110.0	31.0	24	50
NN357	HAZ	TL	160.0	45.0	38	100
NN364	HAZ	TL	200.0	56.0	51	100
NN361	HAZ	TL	260.0	53.0	48	100
NN362	HAZ	TL	330.0	58.0	55	100

A tooltip is displayed over the 'Product Form' column header, containing the text: 'e.g., P= Plate, W=Weld, HAZ= Heat Affected Zone, F=Forging, SRM=Standard Reference Material'.

At the bottom of the table, there is a pagination control showing '1 2 3 4' and a status message 'Displaying Items 1 - 10 of 32'. A 'Return to Specimen Search' button is also visible.

Figure 15 Sample Context Sensitive Help By Using Tooltip

REAP's tables have integrated a very useful help feature. REAP has context-sensitive help that is displayed when users place their cursor on top of the table columns' names. Figure 15 is an example of the approach we are using in REAP for providing context-sensitive help by using a tooltip.

Users can bring up the tooltip by hovering the mouse over the column header, in this case the Product Form column, and a tooltip will appear giving more details on the kinds of information available in this column.

2.9 Searching the Database for Material Data

Users can also search the database for particular materials of interest by selecting the Materials link at the left navigation panel (see **Figure 16**). Again the ability to refine your search by using compound search criteria is available to users.

The MATERIAL table records data that describe the material, such as product form, flux type, etc.

Search Capabilities: By Materials

Materials Search

Notes on Searching This Table

Please Read Cautionary Notice

ID	Ref. ID	Capsule	Heat No.	Heat ID	Product Form	Steel Grade
1	BMI-0372	E	A0421	SASTM	SRM	
2	BMI-0673	V	A0421	SASTM	SRM	
3	BMI-1070	A	A0421	SASTM	SRM	
4	FP-RA-1	V	A0421	SASTM	SRM	
5	GEGR-4443	BOL	A0421	SASTM	SRM	
6	PB-ME 75/02	V	A0421	SASTM	SRM	
7	PB-ME 75/03	B	A0421	SASTM	SRM	
8	SWRI-02-4397	BOL	A0421	SASTM	SRM	
9	SWRI-02-4397	V	A0421	SASTM	SRM	
9	SWRI-02-4531	I	A0421	SASTM	SRM	
10	SWRI-02-5131	S	A0421	SASTM	SRM	

Search Filter: Steel Grade

Clear Filter

Show rows with value that

Contains

A533B

And

Is equal to

Filter

A302B

Figure 16 Search By Materials

Figure 17 shows details on a weld material, including steel grade, heat ID, Heat No., and supplier. Information on the weld flux and weld wire was also provided in the report.



Material: weld	
Notes on the MATERIAL Table	
Details: weld Material ID: 130	
Product Form	weld
Steel Grade	A533B1
Heat ID	WAN201
Heat No.	83650
Supplier	COMBUSTION ENG.
Supplier ID	
Thickness	
Thickness Units	
Source	SIM
Weld Code	
Weld Flux Type	L0091
Weld Flux Lot	1122
Weld Material Supplier	COMBUSTION ENG.
Weld Type	SAW
Weld Wire Heat No.	83650
Weld Wire Type	B-4 MOD
HAZ Heat Base	

Figure 17 Details Of Sample Weld

The order of the entries in the *Report Locations* field reflects the order of the input fields in the MATERIAL form.

2.10 Searching the Database for Chemistry Content Records

Search Capabilities: By Chemistry

The screenshot displays the 'Chemistry Search' interface of the Oak Ridge National Laboratory database. The left sidebar contains navigation links: REAP HOME, USER'S GUIDES, and SEARCH & ANALYZE DATA. The 'Search Chemistry' link is highlighted with a red circle and a red arrow. The main content area shows a table of chemistry data with columns: Plant, Ref. ID, Capsule, Product Form, and Chemistry Details. A search filter is applied to the Chemistry Details column, showing 'Is equal to' and 'weld'. The table lists various materials and their chemistry details, including Almaraz Unit 2, Angra Dos Reis Unit 1, and Arkansas Nuclear One, Unit 1 and 2.

Plant	Ref. ID	Capsule	Product Form	Chemistry Details
Almaraz Unit 2	WCAP-9228	BOL	Plate	
Almaraz Unit 2	WCAP-9228	BOL	Weld	
Angra Dos Reis Unit 1	WCAP-8957	BOL	Forging	
Angra Dos Reis Unit 1	WCAP-8957	BOL	Weld	
Angra Dos Reis Unit 1	WCAP-16879-NP/R0	B	Forging	
Angra Dos Reis Unit 1	WCAP-16879-NP/R0	B	Weld	
Angra Dos Reis Unit 1	SWRI-06-8976	V	Forging	
Arkansas Nuclear One, Unit 1	BAW-1836	A	SRM	
Arkansas Nuclear One, Unit 1	BAW-1836	A	Weld	
Arkansas Nuclear One, Unit 1	BAW-1836	BOL	Weld	
Arkansas Nuclear One, Unit 2	BMI-0584	BOL	Plate	
Arkansas Nuclear One, Unit 2	BMI-0584	BOL	Weld	

Figure 18 Search By Chemistry

A search capability that will allow you to search for details of chemical composition for specific materials and product forms is available to you through the Search Chemistry link, see Figure 18.

The chemistry table stores data related to the chemistry content of materials. There can be more than one laboratory providing chemistry data for the same materials in one citation. If the origin of this set of chemistry values is from another report then this should be noted in the comments. As the chemistry information is often heavily footnoted to describe the origin of the various values, the page number in the report on which the chemistry table appears should be placed in the comments as well.

2.10.1 WCAP Specific Instructions (Westinghouse Reports)

For Westinghouse (WCAP) reports chemistry data can usually be found in Section 4.

2.11 Searching the Database for Heat Treatment Records

Users can get details on the heat treatments applied to individual materials by using the Search Heat Treatment link, see Figure 19.

The heat treatment table records information, such as temperature, duration, etc. specific to the heat treatment applied to a material. Heat treatment data are associated with a specific material. Heat treatment data should be associated with a specific material and should not contain any information already in the Charpy or tensile tables. Not all citations will have heat treatment data.

2.11.1 WCAP Specific Instructions (Westinghouse Reports)

If present, section 4 may contain heat treatment data.

Search Capabilities: By Heat Treatment

Heat Treatments Search

Plant	Ref. ID	Capsule	Product Form	Heat No.	Run No.	Heat Treatment ID
Comanche Peak Unit 1	WCAP-15144	Y	plate	C4533-2		
Comanche Peak Unit 1	WCAP-15144	Y	plate	C4533-2		
Comanche Peak Unit 1	WCAP-15144	Y	plate	C4533-2		
Comanche Peak Unit 1	WCAP-15144	Y	weld	88112		
Cooper	MDE-103-0986	1	plate	C2307-2		
Cooper	MDE-103-0986	1	weld	no heat number		
Cooper	GE-NE-523-159-1292	300D	plate	C2307-2		
Cooper	GE-NE-523-159-1292	300D	weld	no heat number		
Crystal River Unit 3	BAW-1679/R1	B	plate	C4344-1		
Crystal River Unit 3	BAW-1679/R1	B	plate	C4344-1		
Crystal River Unit 3	BAW-1679/R1	B	plate	C4344-1	3	664
Crystal River Unit 3	BAW-1679/R1	B	plate	C4344-1	4	665

Figure 19 Search By Heat Treatment

3 REAP Analysis Service

Analysis of Data

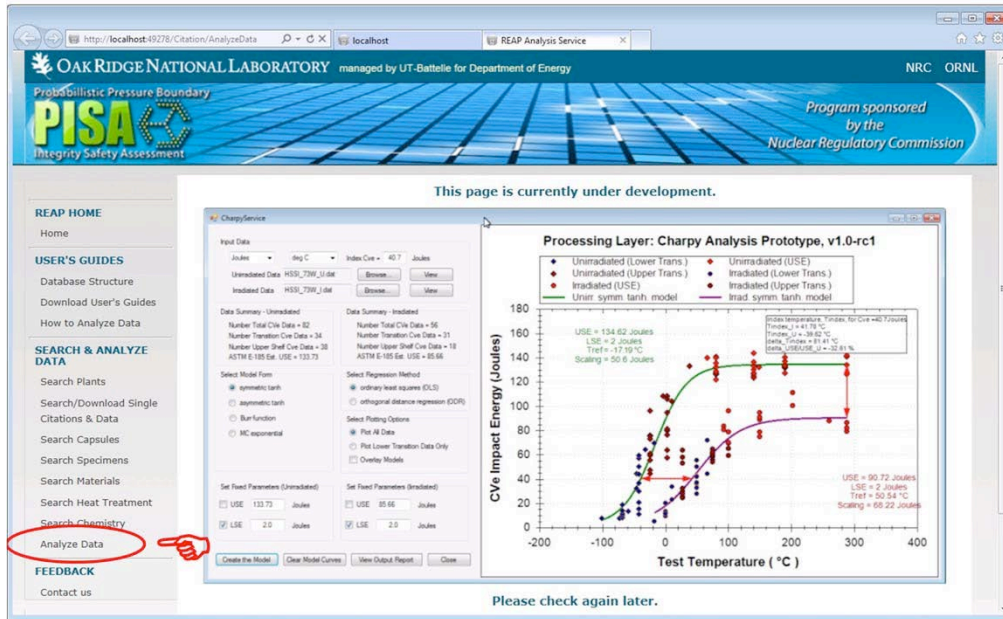


Figure 20 REAP Data Analysis

In this section, we present an overview of some of the tools that we are currently working on and hope to have available for you to use in the very near future, see **Figure 20**. We are developing a REAP Analysis

Service which will allow users to search for data, collect that data into datasets, and then carry out relevant analyses on those datasets.

We are currently working to provide REAP users with the ability to carry out useful analysis while users are logged onto REAP. Currently, when users click on the Analyze Data link, they will see a place-holder that says this page is currently under development, see Figure 21. These analysis capabilities will be available to users during the REAP session.

