Managing Critical Records in the Nuclear Power Industry
(Case Study)

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Nippon Records Management Co., Ltd
Executive Consultant
Sadamaro Yamashita
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Introduction

Executive Summary

1. In the nuclear power industry, large volume of critical records relating to the permission and maintenance/operation of nuclear power plant, which are mandated to create and preserve by the strict laws and regulations, shall be preserved and made available over the long term.

2. Each department will centralize all critical records (officially approved) at the time of creation to avoid the risk of dispersion and loss during active usage phase.

3. Electronic critical records are, in principle, printed on paper for official approval and then put into central storage as “for preservation purpose” at Records Management Center (hereafter, RM Center)

4. Centralized paper records (original) are digitized using scanners and stored in shared servers as working copy for each user to do search and retrieval via internet.

5. In order to prevent the loss of critical records from “earthquake and fire” and “human errors and inadequate handling”, complementing electronic, paper and microfilm media will help to mitigate risks.

6. RM Center has been in operation by specialists group consisting of IT staff, nuclear engineers, records managers, filing clerks with practical experiences on records management

Japan has been prone to various disasters such as earthquakes, storm and floods, and fires. What is worse, because of traditional timber-framed buildings, not mentioning many historical buildings, many valuable materials and books were burned down and washed away. And in recent years, dramatic evolution of IT has drastically increased the volume of electronic records, and secure keeping and maintenance of those electronic records is becoming one of big challenges for storage management as well as paper based records.

In the nuclear power industry, under the strict laws/regulations, each power plant shall generate, keep, and utilize large volume of various records over long periods of time, from planning phase, design & construction, operation, and until decommission.

In order to prevent paper records and electronic records to be retained over long time from loss and scattering due to disasters and human errors, power plants have been addressing the issue of preserving and maintaining critical records safely over long time by adopting a
“centralized storage” approach. The principle of long term secure management is based on the life cycle management of critical records by “RM Center”

1. The Nuclear Power Industry and Long Term Preservation Records

Japan is poor in natural resources. Therefore, dependence on nuclear power plant to ensure energy sources as an important national policy has been in place. Today, Japan is in 3rd ranking in the world after U.S and France in terms of number of nuclear power plants installed. We have now 55 plants in operation, 3 plants under construction, and 9 new plants under plan.

The construction cost of each new nuclear power plant will be somewhere between $3 ~$4 billion. The power capacity generated by the current nuclear power plants will account for about 30% of total power consumption across Japan.

It has been projected that the life of nuclear power plant will be 30 years or so, but, in this past decade, new plant construction for the next generation has been up stopped due to anti-nuclear campaigns by local residents. Therefore, a plan to extend the life of the current plants for several ten years is being worked. Given that the plan assumes to become a reality, the retention period of all relevant critical records associated with the safety and quality controls will be required to be extended accordingly, which will result in necessity to keep and maintain large volume of long term preservation records.

2. Disaster Preparedness and Records Preservation at the Nuclear Power Plant

Frequent occurrences of recent big earthquakes have been high profile concerns, making earthquake preparedness a big social issue in Japan. In particular, how to secure the safety of the nuclear plants in operation is now the most critical issue.

The nuclear plant facilities are constructed based on extreme high safety design criterion if compared to other general buildings and factories. Both RM Center and central storage room for critical records are housed in high quake-resistant building. In addition, being prepared for the worst, other various secure measures are being exercised to avoid the loss and destruction of critical records, both paper and electronic. The principle is to mitigate all possible risks by utilizing effectively or complementing “paper”, ”electronic” ”microfilm” for all critical records.

