



Project Summary

Organization:

AmerenUE, Callaway Nuclear Plant

Solution:

Power Generation/Nuclear

Location:

Fulton, Missouri, USA

Project Objective:

- Regain the plant's outstanding regulatory ratings
- Regain plant's status as one of the most efficient and safest in the country

Products used:

eB Nuclear Application Suite

Fast Facts

- Improved rigor of information management processes, including the engineering design change management process, and improved visibility and access to all critical plan information
- eB, the foundation of Bentley's Assetwise Platform has allowed Callaway to completely replace thirteen mainframe applications
- eB supported the replacement of four steam generators in just 63.5 days by structuring, indexing, and transferring all related information seamlessly

Callaway Nuclear Plant

eB Streamlines Document and Records Management to Significantly Improve Regulatory Rating

The Background

AmerenUE's Callaway Nuclear Plant has achieved one of the best safety and performance records of any nuclear facility since it began operating in 1984. Built at a cost of US\$3 billion, the plant is approximately 100 miles west of St. Louis, Mo. It produces more than 1,200 megawatts of electricity — sufficient to power 750,000 households — using a Westinghouse four-loop pressurized water reactor and an Alstom turbine-generator.

The Challenge

In the 1990s Callaway had consistently received high regulatory ratings. Using a mainframe computing environment and applications developed in-house, Callaway set the standard for effective information and records management processes, systems and procedures. By early 2000, however, Callaway faced some significant challenges:

- The plant's regulatory ratings had been lowered based on various shortcomings and a perceived lack of rigor in some of its processes.
- The plant required major upgrades to replace aging equipment and restore the plant to its full generation capacity.
- An aging workforce and loss of experienced staff jeopardized the future operation of the plant.

At the same time plant personnel faced an increasingly competitive market that required maximum output at minimum cost without compromising safety. What's more, Callaway's information technology (IT) department had to select and install many new PC-based software tools and data types while at the same time provide information that was accurate, timely, and which complied with stringent nuclear records management regulations.

Given these obstacles, Callaway realized its mainframe environment could no longer effectively support its challenging information demands.

The Plan

To address these problems, Callaway senior management set several objectives:

- Regain the plant's outstanding regulatory ratings by 2006
- Replace four steam generators at a cost of \$300 million in 2005
- Regain the plant's status as one of the most efficient and safest in the industry

To meet these objectives, Callaway's forward-looking IT management team recognized it needed a fresh approach and a new toolset to address the rapidly increasing growth in unstructured content — and its critical need for fast, concise, and accurate plant information.

After extensive market research and product evaluations, Callaway selected Bentley's eB Nuclear Suite in 2001 as its new platform for document and records management. Key factors in that decision included:

- A modern multi-tier service-oriented architecture (SOA) based on Microsoft technology. The platform ensures scalability, flexibility, rapid application development, and simplified integration with other systems.
- The unique ability to manage information in context by linking (associating) documents and records with assets, people, processes, projects, and functions. This capability creates multidimensional contextual bridgework that transforms information into knowledge.
- Industry best-practices configuration and change management features in addition to extensive document and records management capabilities.
- A low-priced solution.
- Bentley's unparalleled knowledge of and commitment to the nuclear market.

The Outcome

Since Callaway adopted eB in 2001, it has become one of the core information management platforms at the plant. eB has allowed Callaway to completely replaced thirteen mainframe applications. The system is tightly integrated with Callaway's work management, corrective action, and equipment reliability applications. eB automatically captures and manages records in electronic format from multiple applications eliminating the need to process paper records.



“With eB we consolidated multiple applications resulting in significant cost savings and improved information access and sharing.”

—Janice Hoerber, IT Supervisor, AmerenUE Callaway Nuclear Plant

Approximately 900 people working at the plant use eB every day to capture, retrieve, and view one or more of over six million documents, drawings, records, component data, and other information.

Using the system’s open architecture and powerful application programming interface (API), Callaway developed two front-end applications tailored to the needs of its users. The first, Callaway Document Room, is a web-based portal that allows users to search, retrieve, view, and print any document or record from any location using a standard browser.