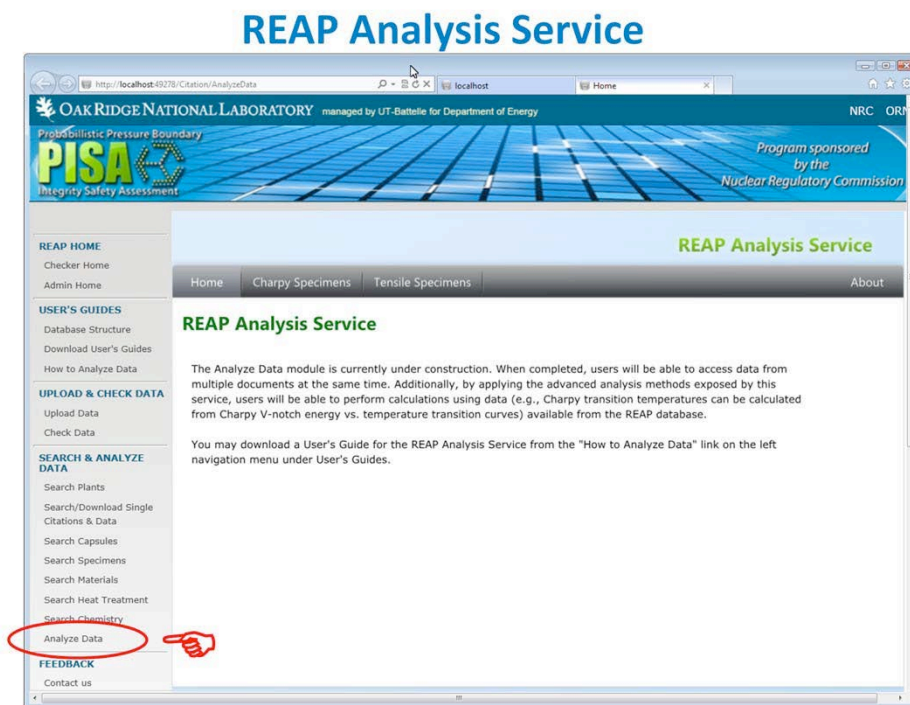


Figure 21 Analysis Service Place-Holder Page

For this prototype, the tab control organizes the analysis process into a logical sequence of steps, see Figure 22; for example

- (1) Create Charpy Datasets
- (2) Charpy Analysis – setup the models and carry out selected numerical analysis procedures
- (3) Data Visualization – visualize the results through online plots of the data overlaid by the results of the modeling analysis

A Tab Control organizes the analysis into a logical sequence of steps: (1) Create Charpy Datasets (2) Analysis (3) Visualization

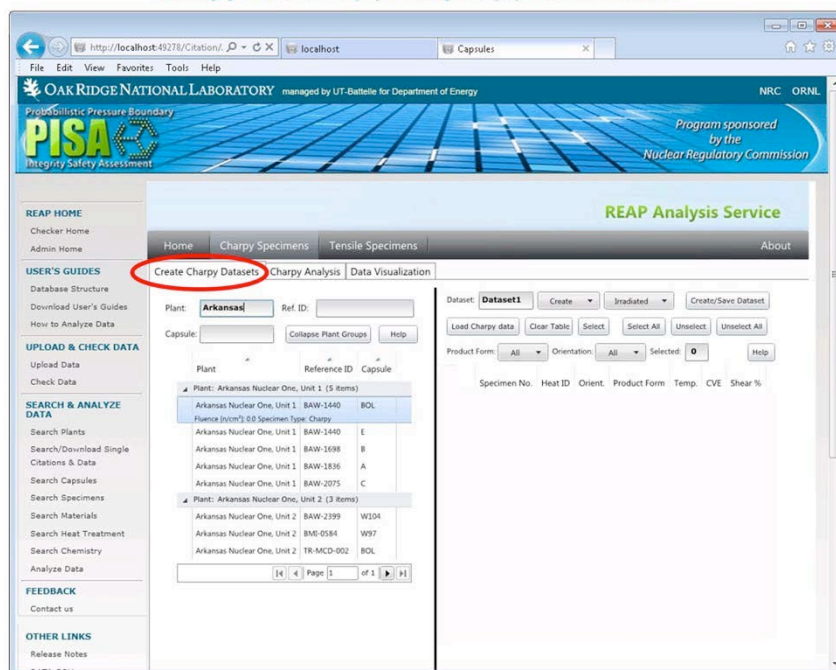


Figure 22 Tab Control Organization

The application talks to the REAP database through a secure WCF web service. Query filtering can be developed to any level of sophistication that is required.

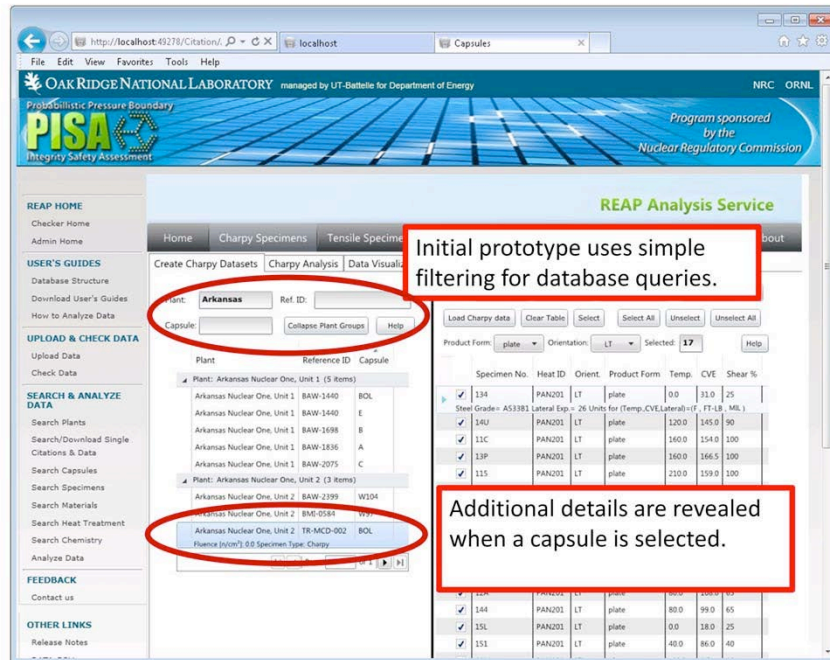


Figure 23 Sample Filtering of Data

The REAP Analysis Service communicates directly to the REAP database. We are working on developing search capabilities that cover a wide range of possibilities.

This initial prototype uses fairly simple search criteria, see Figure 23; however, the intent is to extend that search capability significantly beyond what is shown here in the prototype.

We are working on ways of allowing the user to see as much detail as possible of the data returned by the search.

Once a specific capsule has been selected, additional filtering is available. For the prototype, product form and orientation filters are implemented. Further filters can be easily developed.

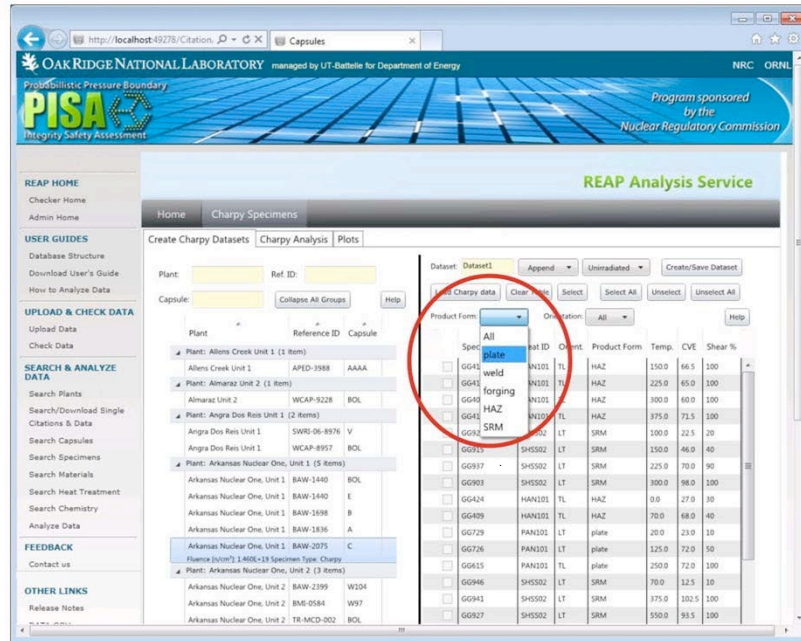


Figure 24 Easy Data Access Through Filters

Figure 24 shows data of a specific capsule. Once that capsule has been found, then additional refinement for selecting data can be performed if desired.

We are allowing the user great latitude in creating datasets.

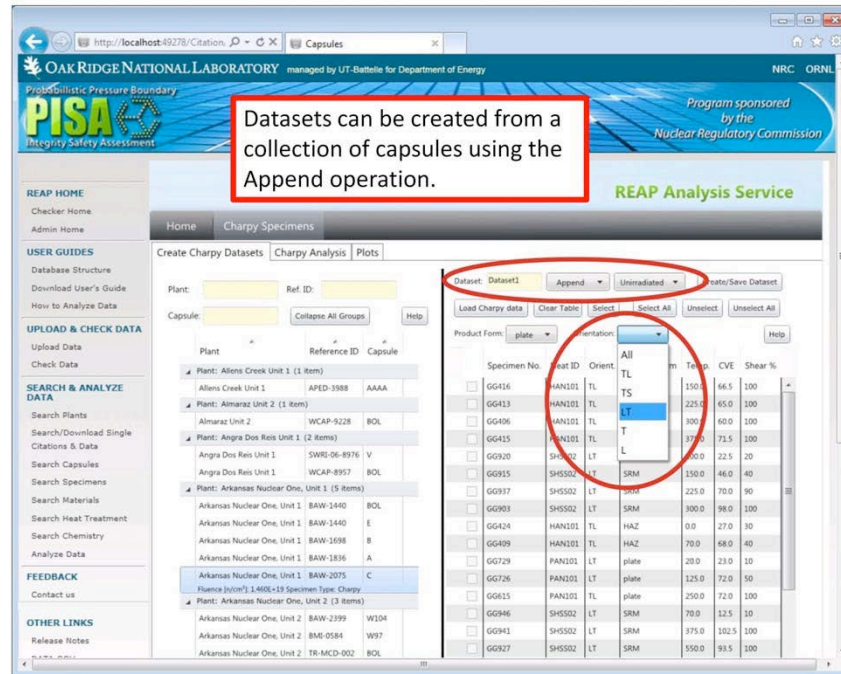


Figure 25 Datasets Creation

On Figure 25, we are looking for all the data available from the plate product form specimens in Capsule C that was taken from Arkansas Nuclear One, Unit 1. Now we can further refine the dataset by choosing a specific orientation. In the prototype, we allow the user to develop datasets from across plants, capsules, and materials by using the Create/Append operations.

We intend to extend these capabilities significantly in future development of the REAP Analysis Service.

Extensive use of informative tooltips will be included.

