



## **Reconstitution/Replacement Options for the Licensing Support Network**

**February 22, 2018**  
**(Revision 4)**

## Revision History

Revision Date	Description	Author
February 22, 2018  Changes denoted with round dotted vertical line	Updated the following to reflect information provided by the Nye County, NV regarding estimated new documentary material headers/documents. <ul style="list-style-type: none"> <li>Section 3 - Underlying Assumptions</li> <li>Table 3-1 - New Header/Document Estimates</li> </ul>	Atomic Safety and Licensing Board Panel
February 12, 2018  Changes denoted with dashed vertical line	Corrected state reference for Inyo County in <ul style="list-style-type: none"> <li>Revision History table</li> <li>Section 3 - Underlying Assumptions</li> </ul>	Atomic Safety and Licensing Board Panel
February 9, 2018  Changes denoted with dotted vertical line	Added Author to Revision History  Added change notation description  Updated the following to reflect information provided by the Inyo County, CA regarding estimated new documentary material headers/documents. <ul style="list-style-type: none"> <li>Section 3 - Underlying Assumptions</li> <li>Table 3-1 - New Header/Document Estimates</li> </ul> Corrected the spelling of the word "Retrieval" in section 8.2.2 and the in the caption for Figure 14.  Updated the standardization risk factor text description for impact and likelihood in Table 8-5 to match the numeric score.	Atomic Safety and Licensing Board Panel
December 21, 2017  Changes denoted with solid vertical line	Added Revision History table.  Updated to reflect information provided by the State of Nevada regarding estimated new documentary material headers/documents.  Updates made to: <ul style="list-style-type: none"> <li>Section 3 - Underlying Assumptions</li> <li>Table 3-1 - New Header/Document Estimates</li> </ul>	Atomic Safety and Licensing Board Panel
December 18, 2017	Initial release	Office of the Secretary and the Atomic Safety and Licensing Board Panel

## Table of Contents

1.	Introduction .....	1
1.1	Public ADAMS LSN Library History .....	2
2.	Scope.....	3
3.	Underlying Assumptions.....	3
4.	Objective.....	5
5.	Current State of the Public ADAMS LSN Library .....	6
6.	Option 1 - Traditional Discovery .....	7
6.1	Assumptions .....	7
6.2	IT System General Description.....	7
6.3	IT System Implementation Costs.....	7
6.4	IT System Implementation Timeframe.....	7
6.5	IT System Implementation Risks/Challenges .....	7
6.6	IT System Implementation Benefits .....	7
7.	Option 2 - Use of Existing Public ADAMS LSN Library .....	8
7.1	Assumptions .....	9
7.2	IT System General Description.....	9
7.3	IT System Intake Alternatives .....	10
7.3.1	Alternative One - EIE System Modification.....	10
7.3.2	Alternative Two - Semi-Manual Process .....	13
7.3.3	Publication to the Public ADAMS LSN Library.....	15
7.3.4	NRC Staff Headers/Documents .....	15
7.4	IT System Implementation Costs.....	16
7.5	IT System Implementation Timeframe.....	17
7.6	IT System Implementation Risks/Challenges .....	18
7.7	IT System Implementation Benefits .....	19
8.	Option 3 - Move to the Cloud .....	20
8.1	Assumptions .....	22
8.2	IT System General Description.....	23
8.2.1	Alternative One – NRC-Maintained Cloud-Based System .....	23
8.2.2	Alternative Two - HLW Participant-Maintained Cloud-Based System .....	26
8.3	IT System Implementation Costs.....	30
8.4	IT System Implementation Timeframe.....	34
8.5	IT System Implementation Risks/Challenges .....	35
8.6	IT System Implementation Benefits .....	36
9.	Option 4 - Rebuild the Original LSN .....	37
9.1	Assumptions .....	37

9.2 IT System General Description.....37

9.3 Search and Retrieval - Rebuild the Original LSN.....39

9.4 IT System Implementation Costs.....40

9.5 IT System Implementation Timeframe.....41

9.6 IT System Implementation Risks/Challenges .....42

9.7 IT System Implementation Benefits .....43

Appendix A - Comparison of Options to Original Licensing Support Network (LSN)  
Functional Requirements .....44