2-1 Managing Critical Records by Complementing Paper and Electronic Media

While electronic records provide benefits such as sharing, editing, creation, and transmission, they are not well suited for preserving and securing originality over long time. On the contrary, paper-based records are well-suited for preservation and keeping originality, but they are not suited for information sharing and editing/creation. In the nuclear power industry, we are addressing the issue of safety management on critical records to be preserved over long time by taking advantage of complementing characteristics between paper and electric media.
Each department receives records in digital form or creates documents digitally (born-digital). Digital critical records received or created at each department are, in principle, printed out on paper for official approval. And then documents (with signature and approval stamp) are sent to RM center for the central storage. All critical paper-based records in the central files are to be scanned, stored in shared servers. Paper records are stored as original at the RM center. Scanned images are shared by many staff members through network for effective usage.

Paper records are stored under strict control on the basis of “safety first” as preservation purpose. And electronic records in shared server are copied on CD or DVD for storing at off-site data center.

For higher valued critical records, they are microfilmed for storing at off-site storage facility to reduce risks further.

<Comparative Characteristics between Paper, Electronic, and Microfilm>
◎ well suited △ moderately suited × not suited

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Media</th>
<th>paper</th>
<th>electronic</th>
<th>microfilm</th>
</tr>
</thead>
<tbody>
<tr>
<td>(1) easy to edit and create</td>
<td>×</td>
<td>◎</td>
<td>×</td>
<td></td>
</tr>
<tr>
<td>(2) convenient transmission</td>
<td>×</td>
<td>◎</td>
<td>×</td>
<td></td>
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<tr>
<td>(3) less storage space</td>
<td>×</td>
<td>◎</td>
<td>△</td>
<td></td>
</tr>
<tr>
<td>(4) retrieval speed</td>
<td>×</td>
<td>◎</td>
<td>△</td>
<td></td>
</tr>
<tr>
<td>(5) sharing</td>
<td>×</td>
<td>◎</td>
<td>△</td>
<td></td>
</tr>
<tr>
<td>(6) long term preservation</td>
<td>◎</td>
<td>×</td>
<td>◎</td>
<td></td>
</tr>
<tr>
<td>(7) originality</td>
<td>◎</td>
<td>×</td>
<td>◎</td>
<td></td>
</tr>
<tr>
<td>(8) no dependence on soft/hardware</td>
<td>◎</td>
<td>×</td>
<td>△</td>
<td></td>
</tr>
<tr>
<td>(9) standards</td>
<td>◎</td>
<td>△</td>
<td>△</td>
<td></td>
</tr>
<tr>
<td>(10) no special skill for retrieval</td>
<td>◎</td>
<td>×</td>
<td>△</td>
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</tbody>
</table>
2-2 Disaster Preparedness for Critical Records

At RM Center, just in case the collapse of buildings occurs by big earthquakes, to prevent critical records from fire and flood damages, the following measures are in place.

1. **prevent paper from file damage**
   - no fall-off from shelves of tight arranged power files
   - protect paper files by robust folders
   - prevent files from dispersion using storage box

2. **prevention from fire**
   - fire prevention, detection tools and program
     (no power leak • gas leak • no smoking)

3. **water damage prevention**
   - RM center and storage repository or room are located on upper floors

4. **damage prevention for digital media**
   - shared servers, CD, DVD, microfilm are safely stored in robust rooms and fire proof cabinet

5. **risk mitigation by using various storage media**
   - duplicates of critical electric records as a backup are made and stored at remote location or off-site center.
   - for highly active records requiring immediate retrieval, create duplicates on CD, DVD, microfilm for distributed storages at RM center, user departments, and off-site storage room

2-3 Damage to RM Center by Mega Earthquake and Restoration

Even if buildings and storage facilities are severely damaged by big earthquake, if we could successfully protect records from fire and flood, we would be able to restore most of microfilms and papers.

When the Niigata big earthquake occurred in July 2007, the nuclear power plant was severely damaged. The building of RM center was also collapsed and people were blocked to get into the RM center, but found that most of paper files were not physically damaged, nor burned out by fire. We could transfer all files safely to a temporary RM center several months later. There was no damage to the server room as well as the network environment, so, within several days after the earthquake, staff people could resume the task of search and retrieval with no troubles for required manuals and drawings for conducting plant inspections and restoring works.
3. **The Life Cycle Management of Critical Records at RM Center**

RM Center plays the role of core function on the management of critical records with regards to the nuclear power plant. RM Center assumes important duties to deal with issues such as information sharing, effective usage, security protection, secured retention period management, media migration through the entire life cycle of critical records—from creation, active /semi-active usage, and then to final disposition (destruction or permanent preservation).