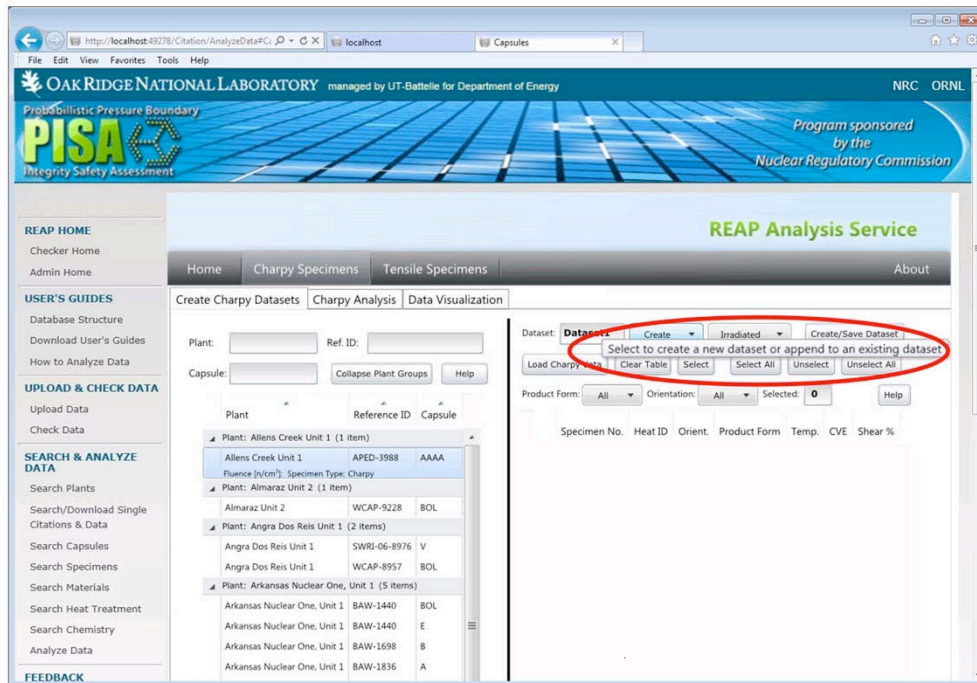


Figure 26 Context Sensitive Help Tooltips

As with the overall web application, we will continue to provide context-sensitive and online help throughout the REAP Analysis Service.

Online help will also be available throughout the application.

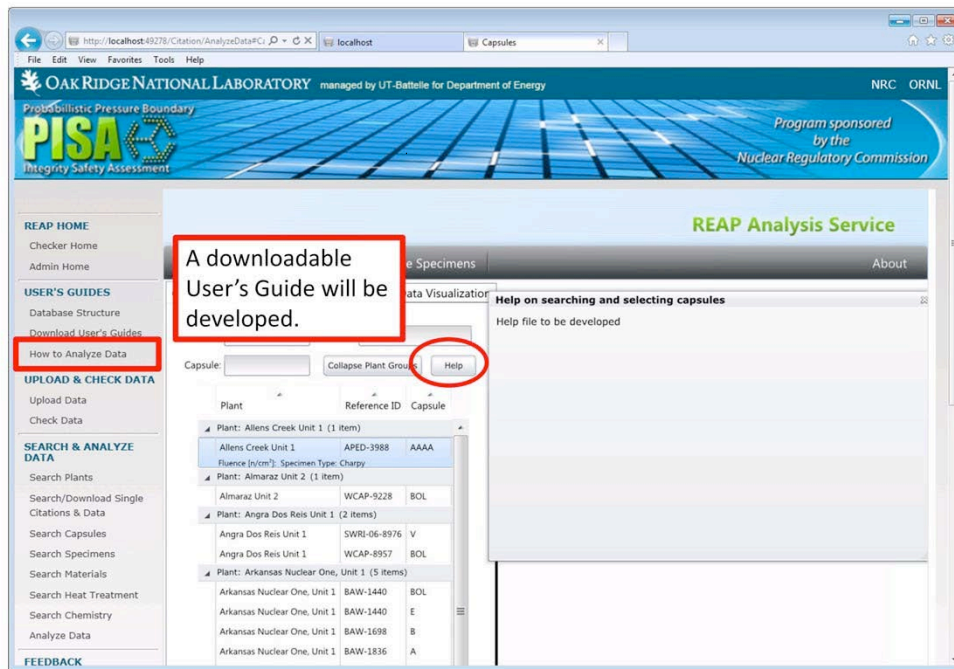


Figure 27 Online Help

As shown in Figure 27, we'll also have a downloadable User's Guide specifically developed for the Analysis Service.

The Charpy Analysis tab allows the user to create models and then compare the results of two user-selected datasets.

The Irradiated and Unirradiated folders are automatically created as an aid to the user, but do not restrict the user's selection of datasets.

Ref. ID	Capsule	Product Form	Orientation
TR-MCD-002	BOL	plate	LT

Specimen No.	Temp.	CVE	Shear %
134	-17.78	42.03	25.00
14U	48.89	196.59	90.00

Ref. ID	Capsule	Product Form	Orientation
BAW-1836	A	plate	LT
BAW-1698	B	plate	LT
BAW-1440	E	plate	LT
BAW-2075	C	plate	LT

Specimen No.	Temp.	CVE	Shear %
GG713	-18.89	29.83	0.00
GG702	131.11	146.43	100.00

Data Summary
 No. of CVN specimens = 33
 No. of transition CVN specimens = 19
 No. of upper shelf CVN specimens = 11
 ASTM E-185 Est. USE = 152.71 Joules

Create Model
 Model Form: symmetric tanh
 Regression: ordinary least squares (OLS)

Set Fixed Parameters
 Index Cve = 40.7 Joules
 Upper Shelf Energy: USE 214.90 Joules

Set Fixed Parameters
 Index Cve = 40.7 Joules
 Upper Shelf Energy: USE 152.71 Joules

Figure 28 Charpy Analysis Tab

The Charpy Analysis tab, see Figure 28, allows the user to create models which can be applied to previously developed datasets. Currently, the prototype focuses on comparing only two datasets.

The created datasets are stored in a secure area on the user's computer and are available for future sessions.

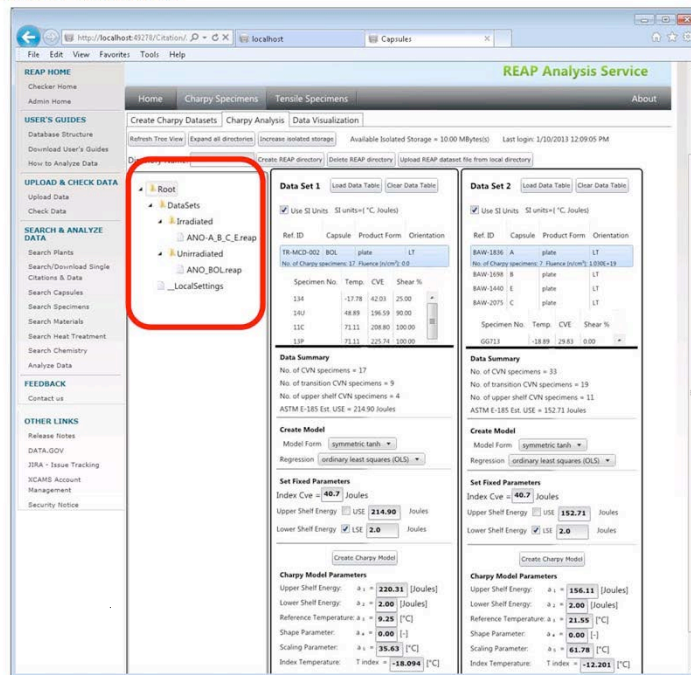


Figure 29 Session Persistence Capabilities

We recognize that session persistence is an important part of any analysis service. We provide the user with the capability of carrying out work during one session, see Figure 29. Users can log out of the session and then return at some later date to pick up right where they left off.

The previously developed datasets, models, and analysis results should be available to users upon their return during a new session.

These next few slides show some the features currently available with the prototype. On Figure 30, we are selecting a model form among several options made available to the user.

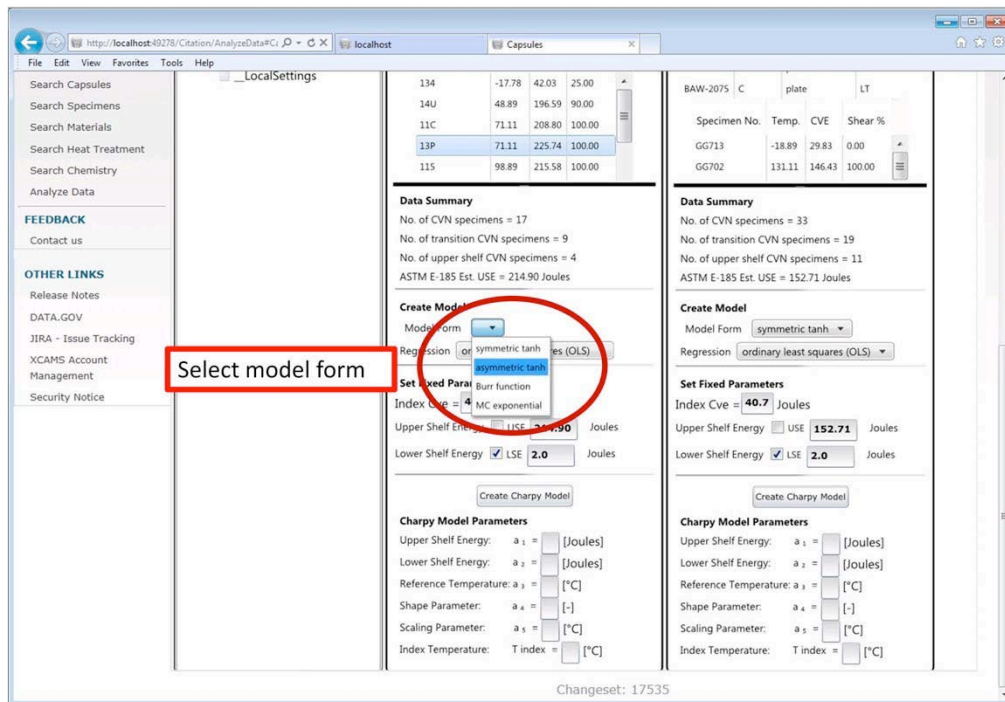


Figure 30 Selection of Model Form

We can then select a curve fitting method, see **Error! Reference source not found.**