Appendix B - Risk Score Table Definitions .....58

Appendix C - Proposed New Functional Requirements.....59

Appendix D - Option Summary Comparison.....61

# List of Figures

Figure 1 - Use of Existing Public ADAMS LSN Library (Conceptual).....	9
Figure 2 - Use of Existing Public ADAMS LSN Library - Additions (EIE Method) (Non-NRC Staff) .....	11
Figure 3 - Use of Existing Public ADAMS LSN Library - Modifications (EIE Method).....	12
Figure 4 - Use of Existing Public ADAMS LSN Library - Deletions (EIE Method).....	13
Figure 5 - Use of Existing Public ADAMS LSN Library - Additions (Semi-Manual Method).....	14
Figure 6 - Use of Existing Public ADAMS LSN Library - Modifications (Semi-Manual Method).....	14
Figure 7 - Use of Existing Public ADAMS LSN Library - Deletions (Semi-Manual Method).....	15
Figure 8 - Use of Existing Public ADAMS LSN Library - Publication.....	15
Figure 9 - Use of Existing Public ADAMS LSN Library - NRC Staff Additions.....	16
Figure 10 - NRC-Maintained Cloud-Based Solution (Conceptual).....	24
Figure 11 – NRC-Maintained Cloud-Based System - Publication.....	24
Figure 12 – NRC-Maintained Cloud-Based System - Publication of NRC Staff Headers/Documents.....	25
Figure 13 – NRC-Maintained Cloud-Based System - Search Interface.....	26
Figure 14 - HLW Participant-Maintained, Cloud-Based System with NRC-Managed Search and Retrieval (Conceptual).....	27
Figure 15 - HLW Participant-Maintained Cloud-Based System, Index, and Search.....	28
Figure 16 - HLW Participant-Maintained System with NRC Maintained Index - Search Interface .....	29
Figure 17 - HLW Participant-Maintained - Linked Only - Search Interface.....	30
Figure 18 - Rebuild the Original LSN (Conceptual).....	39
Figure 19 - Rebuild the Original LSN - Search Interface.....	40

## List of Tables

Table 3-1 - New Header/Document Estimates .....	5
Table 5-1 - Public ADAMS LSN Library Header/Document Collection Count .....	6
Table 6-1 - "Traditional Discovery" Pros/Cons.....	8
Table 7-1 - Alternative One - EIE System Modification Cost Estimate.....	16
Table 7-2 - Alternative Two - Semi-Manual Process Cost Estimate.....	17
Table 7-3 - Use of Existing Public ADAMS LSN Library - EIE System Modification Risk Score.....	19
Table 7-4 - Use of Existing Public ADAMS LSN Library - Semi-Manual Process Risk Score.....	19
Table 7-5 - Alternative One - EIE System Modification Pros/Cons .....	19
Table 7-6 - Alternative Two - Semi-Manual Process Pros/Cons .....	20
Table 8-1 - Alternative One - NRC-Maintained Cloud-Based System Cost Estimate .....	31
Table 8-2 - Alternative Two (a) - HLW Participant-Maintained Cloud-Based System with NRC- Provided Search Portal Cost Estimate .....	31
Table 8-3 - Alternative Two (b) - HLW Participant-Maintained Cloud-Based System with NRC- Maintained Web Page of Participant Links Cost Estimate .....	33
Table 8-4 - Alternative One - NRC-Maintained Cloud-Based System Risk Score.....	35
Table 8-5 - Alternative Two (a) - HLW Participant-Maintained Cloud-Based System with NRC- Provided Search Portal Risk Score .....	35
Table 8-6 - Alternative Two (b) - HLW Participant-Maintained Cloud-Based System with NRC- Maintained Web Page of Participant Links Time Estimate Risk Score .....	36
Table 8-7 - Alternative One – NRC-Maintained Cloud-Based System Pros/Cons.....	36
Table 8-8 - Alternative Two (a) - HLW Participant-Maintained Cloud-Based System with NRC- Provided Search Portal Pros/Cons.....	36
Table 8-9 - Alternative Two (b) - HLW Participant-Maintained Cloud-Based System with NRC- Maintained Web Page of Participant Links Pros/Cons.....	37
Table 9-1 - Rebuild the Original LSN - NRC Cost Estimate .....	40
Table 9-2 - Rebuild the Original LSN - Participant Site Cost Estimate.....	41
Table 9-3 - Rebuild the Original LSN Risk Score.....	42
Table 9-4 - Rebuild the Original LSN Pros/Cons .....	43