The second, Callaway Director, is a powerful, yet intuitive, interface for managing the Callaway Equipment List (CEL) and Nuclear Engineering Design Change (NEDC) process in accordance with industry best practices.

The Process

Callaway has been able to greatly streamline and automate the capture and management of its nuclear records by integrating eB with applications that generate records and electronically transfer them into eB in PDF format. The process currently captures more than 100 record types this way. This has nearly eliminated Callaway’s need to process paper-based records and severely curtailed the associated labor-intensive activities of scanning, quality control, manual indexing, and storage.

The flexible security and permissions capabilities of eB have also enabled Callaway to transfer its confidential records into eB and store them in PDF format. Obviously, these records contain confidential information and access to them has to be strictly controlled — and for privacy reasons, had been managed in paper form. The permissions features of eB solve the confidentiality issue. With eB, Callaway defines who may have access to which records and prohibits access by unauthorized persons.

Confidential records managed by eB include:

- Individual dose records
- Confidential contracts
- Confidential reports
- Records with Social Security numbers
- Training records with test scores
- Confidential audits
- Confidential purchase orders

Callaway has complied since 2003 with the NRC Generic Letter GL88-18 standard that requires electronic records be stored on optical media in two separate locations. It has destroyed its paper-based records, significantly reducing storage requirements.

Most records today are created electronically, greatly improving the quality of the records. For the remaining paper documents, Callaway captures them using a scanner and Kofax’s Ascent Capture tool.

Other records, such as outgoing correspondence, are captured at a departmental level using the ecopy scanning features of multifunction printers and photocopiers, which are then transferred into eB.

The system’s powerful linking feature indexes each record, associating it with every object it relates to — for example, components, procedures, corrective actions, work orders, people, and so on. Defining data this way vastly improves the user’s ability to see, retrieve, and understand information in the context of its use.

eB played a significant role in the success of Callaway’s \$300 million steam generator replacement project — installed in just 63.5 days ending in November 2005. The project involved a huge number of manufacturing and construction records, including 14 modification packages; 1,552 calculations; 26 specifications; and 2,884 drawings from multiple sources, including Framatome and the Steam Generator Team (SGT). eB structured, indexed, and transferred all of these records seamlessly.



The Callaway Nuclear Plant is about 100 miles west of St. Louis, Missouri, USA.

Automated Drawing Lifecycle Management

The powerful work exchange features of eB automated the revision and control of more than 100,000 plant drawings, replacing a manual card-based system that Callaway used for many years. Once the drawings were transferred into eB and the latest revisions were validated, standard workflows managed all changes. This process ensures the timely completion and approval of these drawings, allowing full visibility of their status at any moment.

Today, the overall rigor of the drawing management process is greatly improved, and the backlog of work in progress is greatly reduced. This merited a major citation in the regulatory reviews. With the Callaway Document Room, users can retrieve and view drawings from any workstation and then print them to the appropriate printer using the powerful print server functions in eB. All drawings are associated with the components, locations, and procedures that they relate to, which improves visibility across the enterprise as to the consequence of change and aids in strategic decision-making.



Some of the 100 record types captured by eB-based applications include:

- EMPRV - Work management records
- EMPRV - Materials management records
- IProcure - Purchasing records
- CARS - Corrective action records
- Planning - Planning records
- ERIP - Equipment reliability records
- Training - Training records, commitment tracking records
- AutoLog - Control room event log records
- AutoTour - Plant rounds records
- Rad Waste - Rad waste records
- Chemistry - Chemistry records
- Engineering - Engineering records
- OE - Operational experience records

Master Data Equipment Control

The full Callaway Equipment List (CEL) comprises more than 200,000 components; it has been transferred from the mainframe into eB. A nuclear component classification structure standardized the identification of the items to ensure consistency and avoid duplication. CEL data in eB sits at the core of the Callaway information management landscape. All applications or parties that require equipment data obtain this data from eB. This ensures that accurate, valid, and up-to-date information is available throughout the plant. All changes to this critical plant data are controlled by eB so that it maintains integrity and is completely traceable.

eB builds powerful information bridges by associating components with other components using directional links, such as 'supplied by' and 'controlled by' to create an interdependent model of related components. eB also relates components to drawings, documents, procedures, corrective actions, and more, so that all relevant information is presented and accessible.