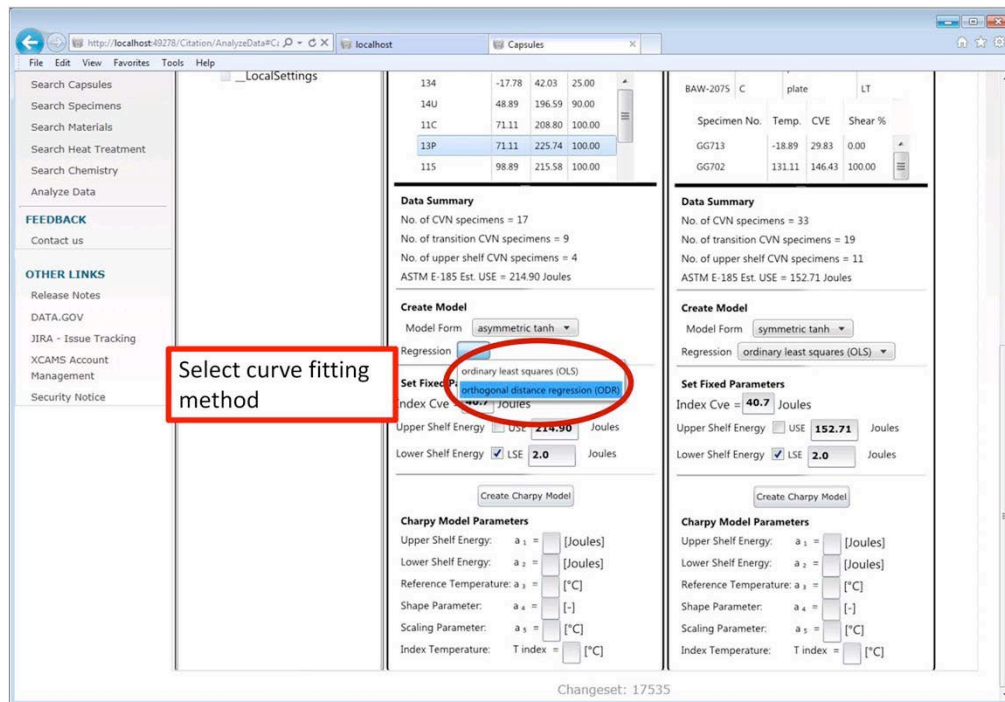


Figure 31 Selection of Curve Fitting Method

On Figure 32, we can choose which parameters of the selected model can be set to constants and which need to be fitted by the analysis using the provided dataset.

The screenshot displays a web-based application for analyzing Charpy impact data. The interface is divided into several sections:

- SEARCH & ANALYZE DATA:** A sidebar on the left with links for Search Plants, Search/Download Single Citations & Data, Search Capsules, Search Specimens, Search Materials, Search Heat Treatment, Search Chemistry, Analyze Data, FEEDBACK, and OTHER LINKS.
- Model Selection:** A central panel showing a tree view of models (ANO-A, B, C, E, reapi; Unirradiated; ANO, BOL, reapi; _LocalSettings) and a table of specimen data.
- Data Summary:** A section providing statistics on the dataset, such as the number of CVN specimens and transition CVN specimens.
- Create Model:** A section for configuring the model, including Model Form (symmetric tanh) and Regression (ordinary least squares (OLS)).
- Set Fixed Parameters:** A section for specifying which parameters are fixed and which are estimated by the model. This section includes checkboxes for 'Index Cve', 'Upper Shelf Energy', and 'Lower Shelf Energy'.
- Charpy Model Parameters:** A section for defining the parameters of the Charpy model, including Upper Shelf Energy, Lower Shelf Energy, Reference Temperature, Shape Parameter, Scaling Parameter, and Index Temperature.

A red box highlights the 'Set Fixed Parameters' section, and a red oval highlights the 'Check box to fix upper shelf energy' checkbox. The text 'Select parameters to be fixed or fitted by model' is overlaid on the red box.

Figure 32 Selection of Parameters

The Data Visualization Tab currently plots the data sets and overlays the results of the curve fitting operation.

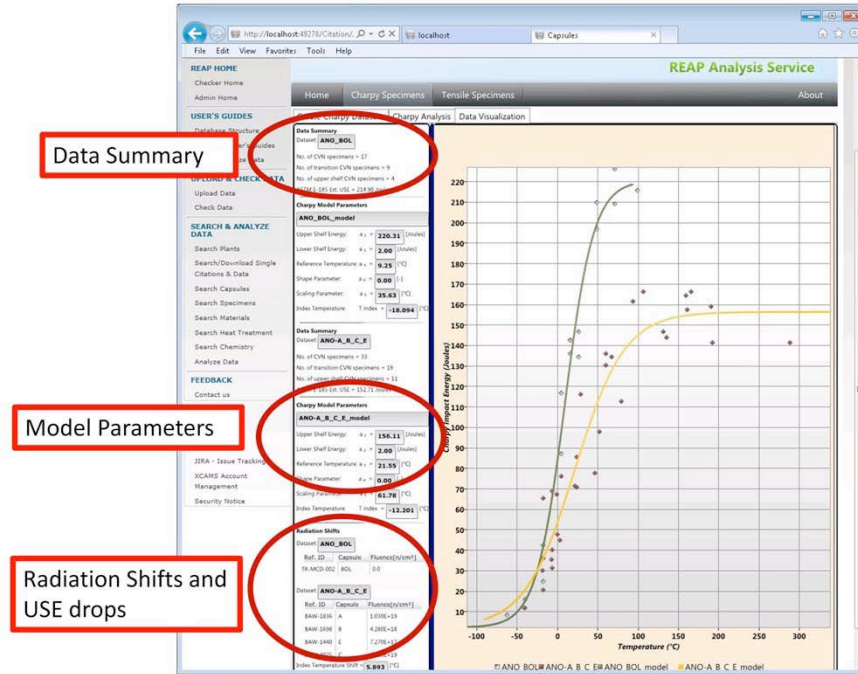


Figure 33 Data Visualization Tab

After clicking on the Create Model buttons, we can then move over to the Data Visualization tab, see Figure 33. On this tab, you will see plots of the datasets overlaid by the results of the model analyses on the two datasets. You can also see summaries of the datasets, the model parameters determined by the analysis.

Zooming in a little bit closer, we can see comparisons of the two datasets, which will show you the resulting radiation shifts and USE drops, see Figure 34.

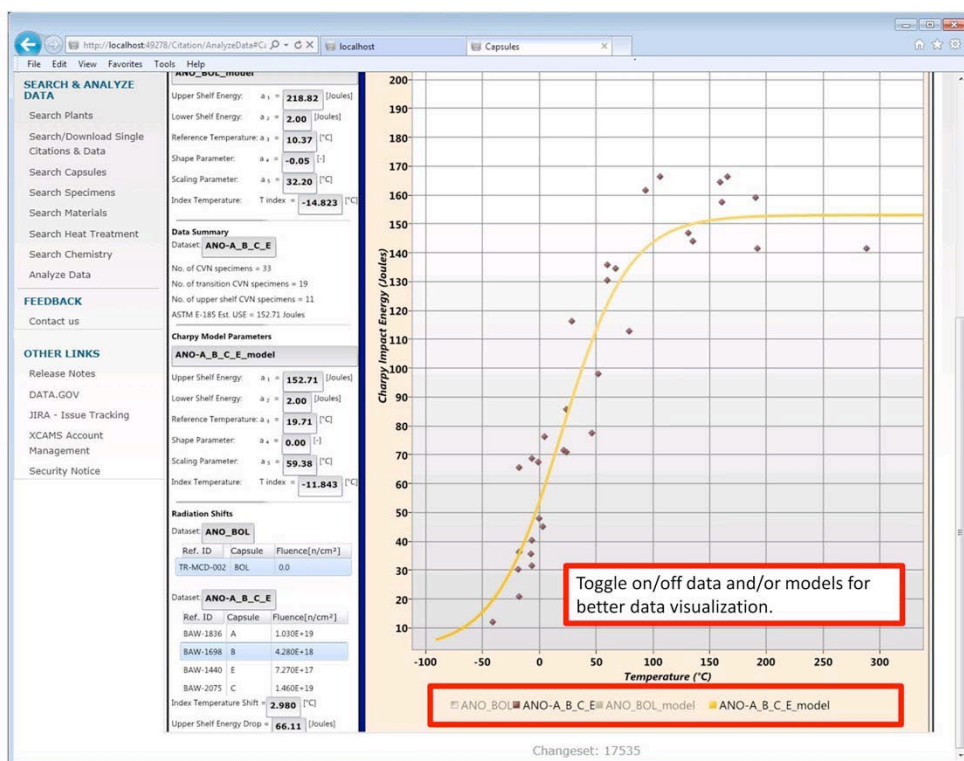


Figure 34 Image Zooming Capability

We are also working on making the plotting of data and results as dynamic as possible to allow users to be able to manipulate the presentation to reveal the kind of information that they are looking for.

As an example of this dynamic capability, along the legend at the bottom of the plot you can toggle off or on models and/or data to isolate certain aspects of the analysis.

4. References

1. Klasky, H. B., et al “*Radiation Embrittlement Archive Project*”, Transactions, SMiRT-22, Division II, San Francisco, CA, USA, August 18-23, 2013.
2. Wang, John Jy-An (2010), “Lessons Learned From Developing Reactor Pressure Vessel Steel Embrittlement Database” ORNL/TM-2010/20, Oak Ridge National Laboratory, Oak Ridge, TN
3. International Atomic Energy Agency (IAEA), Nuclear Power Reactors in the World, Reference data Series No. 2, Vienna April 2006
4. US Nuclear Regulatory Commission (NRC) 2010-2011 Information Digest, NUREG-1350, Volume 22.

5. Appendix A – Mining of surveillance data of irradiated capsules into REAP web application

Notes from Sashi Tadinada, PhD

The steps in mining data from a citation are:

Step 1. Begin search of citations using filters shown below.

Step 2. Get the pdf report and download.

Step 3: After selecting and downloading the citation to be mined, begin the process by adding a new Capsule.

Step 4. Add Material data.

Step 5. Add Heat Treatment.

Step 6. Add Charpy Data

Step 7. Add Tensile Data

Step 8. Add Chemistry Data

The following pages detail each of these steps with screenshots.

5.1 Step 1. Begin search of citations using filters shown below.

- Go to REAP main page: <https://reap.ornl.gov/>
- In the left pane menu, click on “Search/Download Single Citations & Data” under the section “SEARCH & ANALYZE DATA”.



- The link navigates to <https://reap.ornl.gov/Citation/SimpleQuery>. Search for the citation to be mined by entering the search criteria

Search Options

Ref ID: Plant:

Title: Data Entered:

Country: Data Verified:

Report Filename: Mining Status:


Include Discards:

Citations List: Your search returned 2 citation(s).

Show entries

Showing 1 to 2 of 2 entries

Search:

Download Excel Workbook if available	Ref ID	Title	Data Entered	Country	Mining Status
	WCAP-14279-R01	Evaluation of Capsules from Kewaunee & Capsule A-35 from MYNP Reactor Vessel Radiation Surveillance Programs.	Y	USA	Mined

5.2 Step 2. Get the pdf report and download.



- Click on the citation of interest for details

Citations List: Your search returned 2 citation(s).