## 1. Introduction

Under the Nuclear Waste Policy Act of 1982 (NWPA), the U.S. Nuclear Regulatory Commission (NRC) is responsible for evaluating the application of the U.S. Department of Energy (DOE) for authorization to construct a permanent geologic repository at Yucca Mountain in Nevada, and determining whether to authorize construction of the proposed repository. The NRC's licensing process primarily consists of a technical review by the NRC Staff of DOE's construction authorization application and a licensing adjudication before NRC Construction Authorization Boards (CABs). To support the NRC's adjudicatory responsibilities, the Licensing Support Network (LSN) was established as the means of making discovery material electronically available to the various participants in the NRC adjudication via a publicly available distributed database network that was expected to be available for both the initial construction authorization and subsequent receive and possess licensing proceedings.

The development of the original LSN began in 1997 when the NRC issued a proposed rule that was intended to take advantage of technological developments that had occurred since the original "Licensing Support System" rule was adopted in 1989.<sup>1</sup> That proposed rule, adopted at the end of 1998, began a series of meetings and discussions with the LSN Advisory Review Panel (LSNARP) and a technical working group of LSNARP members that culminated in the submission to the NRC Information Technology (IT) Business Council in April 2000 of a business case analysis that discussed several LSN implementation options, including the distributed database configuration that was ultimately implemented.<sup>2</sup>

In October 2001, the original LSN became operational and continued to operate through September 2011 when it was decommissioned. It has been more than six years since the original LSN operated and since that time there have been technological developments and changes to federal IT policy.

The LSN comprised 19 servers in a local area network environment connected to the Internet in an offsite data center, and it was accessible by the public at [www.lsnnet.gov](http://www.lsnnet.gov). The system was connected to the Internet through a firewall, and was protected by an intrusion detection device. Interconnectivity was provided by multiple switches and hubs. The original LSN utilized the following major software components:

- Microsoft Windows 2003 Enterprise Server
- Microsoft SQL Server 2000
- Microsoft Internet Information Services - version 6.0
- Autonomy 2.3 (indexing software)
- WS\_FTP (file transfer protocol software)

Additionally, each high-level waste (HLW) hearing participant operated a web site that hosted its collection of LSN headers/documents. The server count and software configuration listed above

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<sup>1</sup> Establishing a Licensing Support System (LSS) to provide for the electronic availability of documentary material was initially discussed as early as 1989. Since this paper addresses the replacement or reconstitution of the now-decommissioned LSN, the history prior to redesignating the LSS as the LSN is not discussed.

<sup>2</sup> <https://www.nrc.gov/docs/ML0037/ML003722758.html>.

does not include the components that were required for each participant site.

### 1.1 Public ADAMS LSN Library History

The HLW proceeding was suspended in September 2011 and, as part of an orderly suspension, Atomic Safety and Licensing Board Panel (ASLBP) CAB-04 issued an order in April 2011 directing that all HLW hearing participants' LSN document collections be submitted to the Office of the Secretary (SECY) in Portable Document Format (PDF).<sup>3</sup> That order also stated that SECY would add those headers/documents to the NRC's Agencywide Documents Access and Management System (ADAMS) and make them available to the public. The submission of those headers/documents to SECY triggered federal records requirements that obligated the NRC to declare the hearing participant headers/documents as NRC official agency records and preserve them in compliance with National Archives and Records Administration (NARA) requirements and other applicable laws. The HLW hearing participant collections are now part of the ADAMS environment and have a NARA-approved disposition schedule. The headers/documents are stored in an internal ADAMS library to meet federal records requirements, as well as on a public site.

The following series of Commission decisions and communication provide a history of how the participants' collections were placed into ADAMS and made publicly available.

