

The Case for Infobase Technology in the Nuclear Industry

D. C. Wood, S. G. Kovaleski, C. Capps and W. Garff

The information age has resulted in considerable advances in the collection, storage, and manipulation of structured data, as evidenced by the exponential increase in the application of data management software and software systems. Examples include the table capability within word processing software, spreadsheets and databases, many of which have extensive function libraries and macro programming features. The need and acceptance of these mathematical, business and engineering tools is evidenced by the inclusion of these capabilities in most business software packages. In complex technical areas where design calculations, analytical models, technical data and graphical information must be integrated in a computer-aided engineering infrastructure, information systems are frequently developed to allow data access to many users. In the automotive industry, for example, a comprehensive information system integrating the above capabilities into a single proprietary software package has been developed. In other cases, company-based information systems have been developed by integrating various desired elements of off-the-shelf programs under a shell program to accomplish similar objectives.

Text-based documents have important roles in the configuration control of manufactured components, engineered systems and complex multi-system products and facilities. Many of these documents or groups of documents do not lend themselves to structured information systems such as databases. Unlike spreadsheets and databases, software

products for large text-based information sources are not prepackaged with common business software packages, resulting in the misconception that such software is not available except for mainframe applications. This misconception has led to the misapplication of file-based text software or database software in situations where the user desires access and intelligent query capability to vast quantities of related text. For example, procedure information systems often allow a user to query a database of titles, subjects, identification numbers or keywords with the intention of viewing selected complete procedures, typically one at a time. It is much less common for the entire collection of related procedures to be maintained within one file, allowing users instant access to any of the included information through intelligent queries.

For nuclear power plants, one key licensing basis document is the Updated Final Safety Analysis Report (UFSAR). The UFSAR is typically maintained as a controlled hard copy document, printed from a master copy produced from word processed documents, graphic electronic files and hard copy artwork. This master copy may exist as hundreds of 1.44 MB files, each fitting on a high-density PC disk. It is not uncommon for licensees desiring search capability of the entire UFSAR to use a text search engine that queries individual files of the UFSAR sequentially, identifying only the locations of the queried text. The user must open each file to review documents of interest.

Some licensees have recognized the value of storing their UFSAR in a single *infobase*, a collection of text and its associated images and objects stored in a single file that uses a high-level markup language and a compatible viewer to query the text for attributes of

interest. The viewer uses masking and labeling capabilities to format the information for the PC. The infobase may additionally be used to publish the UFSAR and UFSAR Update Packages, as Detroit Edison's Fermi 2 plant has chosen. The infobase format supports multi-user access for full text alphanumeric searches and queries, and allows the licensee to incorporate proposed and approved document changes on a real-time basis, to reference scanned source documents, and to associate many other attributes to text selections.

Cost savings of a magnitude to justify conversion of the UFSAR to infobase format could be realized in the following general areas if a licensee maintains a single UFSAR with an infobase that is used to publish the hard copy UFSAR and support viewing and search tasks both on- and off-site:

- Staff burden reduction associated with maintaining and assuring consistency among multiple UFSAR formats,
- Reduction in time required to process and implement changes affecting UFSAR text by providing real-time direct access for all UFSAR users to approved UFSAR changes for the purpose of initiating additional changes or using the information,
- Reduction in time required to identify and correct sources of discrepancies among UFSAR formats,
- Reduction of the number of controlled hard copies of the UFSAR and the associated cost of production, distribution and updates, and

- Reduction in time spent away from work locations looking at UFSAR hard copies or searching for additional copies.

This infobase technology exists as an affordable, off-the-shelf PC product. There is no practical size limitation for such an infobase, and the applications of infobase technology for the routine research and evaluation of large text-based documents are unlimited. For example, if the docketed NRC inspection report text for a plant was located within a single infobase, the NRC open item, unresolved item, violation number or scanned source document could be viewed instantly, identifying all references to the item prior to its appearance within the inspection reports. On a larger scale, an infobase containing the text of all docketed correspondence could be used to quickly identify historical information related to a given subject. While the developer of the infobase package did not specifically target the nuclear industry when developing this technology, the flexibility exists to maximize the off-the-shelf capabilities of the product and tailor it to user needs, both within and apart from the nuclear industry.