Show entries

Showing 1 to 2 of 2 entries


Search:

Download Excel Workbook if available	Ref ID	Title	Data Entered	Country	Mining Status
	WCAP-14279-R01	Evaluation of Capsules from Kewaunee & Capsule A-35 from MYNP Reactor Vessel Radiation Surveillance Programs.	Y	USA	Mined
	WCAP-14279-R1	ANALYSIS OF CAPSULE S FROM THE WISCONSIN PUBLIC SERVICE CORPORATION KEWAUNEE NUCLEAR PLANT REACTOR VESSEL RADIATION SURVEILLANCE PROGRAM	Y	USA	Mined

- The link displays the details of the citation. Download the PDF containing the surveillance data

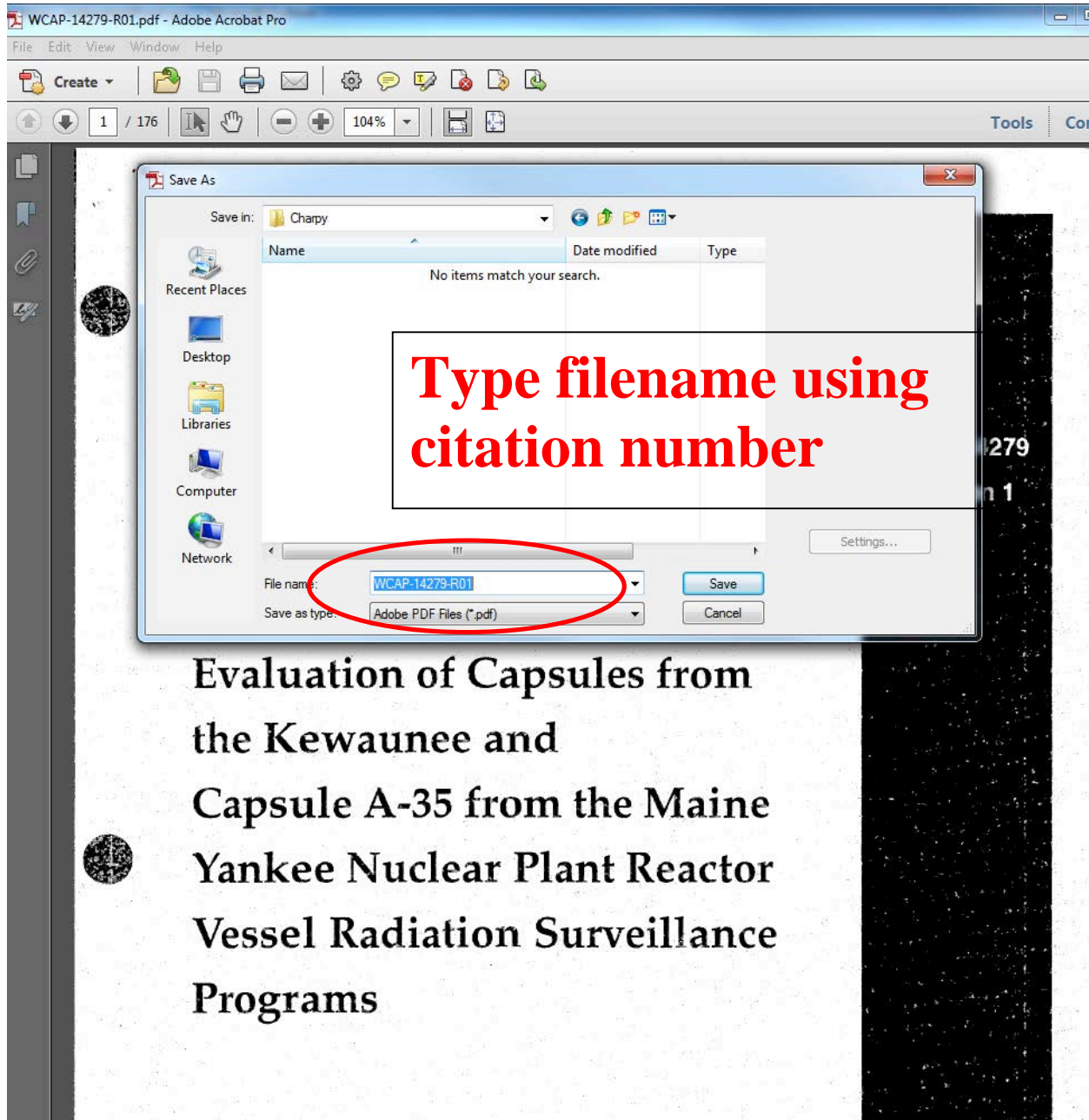
Citation Details

Details: WCAP-14279-R01

Reference ID	WCAP-14279-R01
Associated Plant	Kewaunee Nuclear Power Plant
Report Type	Power Reactor
Report Subtype	Capsule
Report Title	Evaluation of Capsules from Kewaunee & Capsule A-35 from MYNP Reactor Vessel Radiation Surveillance Programs.
Report Authors	Boyd C.H., Terek, E., Anderson S.L.
Report Date	September 1998
Published by	Westinghouse Electric Company
ADAMS No.	ML111861764
Report File Name	KWE_1998_SEP_CAPS.pdf 
Associated Legal File(s)	No legal documents have been uploaded for this citation.
Report Proprietary?	FALSE
Data Entered? (Y/N)	Y
Data Mining Status	Mined
Data Mining Filename	
Data Mining File Location	
Legal Permission Granted?	FALSE
Data Verified? (Y/N)	Y
Comments	
Number of Data Verifications	None
Data Source	
Reason for Update	citation updated using web app

Click on link to
open the report

- Save the file on the hard disk. It's useful to use the name of the citation as the filename of for the PDF rather than the default.



5.3 Step 3: After selecting and downloading the citation to be mined, begin the process by adding a new capsule.

- In the left pane menu, click on “upload data” under the section “UPLOAD & CHECK DATA”.



- The link navigates to display various options for adding and uploading new records. Click on “Add New Capsule”.

Add & Upload New Records

► [Please Read Cautionary Notice](#)

► [Procedure for adding new records to REAP database](#)

- [Add New Plant](#)

- [Add New Citation](#)

- [Add New Capsule](#)

- [Add Materials and Heat Treatments](#)

- [Add Charpy Specimens](#)

- [Add Tensile Specimens](#)

- [Add Chemistry and Chemistry Elements](#)

- The “*Add a Capsule*” page comes up to begin the process of entering the initial overview capsule data. Finish entering the capsule data and click “Add”.

Add a New Capsule

▶ Notes on CAPSULE Table	
▶ Notes on "Entry No." Field	
▶ Notes on "Change in Irradiation Environment" Field	

Capsule Name*	S
Associated Plant:*	Maine Yankee Nuclear Plant (MY) ▼
Associated Citation:*	WCAP-14279-R01 ▼
Entry No.:	1
Change in Irradiation Environment	
Entry Date	<input type="text"/>
Withdrawal Date	<input type="text"/>
Azimuthal Location	
Effective Full Power (EFP)	
Time Units for EFP*	Select EFP Time Units. [Required] ▼
Lead Factor	
Fast Neutron Fluence (E > 1 MeV)	
Units for Neutron Fluence	
Neutron Flux	
Units for Neutron Flux	
Neutron Exposure in [dpa]	
Dose Rate in [dpa/sec]	
Minimum Temperature	
Maximum Temperature	
Average Temperature	
Units for Temperature*	Select Temperature Units [Required] ▼
Report Locations	
Comments	<div></div>
Data Source	Entered from web application.
Date Record Created	6/10/2013 3:56:51 PM
Record Created by	s5x

| | *Required field.

- This is an example of capsule data for an irradiated capsule.

Capsule: S from Kewaunee Nuclear Power Plant as cited in report WCAP-14279-R01

Capsule Details

Attribute	Data Value
Capsule Name	S
Entry No.	1
Change in Irradiation Environment	
Entry Date	
Withdrawal Date	
Azimuthal Location	
Effective Full Power (EFP)	16.2
Time Units for EFP	Y
Lead Factor	
Neutron Fluence (E > 1 MeV)	3.36E+19
Units for Neutron Fluence	n/cm2
Neutron Flux	6.57e+10
Units for Neutron Flux	n/cm2-s
Neutron Exposure in dpa	5.69e+-02
Dose Rate in dpa/sec	1.1e-10
Minimum Temperature	
Maximum Temperature	
Average Temperature	
Units for Temperature	F
Report Locations	6-34
Comments	
Data Source	
Reason for Update	capsule updated using web app
Number of Specimens	59
Date of Last Update	6/10/2013 4:00 PM
Last Updated by	s5x
Copy Export	

[Edit](#) | [Delete](#)

- Sometimes, the capsule may be irradiated or is a BOL (Beginning of Life, i.e., no irradiation damage) entry. Example of a BOL capsule record:

Details for Capsules Record - Windows Internet Explorer

http://localhost:65522/CapsulesCRUD/Details/1696

File Edit View Favorites Tools Help

Details for Capsules ... X Details for Capsules Rec...

Capsule: BOL from Braidwood Unit 2

Details: BOL

Attribute	Data Value
Capsule Name	BOL
Entry No.	1
Change in Irradiation Environment	
Entry Date	
Withdrawal Date	
Azimuthal Location	
Effective Full Power (EFP)	0
Time Units for EFP	Y
Lead Factor	
Neutron Fluence (E > 1 MeV)	
Units for Neutron Fluence	
Neutron Flux	
Units for Neutron Flux	
Neutron Exposure in dpa	
Dose Rate in dpa/sec	
Minimum Temperature	-180
Maximum Temperature	320
Average Temperature	
Units for Temperature	F
Report Locations	
Comments	Capsule record created to associate beginning of life (BOL) specimens with plants and citations.
Data Source	
Reason for Update	
Number of Specimens	0
Date of Last Update	6/14/2012 12:05 PM
Last Updated by	ptw

Copy Export

[Edit](#) | [Delete](#)

Local intranet | Protected Mode: Off 100%

5.4 Step 4. Add material data.

- Navigate to Upload Data -> “Add Materials and Heat Treatment”

Add & Upload New Records

► [Please Read Cautionary Notice](#)

► [Procedure for adding new records to REAP database](#)

- [Add New Plant](#)
- [Add New Citation](#)
- [Add New Capsule](#)
- [Add Materials and Heat Treatments](#)
- [Add Charpy Specimens](#)
- [Add Tensile Specimens](#)
- [Add Chemistry and Chemistry Elements](#)

- Enter information on Product Form (Plate, Forging, Weld or HAZ), Steel Grade, Heat No. etc.