Critical to the effective operation of a nuclear plant is managing all Engineering Design Changes in a controlled and efficient manner. The Standard Nuclear Performance Model (SNPM) defined by the Nuclear Energy Institute (NEI) identifies configuration and change management as one of the primary nuclear processes and has published the best practices standard AP-929.

AP-929 defines the processes for evaluating and implementing any proposed change to a nuclear plant based on the scope and extent of the proposed change. Changes that impact the basic physical design

or functionality of a plant need to be far more rigorously investigated than a component configuration change or a change to a document, drawing, or procedure.

As illustrated in the diagram below, the objective of AP-929 is to maintain conformance at all times by means of a closed loop change management process among these three elements. (Figure 1).

- Requirements – what the plant should consist of based on design and other requirements
- Physical configuration – what the plant actually consists of
- Configuration information – what plant operators say the plant consists of as captured in documents, drawings, records, databases, etc.

The powerful configuration and change management capabilities of eB allowed Callaway engineers to transfer from the mainframe to eB and implement a process that conforms to AP-929 requirements.

The Callaway Director interface and suitable wizards based on standard workflow templates, forms and processes available 'out-of-the-box' allows users to manage and implement proposed change requests, initiated elsewhere, such as in the corrective action system. Then, using powerful change impact analysis capabilities, decision-makers can use eB to see and evaluate the full impact of a proposed change on related components, drawings, procedures, and more. The systems' work management features track and manage changes through multiple stages to give users full visibility and status reporting on any change.

During the steam generator replacement project, Callaway Director successfully controlled more than 40 modifications to the plant while significantly reducing Field Change Notices — an advantage directly attributable to the improved visibility to related objects. The renewed rigor and effectiveness of the plant's operations led to a favorable review during the next regulatory assessment.

In addition, eB has been integrated with other primary systems used at Callaway, including:

- EMPRV: Work and material management system
- CARS: Corrective action system
- ERIP: Equipment reliability system

In each case eB supplies master component data and all associated documents, drawings, and records to these systems so that users can effectively execute their tasks. For example, if a work package is being prepared in EMPRV, eB provides the latest revision of all required drawings, documents, and records and streamlines the printing of the work package.

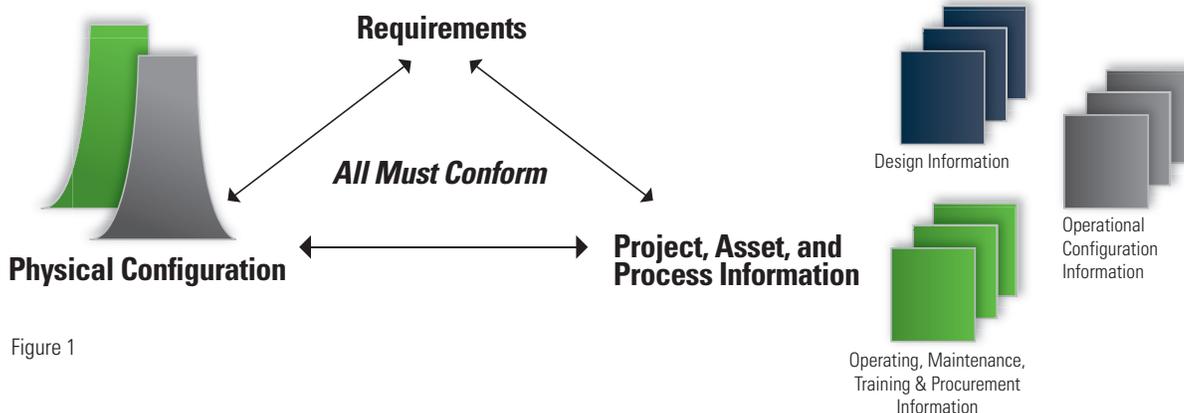


Figure 1

“With eB we’ve been able to improve the rigor of our design change process and address regulatory compliance requirements.”