- In CLI-13-08, the Commission directed the Secretary of the Commission, in conjunction with agency records staff, to enter the LSN document collections in the Secretary's possession into non-public ADAMS to facilitate the NRC Staff's work completing the Safety Evaluation Report relating to DOE's construction authorization application.<sup>4</sup>
- In CLI-14-01, the Commission directed agency staff to make the LSN document collection publicly available in ADAMS.<sup>5</sup>
- In SRM-COMSECY-14-0041, the Commission approved agency staff's recommendation to make LSN documents available to the public through ADAMS with an enhanced search capability. In addition, the Commission directed that, consistent with 10 C.F.R. § 2.1011, LSN document activities should be coordinated by SECY and ASLBP.<sup>6</sup>
- In SECY-15-0150, SECY and ASLBP informed the Commission that the project to make the LSN header/document collection publicly available in ADAMS would begin in December 2015.<sup>7</sup>
- In SECY-16-0091, SECY and ASLBP informed the Commission that the ADAMS LSN Library would become publicly available on August 19, 2016.<sup>8</sup> The ADAMS LSN Library did, indeed, become public on that date.

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<sup>3</sup> <https://www.nrc.gov/docs/ML1110/ML111010483.pdf>.

<sup>4</sup> <https://www.nrc.gov/docs/ML1332/ML13322A744.pdf>.

<sup>5</sup> <https://www.nrc.gov/docs/ML1402/ML14024A429.pdf>.

<sup>6</sup> <https://www.nrc.gov/docs/ML1503/ML15034A086.pdf>.

<sup>7</sup> <https://www.nrc.gov/docs/ML1533/ML15335A395.pdf>.

<sup>8</sup> <https://www.nrc.gov/docs/ML1621/ML16210A436.pdf>.



- Also in SECY-16-0091 SECY and the ASLBP notified the Commission that issues were found with 130 of the 3,692,306 public ADAMS LSN Library headers/documents when the LSN Library was verified using the LSN Administrator's (LSNA) final list of LSN Accession Numbers and the corresponding Participant Accession Numbers provided to SECY per a July 28, 2011 CAB-04 order.<sup>9</sup> The resolution of these issues is documented in the public ADAMS LSN Library Anomaly Resolution document.<sup>10</sup>

## **2. Scope**

The scope of this document is limited to the technical discussion of options to reconstitute or replace the original LSN. Each option discussed assumes, unless otherwise noted, that any IT system developed to emulate or replace the original LSN would meet the functional requirements found in Appendix A to this document.

## **3. Underlying Assumptions**

There are a number of factors that will influence a decision to either reconstitute or replace the original LSN, potentially with one of the options outlined in this paper. The following list provides factors that will need to be taken into consideration when reviewing the various options:

- 10 C.F.R. Part 2, Subpart J provides specific rules governing the purpose and operation of a discovery system for the HLW proceeding. These rules remain unchanged.<sup>11</sup> Any option, even a reconstituted LSN, will require modifications to or exemptions from several sections of Subpart J.
- An LSNA would be appointed to oversee design, implementation, and operation of a reconstituted or replacement LSN.<sup>12</sup>
- The hardware components that constituted the NRC-operated portion of the original LSN are no longer available.
- The original LSN software components, inclusive of operating system platforms, are no longer vendor-supported and, in some instances, newer versions are unavailable.

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<sup>9</sup> <https://www.nrc.gov/docs/ML1120/ML11209C291.pdf>.

<sup>10</sup> <https://www.nrc.gov/docs/ML1708/ML17087A500.pdf>.

<sup>11</sup> A technical working group, formed at the direction of the LSNARP, developed the functional requirements that were summarized in the March 20, 2000 LSNARP Technical Working Group Meeting notes, <https://www.nrc.gov/docs/ML0501/ML050110336.pdf>. These requirements culminated in a June 2001 LSN Baseline Design Requirements document and are reflected in the "Project Definition and Analysis Document for the Licensing Support Network," <https://www.nrc.gov/docs/ML0108/ML010850295.pdf>.

<sup>12</sup> 10 C.F.R. § 2.1011(c).