Add a New Material Record

▶

▶ **Notes on adding Heat Treatment Records**

Product Form*	F
Steel Grade*	SA 533B
Heat ID	
Heat No.*	
Supplier	
Supplier ID	
Thickness	
Thickness Units	
Source	
Weld Code	
Weld Flux Type	
Weld Flux Lot	
Weld Material Supplier	
Weld Type	
Weld Wire Heat No.	
Weld Wire Type	
HAZ Heat Base	
HAZ Heat Weld	
Report Locations	
Data Source	
Comments	
Added by	s5x
Date Record Added	6/10/2013 4:27:43 PM

- Often, many capsules contain specimens of multiple materials. A separate record must be created for each material.
- **IMPORTANT: NOTE DOWN THE MATERIAL ID.** It is needed for entering heat treatment data in Step 5.

Example: Record for a Forging Material

Material: forging

Note the material ID

► Notes on the MATERIAL Table

Details: forging Material ID: 1628

Product Form	forging
Steel Grade	A533 Grade B, Class 1
Heat ID	
Heat No.	122X208VA1
Supplier	
Supplier ID	
Thickness	
Thickness Units	
Source	
Weld Code	
Weld Flux Type	
Weld Flux Lot	
Weld Material Supplier	
Weld Type	
Weld Wire Heat No.	
Weld Wire Type	
HAZ Heat Base	
HAZ Heat Weld	
Report Locations	5-8
Comments	entered from web application
Data Source	
Reason for Update	

Example: Record for a Weld Material

Material: weld

► **Notes on the MATERIAL Table**

Details: weld Material ID: 1629

Product Form	weld
Steel Grade	A533 Grade B, Class 1
Heat ID	
Heat No.	1P3571
Supplier	
Supplier ID	
Thickness	
Thickness Units	
Source	
Weld Code	
Weld Flux Type	Linde 1092
Weld Flux Lot	3958
Weld Material Supplier	
Weld Type	3/16-inch Mil B-4
Weld Wire Heat No.	1P3571
Weld Wire Type	
HAZ Heat Base	
HAZ Heat Weld	
Report Locations	4-1
Comments	entered from web application
Data Source	
Reason for Update	

Example: Record for a HAZ Material

Material: HAZ

► **Notes on the MATERIAL Table**

Details: HAZ Material ID: 1630

Product Form	HAZ
Steel Grade	SA533 B-1 plate
Heat ID	
Heat No.	122X208VA1
Supplier	
Supplier ID	
Thickness	
Thickness Units	
Source	
Weld Code	
Weld Flux Type	
Weld Flux Lot	
Weld Material Supplier	
Weld Type	
Weld Wire Heat No.	
Weld Wire Type	
HAZ Heat Base	122X208VA1
HAZ Heat Weld	1P3571
Report Locations	4-1
Comments	entered from web application
Data Source	
Reason for Update	

5.5 Step 5. Add Heat Treatment.

- Get the material ID for entering the heat treatment details.
- Navigate to the details page of the material and click on the “Add a Heat Treatment” under Associated Heat Treatments section on the page.

Material: HAZ

► [Notes on the MATERIAL Table](#)


Details: HAZ Material ID: 1630

Product Form	HAZ
Steel Grade	SA533 B-1 plate
Heat ID	
Heat No.	122X208VA1
Supplier	
Supplier ID	
Thickness	
Thickness Units	
Source	
Weld Code	
Weld Flux Type	
Weld Flux Lot	
Weld Material Supplier	
Weld Type	
Weld Wire Heat No.	
Weld Wire Type	
HAZ Heat Base	122X208VA1
HAZ Heat Weld	1P3571
Report Locations	4-1
Comments	entered from web application
Data Source	
Reason for Update	
Date of Last Update	4/25/2013 12:00 AM
Last Updated by	s5x

[Copy](#) [Export](#)

[Edit](#) | [Delete](#)

▼ **Associated Heat Treatments**

[Add a heat treatment](#)  **There are no heat treatments associated with this material.**

- Enter heat treatment details as per the menu

Add a New Heat Treatment Record

► Notes on Heat Treatment Records

Material ID*	1630
Run No.	1
Min. Temperature	1200
Max. Temperature	1600
Temperature Range	
Duration in Hours	
Quench Method	
Heat Treatment Method	
Units for Temperature*	degrees Fahrenheit
Report Locations	2-21
Data Source	
Comments	
Added by	s5x
Date Record Added	6/10/2013 4:45:32 PM

| *Required field.

**Change run no. for
multiple heat
treatment records**

- For multiple runs of Heat Treatments for the material, change Run no. and create multiple records. The various heat treatment records should now be displayed in the material details page:

HAZ Heat Weld	
Report Locations	5-8
Comments	entered from web application
Data Source	
Reason for Update	
Date of Last Update	4/25/2013 12:00 AM
Last Updated by	s5x
Copy Export	

[Edit](#) | [Delete](#)

Associated Heat Treatments

Add a heat treatment

Show 10 entries

Showing 1 to 3 of 3 entries

Search:

	Heat Treatment ID	Quench Method	Heat Treatment Method	Report Location
See Details	2645	WQ	Z	4-6
See Details	2646	AC	T	4-6
See Details	2647	FC	R	4-6

[Copy](#) [Export](#)

First Previous 1 Next Last

5.6 Step 6. Add Charpy Data

- Prepare Charpy data CSV file. See Appendix – A for details.
- Navigate to Upload Data -> “Add Charpy Specimens”

Add & Upload New Records

▶ [Please Read Cautionary Notice](#)

▶ [Procedure for adding new records to REAP database](#)

- [Add New Plant](#)
- [Add New Citation](#)
- [Add New Capsule](#)
- [Add Materials and Heat Treatments](#)
- [Add Charpy Specimens](#)
- [Add Tensile Specimens](#)
- [Add Chemistry and Chemistry Elements](#)

- In the form, select Associated Citation, Associated Capsule, Associated Material for which the charpy data is to be uploaded

Add Charpy Specimens

Charpy Data Template

Associated Citation*	WCAP-14279-R01	Associated Citation
Associated Capsule*	S (2300)	
Materials Already Assigned to the Selected Capsule [FYI]	122X208VA1 forging (1628)	Associated
Associated Material*	122X208VA1 forging (1628)	Material
Specimen Subtype		
Size		
Position		
Drawing File Name		
Temperature Units*	degrees Fahrenheit	
CVE Units*	ft-lbf	
Lateral Expansion Units*	mils (0.001 inch)	
TUP Geometry		
Test Standard(s)		
Report Locations		
Comments		
Data Source	Entered from web application.	
Date Record Created	6/10/2013	
Record Created by	s5x	

Notes on adding Charpy specimen data

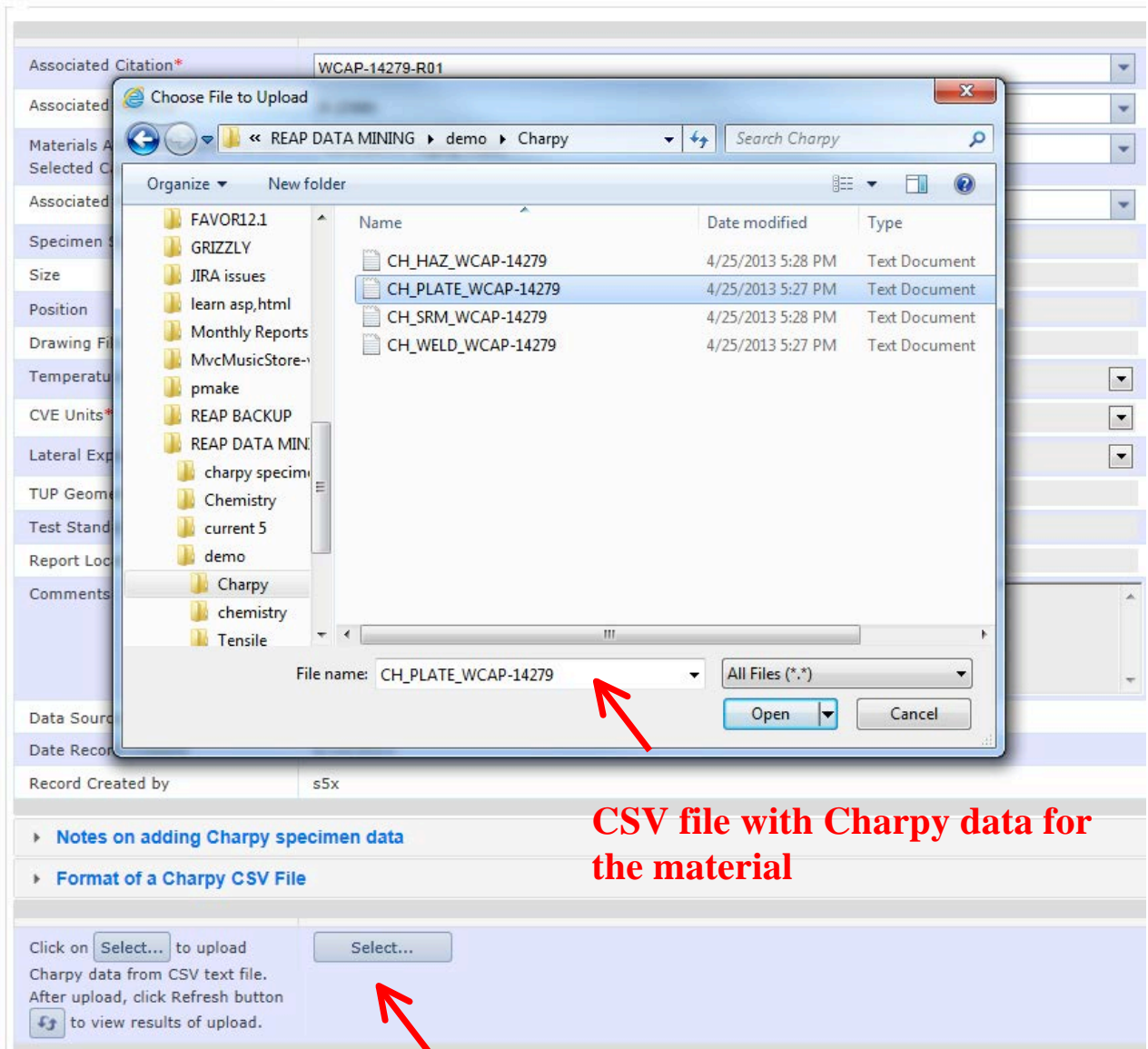
Format of a Charpy CSV File

Click on to upload Charpy data from CSV text file. After upload, click Refresh button to view results of upload.

- Click on “Select ...” button to upload the Charpy test data.

Add Charpy Specimens

 **Charpy Data Template**



Associated Citation* WCAP-14279-R01

Associated

Materials A

Selected C

Associated

Specimen s

Size

Position

Drawing Fil

Temperatu

CVE Units*

Lateral Exp

TUP Geome

Test Stand

Report Loc

Comments



Data Sourc


Date Recor

Record Created by s5x

Notes on adding Charpy specimen data

Format of a Charpy CSV File

Click on  to upload Charpy data from CSV text file. After upload, click Refresh button  to view results of upload.