—Scott Clardy,
Configuration Manager,
AmerenUE Callaway
Nuclear Plant

eB is the technology behind AssetWise, Bentley’s asset lifecycle information management (ALIM) platform. For more information, visit www.bentley.com/assetwise.

Find out about Bentley at: www.bentley.com

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eB also ensures that a completed work package transfers seamlessly as a record into eB from EMPRV. Any corrective action request initiated in the CARS system immediately becomes linked to a valid component, drawing, procedure, person, or other entity managed by eB. This eliminates data redundancy and repositories of disconnected information. Instead users gain full visibility of all the proposed and pending changes and can rely on the integrity of the information.

With eB, Callaway can make more informed decisions.

Achieving Excellence

Callaway’s transformation of its information management processes using eB has been a complete success, positively impacting costs, timeliness, access, accuracy, and accountability. Among the most important benefits are:

- Vastly improved visibility and rapid access to all critical plant information, documents, and records
 - » All information is stored in electronic form in a secure digital vault
 - » All information is identified in context to what it relates to, improving comprehension and decision making
 - » Rapid retrieval, viewing, and printing of documents and records from any desktop improves productivity and efficiency
- Greatly enhanced records management process
 - » Automatically captured and transferred records in electronic form from multiple applications
 - » Significantly reduced labor-intensive manual process to scan, quality-control, index and store paper-based records
 - » Records generated electronically and stored in PDF, providing much better quality
 - » A reduction in paper use and storage space, leading to cost savings
 - » An increase in the value of records and reduced associated risks because of contextual links to other entities
 - » A more rapid retrieval of records from any desktop to improve productivity
- Improved rigor of information management processes, especially the engineering design change management process
 - » Full visibility of the impact of any change improves decision making and reduces risk
 - » Tracks approved changes to completion
 - » Improved information integrity
 - » Change process complies with industry best practice AP-929 standard design change management process
- Consolidated multiple applications on a single, modern platform
 - » Streamlined business processes
 - » Information accessible from and to other applications

- » Reduced IT support costs
- » Web access to all information
- » Rapid application development environment

The Future

Callaway’s success with eB has its executive management preparing to further automate and streamline its information management processes.

One of its remaining major challenges is to create and update complex technical documents, such as Design Basis Documents, Final Safety Analysis Reports, Technical Specifications, procedures, calculations, and work instructions. It is time-consuming and costly to maintain these critical documents and ensure their accuracy. Moreover, the consequences of errors can be disastrous, affecting both plant safety and performance.

In order to streamline this process, maximize the re-use of information, and ensure its integrity and visibility, it is necessary to look within a document and manage the content elements.

With the rapid adoption of XML as a standard for data and content management, it is now possible to identify and manage elements of a document to whatever degree of specificity required. For example, it is possible to identify, tag, and manage any heading, sub-heading, paragraph, sentence, phrase, or word in XML.

When the powerful configuration and change management features in eB are applied to tagged content, the management of complex documents moves to a new level.

An Example

When integrated with a content management system, eB uniquely identifies, tags, and relates each critical content element within complex documents to other objects managed by eB — for example, components, locations, people, processes, other documents, and content elements.

eB is key to Callaway’s quest for performance excellence. This powerful toolset allows document authors to re-use and control content components in multiple documents, greatly improving productivity when creating and maintaining complex documents, while at the same time ensuring their integrity. It also enables users of these complex documents to have full visibility to all related objects from within a document itself, which helps make better decisions and mitigates risk. In this way, information becomes fully traceable. For example, users can follow the path of a specific requirement in a CFR regulation to the design basis element that addresses the requirement to the component that fulfills the requirement to any other element that supports the requirement.

These tools will help position Callaway at the forefront of the nuclear industry with systems and processes that set the standard for years to come. It will also result in further streamlining Callaway’s business processes, reducing labor-intensive activities and costs, and improving the visibility and integrity of plant information.