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Applications for Electronic Documents[a]

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This paper discusses the application of electronic media to documents, specifically Safety Analysis Reports (SARs), prepared for Environmental Restoration and Waste Management (ER&WM) programs being conducted for the Department of Energy (DOE) at the Idaho National Engineering Laboratory (INEL). Efforts are underway to upgrade our document system using electronic format.

To satisfy external requirements (DOE, State, and Federal), ER&WM programs generate a complement of internal requirements documents including a SAR and Technical Safety Requirements along with procedures and training materials. Of interest, is the volume of information and the difficulty in handling it.

A recently prepared ER&WM SAR consists of 1,000 pages of text and graphics; supporting references add 10,000 pages. Other programmatic requirements documents consist of an estimated 5,000 pages plus references.

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One applicable external requirements document, Code of Federal Regulations Part 40, contains approximately 12,000 pages. Compliance with and management to these requirements requires the preparation, processing, and control of up to 30,000 pages of information.

Each activity must comply with all requirements. Internal and external agencies have the right, upon notice, to audit virtually any activity to verify compliance. An auditor needs only to randomly select a few of the thousands of pages of requirements and test for compliance. The operating program must demonstrate compliance with all 30,000 pages.

The sheer volume makes accurate preparation and updating of this set of requirements nearly hopeless. A 12-month review cycle is typical, making achievement of a "living document" impossible. Configuration control can be achieved only at a cost few programs can afford.

Electronic access to the external requirements documents is rapidly being provided. Internal requirements documents must also be placed in electronic format. We are initiating a systems engineered approach to integrate and cross-correlate our internal requirements documents. Paper documents are rapidly becoming obsolete and should be retained for archival purposes only and not be relied on for daily use.

Documents must be prepared, reviewed and approved, and, finally, used. Each step provides opportunity for error. The larger the volume,

the more individuals must be involved, and the greater the possibility of human error.

Preparation involves extracting and translating material from source documents. This step introduces human error because the paraphrased version cannot contain the same material as the reference document. But, paraphrasing has always been necessary to prevent the new document from becoming hopelessly large.

CD-ROM (compact disc, read-only-memory) offers an alternative. An electronic document can contain the entire reference and direct the reader to the required original text. Translation of engineering drawings to "cartoons," and the presentation of summary instead of detailed data both negatively impact usefulness; each abstraction eliminates information and reduces useability. Technical documents have many users with differing needs. The operations engineer cannot afford to operate from the same truncated diagram important to the highest level approver. CD-ROM allows source information to be immediately available and related software with hyper-text and windows allow the user to look to the depth of his own needs.

Significant review time is spent checking reference documents. With hundreds of nonuniform, nonindexed references it often takes several hours to retrieve a single reference. Since the new document probably paraphrased the original text, more time is required to perform a content and intent match. Subsequent document revisions can easily require the

same review time and effort. Electronic media has the potential to shorten this time significantly.

Relative to use, let us focus only on procedures written to achieve the commitments made in higher tier documents. The DOE Writers Guide for Technical Procedures states that the technical bases documents must be searched for relevant and applicable information and placed in the "Procedure History File" before developing a procedure. These technical bases are precisely the 30,000 pages described above plus "operational 'lessons learned,' conditions of performance, and so on." This guidance is impossible to follow without electronic searchable documents.

A project has been initiated to place an ER&WM SAR and all its reference documents on a single CD-ROM disk. This will give full indexable access to 11,000 pages. Next the SAR will be interfaced with other internal requirements documents to allow interface and consistency reviews. Finally, existing operating procedures and training plans will be electronically connected to the primary internal driver documents. A program has already been developed that can accomplish the latter step.

Rule-generated documents can be prepared with all primary documents in electronic form, perhaps on a single CD-ROM. Briefly, each information element would be generated, reviewed, and approved as a stand-alone entity and added to a relational data base. Documents would be electronically generated as needed by logical retrieval of the information elements. In

this manner, one can "see" any document required, at any depth, and in many formats, and, at any point turn to the source document.

Translation and transcription errors can be eliminated. Documents can contain all the information needed, and information content controlled by need, not by weight. Procedures and training materials can be directly traceable to primary requirements, greatly improving human motivation and human performance.