CSV file with Charpy data for the material

Click here to start uploading the CSV file


- Click Refresh Button to view the results of upload.
- Click “Add” to complete the upload of Charpy data.

NOTE: REPEAT THESE STEPS FOR ALL MATERIALS IN THE CAPSULE.

Data Source	Entered from web application.							
Date Record Created	6/10/2013							
Record Created by	s5x							

► Notes on adding Charpy specimen data




► Format of a Charpy CSV File



Click on to upload Charpy data from CSV text file. After upload, click Refresh button  to view results of upload.

✓ CH_PLATE_WCAP-14279.txt

+ Add Charpy Data Point.

	Spec. No.	Orientation	Temp.	CVE	Lateral Exp.	Shear %	Fluence
<input type="button" value="Edit"/> <input type="button" value="Delete"/>	P28	LT	-25	14	8	0	3.36E+19
<input type="button" value="Edit"/> <input type="button" value="Delete"/>	P31	LT	10	17	12	5	3.36E+19
<input type="button" value="Edit"/> <input type="button" value="Delete"/>	P33	LT	25	26	22	10	3.36E+19
<input type="button" value="Edit"/> <input type="button" value="Delete"/>	P35	LT	40	55	42	15	3.36E+19
<input type="button" value="Edit"/> <input type="button" value="Delete"/>	P25	LT	50	39	28	15	3.36E+19
<input type="button" value="Edit"/> <input type="button" value="Delete"/>	P30	LT	60	65	46	20	3.36E+19
<input type="button" value="Edit"/> <input type="button" value="Delete"/>	P34	LT	75	78	52	30	3.36E+19
<input type="button" value="Edit"/> <input type="button" value="Delete"/>	P26	LT	100	100	69	40	3.36E+19
<input type="button" value="Edit"/> <input type="button" value="Delete"/>	P27	LT	150	123	81	60	3.36E+19
<input type="button" value="Edit"/> <input type="button" value="Delete"/>	P32	LT	200	130	85	85	3.36E+19

Displaying items 1 - 10 of 24

*Required field.

Hit add to finish upload of Charpy data

5.7 Step 7. Add Tensile Data

- Prepare Tensile data CSV file. See Appendix – B for details.
- Navigate to Upload Data -> “Add Tensile Specimens”

Add & Upload New Records

► [Please Read Cautionary Notice](#)


► [Procedure for adding new records to REAP database](#)

- [Add New Plant](#)
- [Add New Citation](#)
- [Add New Capsule](#)
- [Add Materials and Heat Treatments](#)
- [Add Charpy Specimens](#)
- [Add Tensile Specimens](#)
- [Add Chemistry and Chemistry Elements](#)

- In the form, select Associated Citation, Associated Capsule, Associated Material for which the Tensile data is to be uploaded

Add Tensile Specimens

Tensile Data Template

Associated Citation	
Associated Citation*	WCAP-14279-R01
Associated Capsule*	S (2300)
Materials Already Assigned to the Selected Capsule [FYI]	122X208VA1 forging (1628)
Associated Material*	122X208VA1 forging (1628)
Specimen Subtype	
Size	
Position	
Drawing File Name	
Temperature Units*	degrees Fahrenheit
Strength Units*	ksi
Test Standard	
Report Locations	6-5
Comments	
Data Source	Entered from web application.
Date Record Created	6/10/2013
Record Created by	s5x
<p>► Notes on adding tensile specimen data</p> <p>► Format of a Tensile Data CSV File</p>	
Click on "Select..." to upload tensile data from CSV text file. After upload, click "Refresh" button  to view results of upload.	<div>Select...</div>
<div>+ Add Tensile Data Point.</div>	

- Click on “Select ...” button to upload the Tensile test data.

Add Tensile Specimens

Tensile Data Template

Associated Citation* WCAP-14279-R01

Associated Materials Selected

Associated Specimen

Size

Position

Drawing

Temperature

Strength

Test Start

Report Length

Comments

Data Source

Date Recorded

Record Count

Note

Format of a Tensile Data CSV File

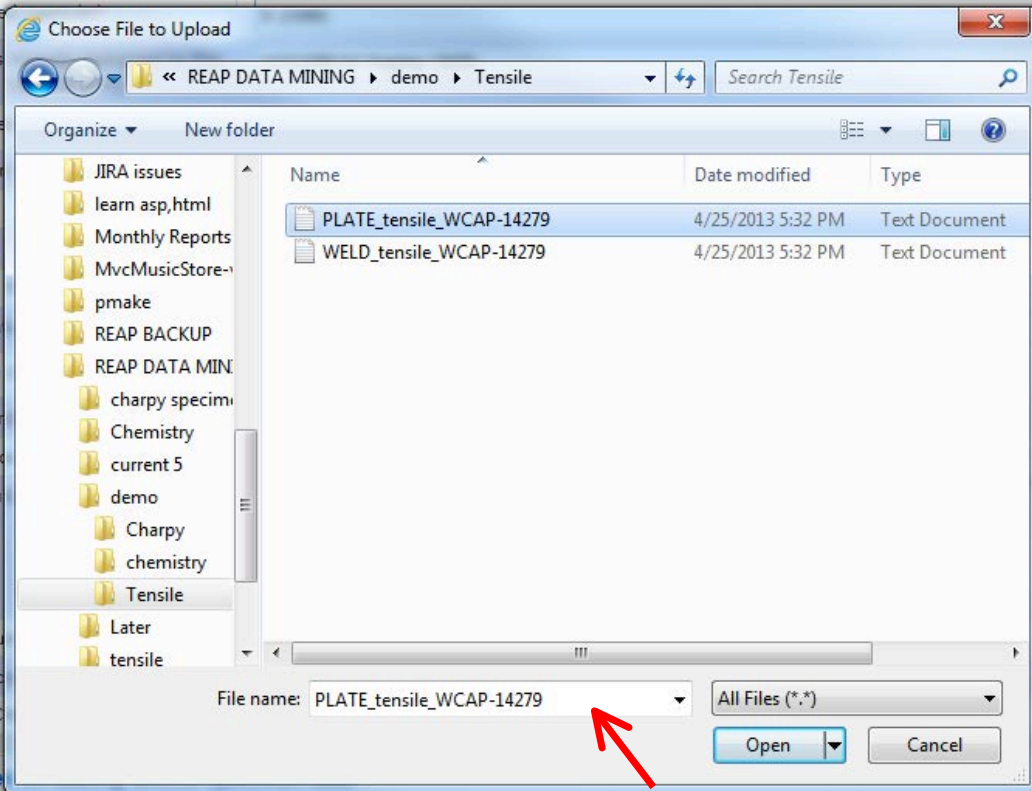
Click on "Select..." to upload tensile data from CSV text file. After upload, click "Refresh" button to view results of upload.

Select...

+ Add Tensile Data Point.

Spec. No.	Orient.	Temp.	Offset	Yield	Tensile	Elongation	% Reduc. Area
No records to display.							

Displaying items 0 - 0 of 0



CSV file with Tensile data for the material

Click here to start uploading the CSV file

Refresh Button


- Click Refresh Button to view the results of upload.
- Click “Add” to complete the upload of tensile data.

NOTE: REPEAT THESE STEPS FOR ALL MATERIALS IN THE CAPSULE.

Strength Units*	ksi
Test Standard	
Report Locations	6-5
Comments	
Data Source	Entered from web application.
Date Record Created	6/10/2013
Record Created by	s5x

► [Notes on adding tensile specimen data](#)

► [Format of a Tensile Data CSV File](#)





Click on "Select..." to upload tensile data from CSV text file. After upload, click "Refresh" button  to view results of upload.

Select...

✓ PLATE_tensile_WCAP-14279.txt

+ Add Tensile Data Point.

	Spec. No. ▼	Orient. ▼	Temp.	Offset Yield	Ultimate	Eng. Fract. Str.	Elong. Total %	% Reduc. Area
Edit Delete	P9	LT	72	73.3	92.7	58.1	25.2	68
Edit Delete	P10	LT	115	72.1	91.7	55	22.4	70
Edit Delete	P11	LT	250	69.3	87.6	54	22.5	68
Edit Delete	P12	LT	550	70.8	92.7	58.1	22.1	62
Edit Delete	S7	TL	50	79.4	98.8	60.1	25.1	65
Edit Delete	S8	TL	135	74.4	92.7	56	23.5	64
Edit Delete	S9	TL	550	67.7	98.6	59.1	21.6	70




1



Displaying items 1 - 7 of 7

[Add](#)
[Cancel](#)
| *Required field.



Hit add to finish upload of Tensile data








5.8 Step 8. Add Chemistry Data

- Prepare Charpy data CSV file. See Appendix – C for details.
- Navigate to Upload Data -> “Add Chemistry and Chemistry Elements”

Add & Upload New Records

▶ [Please Read Cautionary Notice](#)

▶ [Procedure for adding new records to REAP database](#)

-  [Add New Plant](#)
-  [Add New Citation](#)
-  [Add New Capsule](#)
-  [Add Materials and Heat Treatments](#)
-  [Add Charpy Specimens](#)
-  [Add Tensile Specimens](#)
-  [Add Chemistry and Chemistry Elements](#)

- In the form, select Associated Citation, Associated Capsule, Associated Material for which the Chemistry data is to be uploaded
- After that, click on the “+ Add chemistry record” to insert the specimen number

Add Chemistry Data

Chemistry Elements Template

Notes on the CHEMISTRY Table

Associated Citation	WCAP-14279-R01
Associated Capsule	S (2300)
Materials Already Assigned to the Selected Capsule [FYI]	122X208VA1 forging (1628)
Associated Material*	122X208VA1 forging (1628)
Chemistry Laboratory	
Chemical Table Filename	
Origin Location	
Other References	
Page No. of Chemical Table	35
Report Locations	
Comments	

Associated Citation

Associated Material

Add chemistry record

Specimen Number

1

Insert Cancel

General Notes on Uploading Chemistry and Chemistry Element Data

Uploading One Chemistry Element Data Pair at a Time

Editing Uploaded Chemistry Data

+ Add chemistry record.

Specimen Number
No records to display.

Displaying items 0 - 0 of 0

Uploading Chemistry Element Data in a Block from a CSV File.

Format of a Chemistry Element Data CSV File

Click on "Select..." to upload chemistry element data from CSV text file. After upload, click the

Select...

- Click on “Select ...” button to upload the Chemistry data.