The most important role RM Center plays is to prevent the dispersion, loss, inadequate disposal of critical records from human errors and miss handling as well as natural disasters during their long term life cycle.

RM Center, while addressing diversity and sophistication of software and hardware often accompanied by technical revolution of IT, has focused its efforts on the development of new management methodology and updating electronic data in order to keep properly managing those critical records which continue to increase in volume daily.
3-1 Assessment/Selection and Centralized Storage

Critical records at the nuclear power plant are identified through assessment/selection process based on “critical records classification criterion”. Records identified as critical under the laws/regulations which mandate creation and preservation are listed broadly, including application for permission, approval, notification, reporting, and those categorized as accountability, safety operation, maintenance such as design materials, drawings, operation manuals, maintenance/inspection/trouble, various investigation study, new information on other plants/on technology worldwide.

All of those targeted as critical records are, in principle, centrally managed right after final approval and seal.

3-2 Indexing and Registration

All critical records to be transferred to RM Center for centralized storage are scanned and stored in PDF format. RM Center creates index database according to classification criterion (business, facility/equipment, importance level etc.), other attributes (author, date created, addressee, generating unit,), and attributes for retention schedule (media, storage location, retention period).

Accurate indexing data registration and updating is now an important task for RM Center

3-3 Setting-up Retention Schedule

All records need to be properly managed based on planned procedures for changes regarding storage media, storage locations, and storage system during the entire life of records that is from creation/receipt, through active/semi active use, to final disposition or long term preservation.

At the nuclear power plant, depending on activity level and immediate requirement needs, paper records are transferred from RM Center to “storage room” at the same building, and then to off-site storage facility based on established retention schedule. Electronic records are transferred from “shared servers” to “off-site data center” and further, depending on needs, electronic records are converted on other media such as CD, DVD, or microfilm.

3-4 Security Control

Along with the prevention measure for critical records loss in the event of disaster, security measures are now becoming a big challenge against problems like information leak and alteration with regard to electronic records, attacks from cracker, and virus.

RM Center is working together with IT department on secure and safety management for electronic data, including identification of classified records, rules regarding disclosure limitation and security protection, updating manuals, security measures regarding database and network environments.
3-5 Database Build-Up & Operation

RM Center architects and operates the database of records management shared by all departments to keep properly operating high volume of critical records life cycle management without stopping over long time.

Also, all staff people belonging to the plant are able to search, retrieve, and view critical records using unified retrieval system and records management databases via network.

3-6 Operation and Organizational Structure of records Management Center

RM Center is being operated by cooperative structure consisting of various specialists involved with nuclear records management, just name a few, IT staff, nuclear engineers, records management practitioners, filing clerks. In particular, in order to maintain and updating electronic records properly in response to future IT technology evolution, it is very important to establish closer partnership between IT specialists and RM specialists. In the nuclear power industry, it is a pressing need to train new people with capabilities to respond to diversified needs of records management in the future.

4. The Role of RM Center to Support the Safety of the Nuclear Power Plant

During the first several years when the power plant got into operation, until critical records was transferred to the storage room due to lower usage rate, each department had stored and maintained individually, resulting in high risks of loss and unknown location of critical records.

The more storage volume of electronic records increases, the higher risks are likely to be projected. So, there was an increased need for RM Center to have critical records in central management right after records creation/collection phase, and as a result, many nuclear power plants have established “RM Center”.

In the nuclear industry, to secure the safety of power plant is the most critical management issue than anything else. As organization, people, and technologies involved with the operation of power plant will change as time goes by, in terms of securing the safety of nuclear power plant, proper long term preservation and continuity of critical records is extremely important. RM Center holds a primary role to make it happen.