

# ENGINEERING THE NEXT GENERATION OF REACTORS

Sponsored by the Operations and Power Division

Cosponsored by the Environmental Sciences Division

Session Organizer: Greg Gibson (SCE, San Onofre)

## Paper/Panel

### 1. Are You Managing Your Information or Your Paper?—Letting Go of “The Page Paradigm,” *Douglas C. Wood, Rebecca L. Steinman (Advent Eng)*

#### INTRODUCTION

In the 1970s and 1980s, when engineering and construction was at its peak for most of the presently operating U.S. nuclear power plants, the quality assurance environment necessitated that a robust records management infrastructure be put in place to assure that key design, licensing, and historical information was captured and retained. At that time, the hard copy document became the building block of virtually all document control and records management systems. As a practical means to uniquely identify and control critical documents, many formatting features were established such as headers and footers (containing document title, revision, page numbers, etc), and in the cases of large documents that could be revised one page at a time, listings of the current revision for each page in the document. In this “page paradigm,” revisions to the information contained in these documents has to also address non-trivial changes to the document identification and control information.

Advances in computer, imaging, and electronic storage technology over the past 20 years has allowed the early hard-copy records management systems to evolve into sophisticated, state-of-the-art electronic systems. These systems are designed to find specific documents of interest, display the documents on the computer screen that is identical to the hard copy, and in many cases, search for text within them. In parallel, engineering computational and information tools have evolved that allow users to directly access data and information without the need to refer to or create controlled document records. In today’s competitive envi-

ronment, document management systems are often erroneously perceived to be a single application suitable and adequate for both records management and engineering information users. This puts the engineering user at a particular disadvantage when he or she needs to quickly extract selected information from thousands or millions of pages of text-based information.

This paper discusses the inherent differences between document management systems and information management systems from the user perspective, and identifies some of our resource-consuming “page paradigm” habits that can be eliminated by managing engineering information at its source rather than where it is used.

#### DISCUSSION

In simplistic terms, electronic data management tools used in the nuclear industry tend to fall into one of two categories: (a) records management and (b) information management. Records management applications typically use electronic document management systems to produce, maintain, and manage documents true to their page image format. The focus is on what we call the page paradigm—maintaining the document as it was originally produced. By their nature, records management tools are good at defining and maintaining the location of the vault location of the original hard copy, defining the current revision of an active document, displaying an image of the document on the user’s computer screen, and in most cases, searching for specified text within the system. However, records management software tends to lack the ability to find specific information when the person searching does not already know where to look.

In contrast, information management applications focus on the actual information in a document, rather than what the document looks like. Information management technologies allow

TABLE I

Desired Information Management System Attributes

Lightning fast searches	Post approved changes**
Intelligent searches (wild card, etc)	Show responsibility*
Display hits in context	Cross-reference to change documents*
Show only hits	Provide validation references*
Publish directly from the source	
Navigational links	
Links to external documents (references, etc.)	
Compile reports	

\*The \* applies to “living” documents such as current UFSAR, DBDs, etc.

users to quickly find information of interest and learn about the information in the context of where it is found. Additionally, user enhancements to most information management software make simple searches faster and more productive by providing links, similar to those used on a web page, to other supporting documentation, regardless the specific document actually containing the information. The relational database is an example of an information management application that is highly effective for structured data, and limited capability exists to incorporate unstructured (text-based) data either directly in text fields or through external links. The infobase [1] is highly optimized for large text-based documents or large collections of text-based documents (including graphic objects).

Consider the example of an electronic information management system for all the unstructured information (text) associated with the design and licensing basis for a modern nuclear plant. The boundary of such a system might include the original FSAR, current UFSAR, NRC SER and supplements, docket correspondence from initial licensing to the present (including inspection reports and LERs), generic NRC communications

(Generic Letters, Notices, and Bulletins), and plant-specific design basis documents and their references. Table I summarizes the desired user attributes for such an electronic information management system. The attributes designated with \* in Table I are only relevant to portions of the information that are "living" documents.

#### CONCLUSION

The cost-competitiveness of the industry demands innovative and efficient information management solutions to allow the users to extract accurate, complete, and relevant information from controlled plant information and data. The use of information management systems optimized for this purpose provides productivity and quality improvements to the user over use of records management systems.

- 
1. D. C. WOOD, S. G. KOVALESKI, C. CAPPS, W. GARFF, "The Case for Infobase Technology in the Nuclear Industry," *Trans. Am. Nucl. Soc.*, **80**, 212 (1999).

#### Panel Discussion

**Invited Panelists: Use of IT and Computational Technologies for Future Reactors, Akira Omoto (TEPCO-Japan)**

**Advanced Computer Electrical Engineering Design and Analysis Simulation, A. Nasle (EDSA Micro)**

**The Use of Three-Dimensional Modeling in Future Projects (Such as Design and Construction of Next Generation of Reactors and Control Room Design), N. Tutos (Dessault Sys)**

**French Control Room Design and Computer Operating Controls, B. Salha (EdF-France)**

**Construction Conceptual Modeling and Estimation Tools, John Polcyn, D. Fox-Rabinovitz, L. Lynch (Bechtel)**

**Managing Information in the Next Generation of Reactors and Letting Go of the "Page Paradigm," D. Wood, R. Steinman (Advent Eng)**