The screenshot shows a web application interface with a file upload dialog box open. The dialog box is titled "Choose File to Upload" and shows the file structure of a project named "REAP DATA MINING". The file "PLATE_tensile_WCAP-14279" is selected. A red arrow points to this file with the label "CSV file with chemistry data for the material". Below the dialog box, there is a "Select..." button. A red arrow points to this button with the label "Click here to start uploading the CSV file". To the left of the button, there is a "Refresh Button" label with a red arrow pointing to a refresh icon in the interface.

Associated Citation: WCAP-14279-R01

Associated Capsule: S (2300)

Materials Already Assigned to the Selected Capsule [FYI]: 122X208VA1 forging (1628)

Choose File to Upload

Projects > REAP DATA MINING > demo > Tensile

Search Tensile

Organize New folder

Name	Date modified	Type	Size
PLATE_tensile_WCAP-14279	4/25/2013 5:32 PM	Text Document	5
WELD_tensile_WCAP-14279	4/25/2013 5:32 PM	Text Document	5

File name: PLATE_tensile_WCAP-14279 All Files (*.*)

Open Cancel

CSV file with chemistry data for the material

+ Add chemistry record.

Specimen Number

Edit Delete 1

Displaying items 1 - 1 of 1

Refresh Button

Uploading Chemistry Element Data in a Block from a CSV File.

Format of a Chemistry Element Data CSV File

Select...

Click here to start uploading the CSV file

- Click Refresh Button to view the results of upload.
- Click “Add” to complete the upload of tensile data.

NOTE: REPEAT THESE STEPS FOR ALL MATERIALS IN THE CAPSULE.

▶ **Editing Uploaded Chemistry Data**

+ Add chemistry record.

Specimen Number	
<div> <div>1</div> <div>Edit</div> <div>Delete</div> </div>	1

+ Add new element


	Element Name	Weight %
<div>Edit</div> <div>Delete</div>	C	0.19
<div>Edit</div> <div>Delete</div>	Mn	1.43
<div>Edit</div> <div>Delete</div>	P	0.011
<div>Edit</div> <div>Delete</div>	S	0.007
<div>Edit</div> <div>Delete</div>	Si	0.31
<div>Edit</div> <div>Delete</div>	Ni	0.58
<div>Edit</div> <div>Delete</div>	Mo	0.5
<div>Edit</div> <div>Delete</div>	Cu	N/Aa

⏪ ⏩ 1 ⏪ ⏩ Displaying items 1 - 8 of 8

⏪ ⏩ 1 ⏪ ⏩ Displaying items 1 - 1 of 1


▶ **Uploading Chemistry Element Data in a Block from a CSV File.**

▶ **Format of a Chemistry Element Data CSV File**

Click on "Select..." to upload chemistry element data from CSV text file. After upload, click the "Refresh" button  to view results of upload.

Select...

- ✓ PLATE_tensile_WCAP-14279.txt
- ✓ plate_WCAP-14279.txt
- ✓ PLATE_UNIT2_SASR 90-28.txt

Add  | *Required field.

Hit add to finish upload of chemistry data

5.9 Preparing CSV file for Charpy data

- Navigate to Upload Data

- Download “Charpy Data” Template

Add & Upload New Records

► [Please Read Cautionary Notice](#)

► [Procedure for adding new records to REAP database](#)

- [Add New Plant](#)
- [Add New Citation](#)
- [Add New Capsule](#)
- [Add Materials and Heat Treatments](#)
- [Add Charpy Specimens](#)
- [Add Tensile Specimens](#)
- [Add Chemistry and Chemistry Elements](#)

Download Data Templates

- [Charpy Data](#)
- [Tensile Data](#)
- [Chemistry Elements](#)

- Copy the Charpy data from the citation and arrange into the format required of CSV file.

Specimen orientation Fluence value

Table 5-3 Charpy V-notch Data for the Kewaunee Intermediate Shell Forging 122X208V/A1 Irradiated to a Fluence of $3.36 \times 10^{19} \text{ n/cm}^2$ ($E > 1.0 \text{ MeV}$) (Tangential Orientation)

Sample Number	Temperature		Impact Energy		Lateral Expansion		Shear (%)
	(°F)	(°C)	(ft-lb)	(J)	(mils)	(mm)	
P28	-25	-32	14	19	8	0.20	0
P31	10	-12	17	23	12	0.30	5
P33	25	-4	26	35	22	0.56	10
P35	40	4	55	75	42	1.07	15
P25	50	10	39	53	28	0.71	15
P30	60	16	65	88	46	1.17	20
P34	75	24	78	106	52	1.32	30
P26	100	38	100	136	69	1.75	40
P27	150	66	123	167	81	2.06	60
P32	200	93	130	176	85	2.16	85
P29	200	93	142	193	81	2.06	100
P36	300	149	154	209	85	2.16	100

Typical Charpy test results table

```

63 ** replace examples records shown be
64 ** the data from the current citatic
65 *****
66 P28,LT,-25,14,8,0,3.36E+19
67 P31,LT,10,17,12,5,3.36E+19
68 P33,LT,25,26,22,10,3.36E+19
69 P35,LT,40,55,42,15,3.36E+19
70 P25,LT,50,39,28,15,3.36E+19
71 P30,LT,60,65,46,20,3.36E+19
72 P34,LT,75,78,52,30,3.36E+19
73 P26,LT,100,100,69,40,3.36E+19
74 P27,LT,150,123,81,60,3.36E+19
75 P32,LT,200,130,85,85,3.36E+19
76 P29,LT,200,142,81,100,3.36E+19
77 P36,LT,300,154,85,100,3.36E+19
78 S31,TL,-50,13,8,0,3.36E+19
79 S33,TL,-25,36,24,10,3.36E+19
80 S27,TL,-10,5,4,0,3.36E+19
81 S35,TL,-5,69,51,20,3.36E+19
82 S30,TL,0,48,35,10,3.36E+19
83 S36,TL,10,37,26,10,3.36E+19
84 S26,TL,50,48,35,15,3.36E+19
85 S28,TL,75,87,60,25,3.36E+19
86 S29,TL,100,115,76,50,3.36E+19
87 S34,TL,150,154,91,100,3.36E+19
88 S25,TL,200,147,90,100,3.36E+19
89 S32,TL,300,156,77,100,3.36E+19

```

CSV Data File

5.10 Preparing CSV file for Tensile data

- Navigate to Upload Data
- Download “Tensile Data” Template

Add & Upload New Records

► [Please Read Cautionary Notice](#)

► [Procedure for adding new records to REAP database](#)

- [Add New Plant](#)
- [Add New Citation](#)
- [Add New Capsule](#)
- [Add Materials and Heat Treatments](#)
- [Add Charpy Specimens](#)
- [Add Tensile Specimens](#)
- [Add Chemistry and Chemistry Elements](#)

Download Data Templates

- [Charpy Data](#)
- [Tensile Data](#)
- [Chemistry Elements](#)

- Copy the tensile data from the citation and arrange into the format required of CSV file.

Fluence value Specimen orientation

Sample No.	Test Temp. (°F)	Normalized Energies (ft-lb/in ²)			Yield Load $P_{0.2}$ (lbs)	Time to Yield $t_{0.2}$ (μsec)	Max. Load P_u (lbs)	Time to Max. t_u (μsec)	Fast Fract. Load P_f (lbs)	Arrest Load P_a (lbs)	Yield Stress σ_y (ksi)	Flow Stress σ_f (ksi)
		Charpy Energy E_0 (ft-lb)	Charpy E_0/A	Max. E_0/A	Prop. E_0/A							
S31	-50	13	105	61	44	3952	4234	0.19	4234	217	131	136
S33	-25	36	290	260	30	3919	4910	0.16	4909	120	130	147
S27	-10	5	40	18	22	2673	2673	0.12	2673	148	89	89
S35	-5	69	556	368	187	3651	4946	0.18	4946	209	121	143
S30	0	48	387	354	33	3878	4925	0.09	4914	76	129	146
S36	10	37	298	270	28	3670	4995	0.57	4995	179	122	144
S26	50	48	387	341	45	3524	4738	0.69	4738	148	117	137
S28	75	87	701	369	332	3551	4308	0.76	4308	323	118	138
S29	100	115	926	360	566	3372	2946	0.76	2946	736	112	134
S34	150	154	1240									
S25	200	147	1184									
S32	300	156	1256									

Typical Tensile test results table

CSV Data File








5.11 Preparing CSV file for Chemistry data

- Navigate to Upload Data
- Download “Chemistry Elements” Data Template




Add & Upload New Records

► [Please Read Cautionary Notice](#)

► [Procedure for adding new records to REAP database](#)

-  [Add New Plant](#)
-  [Add New Citation](#)
-  [Add New Capsule](#)
-  [Add Materials and Heat Treatments](#)
-  [Add Charpy Specimens](#)
-  [Add Tensile Specimens](#)
-  [Add Chemistry and Chemistry Elements](#)

Download Data Templates

-  [Charpy Data](#)
-  [Tensile Data](#)
-  [Chemistry Elements](#)

Material type

Table 4-1 Chemical Composition (wt%) of the Kewaunee Reactor Vessel Beltline Region Surveillance Material⁽¹⁾

Element	Intermediate Shell Forging 122X208VA1	Lower Shell Forging 123X167VA1	Weld Metal
C	0.21	0.20	0.12
Si	0.25	0.28	0.20
Mo	0.58	0.58	0.48
Cu	0.06	0.06	0.219 ⁴⁰
Ni	0.71	0.75	0.724 ⁴⁰
Mn	0.69	0.79	1.37
Cr	0.40	0.35	0.090
V	<0.02	<0.02	0.00
Co	0.011	0.012	<0.01
Sn	0.01	0.01	0.004
Ti	<0.001	<0.001	<0.001
Zr	0.001	0.001	<0.001
As	0.001	0.004	0.004
Sb	<0.001	0.001	0.001
S	0.011	0.009	0.011
P	0.01	0.01	0.016
Al	0.004	0.006	0.010
B	<0.003	<0.003	<0.003
N ₂	0.006	0.010	0.012
Zn	--	--	<0.001

Typical chemistry elements table

- Copy the Chemistry data from the citation and arrange into the format required of CSV file.

```

49  ** citation, use "not_reported"
50  ** as shown below.
51  **
52  *****
53  ** replace examples records shown below
54  ** the data from the current citation
55  *****
56  C,0.21
57  Si,0.25
58  Mo,0.58
59  Cu,0.06
60  Ni,0.71
61  Mn,0.69
62  Cr,0.4
63  V,<0.02
64  Co,0.011
65  Sn,0.01
66  Ti,<0.001
67  Zr,0.001
68  As,0.001
69  Sb,<0.001
70  S,0.011
71  P,0.01
72  Al,0.004
73  B,<0.003
74  N,0.006
75  Zn,-

```

CSV Data File