- The original LSN Guidelines would be updated by the LSNA, in coordination with the LSNARP, to provide technical guidance on the operation of a reconstituted or replacement LSN.<sup>13</sup>
- A reconstituted LSN or replacement system will need to remain in operation through (1) the construction authorization licensing proceeding; (2) the interim period between the construction authorization and receive and possess licensing proceedings; (3) the receive and possess licensing proceeding; and (4) any judicial appellate proceedings following the receive and possess licensing proceeding.
- The bibliographic information provided by each participant in 2011 continues to be associated with each header and document.
- The originally assigned LSN accession number can be used to find headers and documents in the public ADAMS LSN Library.<sup>14</sup>
- Parties to the proceeding that provided 500 or more items of documentary material via the original LSN or sponsored ten or more admitted contentions were requested to provide an estimate as to the number of new documentary material headers/documents each might produce should the proceeding resume.<sup>15</sup> The responses from the Nuclear Energy Institute, DOE, the NRC Staff, State of Nevada, Inyo County, CA, and Nye County, NV can be found in ADAMS as follows:
  - Nuclear Energy Institute: <https://www.nrc.gov/docs/ML1733/ML17338A636.html>
  - DOE: <https://www.nrc.gov/docs/ML1733/ML17339A777.html>
  - NRC Staff: <https://www.nrc.gov/docs/ML1733/ML17339A841.html>
  - State of Nevada: <https://www.nrc.gov/docs/ML1735/ML17352A238.html>
  - Inyo County, CA: <https://www.nrc.gov/docs/ML1803/ML18036A186.html>
  - Nye County, NV: <https://www.nrc.gov/docs/ML1805/ML18052B081.html>

The California Energy Commission and Clark County, NV did not provide a formal written response to this inquiry.

Party responses are summarized in the table below.

<sup>13</sup> The LSN Guidelines, <https://www.nrc.gov/docs/ML0613/ML061380788.html>, were prepared under the direction of the LSNA to document the decisions reached by the LSNARP and the technical aspects of the July 2001 amendments to 10 C.F.R. Part 2, Subpart J, that implemented the original LSN technical solution. They in no way affected, superseded, or otherwise relieved a participant from compliance with 10 C.F.R. Part 2.

<sup>14</sup> When documents were added to the original LSN, they were assigned an LSN accession number. The LSN accession number comprises a three-character participant identifier followed by a nine-digit zero filled sequential number. When the LSN assigned accession numbers, it incremented the last number assigned to the participant submitting the header/document by one. If a header/document was removed, the LSN accession number assigned to that header/document was not reused. Thus, there may be gaps in the “sequentially” assigned LSN accession numbers.

<sup>15</sup> <https://www.nrc.gov/docs/ML1733/ML17338A578.html>.

**Table 3-1 - New Header/Document Estimates**

Hearing Participant	Possible New Header-Only Entries	Possible New Header/Document Only Entries
California Energy Commission	No Response Provided	
Clark County, NV	No Response Provided	
Inyo County, CA	0	~50
Nuclear Energy Institute	0	Between 100 and 500
Nye County, NV	~5 percent	Between 100 and 500
State of Nevada	To Be Determined	> 1000*
DOE	~9 percent	> 1000**
NRC	~1 percent	1000 to 2000***

\* In its response, the State of Nevada indicated it currently does not have the time and resources available to ascertain the volume of new documentary material in its possession. The State of Nevada also indicated that further work conducted by DOE may result in additional submitted contentions that, in turn, would generate additional documentary material.

\*\* In its response, DOE indicated that it was unable to provide a reasonable estimate of the volume of additional documentary material to be added to an LSN. According to DOE, the volume of documentary material depended, in large part, on additional work DOE will conduct concerning its license application and the number and subject of contentions that DOE will be required to address.

\*\*\* The NRC Staff noted that given the significant uncertainties related to the resumption of the Yucca Mountain adjudication, including, for example, the timing and schedule of the proceeding, it was providing a rough estimate based on significant uncertainties that could be subject to change.

#### 4. Objective

The objective of this paper is to outline possible IT system options for the replacement of the original LSN, as well as to discuss the option of reconstituting the original LSN. The discussion below includes a brief technical/operational description of the options. All cost and time estimates provided in this options paper are estimates based on available information and are intended to provide a consistent comparison basis between options.<sup>16</sup> Depending on the option selected, market research and a more detailed independent government cost estimate may be conducted as part of any budget formulation or procurement activities to develop a more precise cost. A project plan, depending on the option selected, may be developed to provide a more accurate schedule. The final implemented solution for the selected option may vary from the description provided in this paper as the selected option will be subject to design reviews and

<sup>16</sup> The cost and time estimates are not provided for the specific activities listed in the cost and time estimate tables as this may or may not be indicative of potential future contracted work. Participant cost and time estimates could not be determined as they will be dependent, in the case of cost, on the size of the participant's collection and, in the case of time, on the IT procurement processes and IT policies applicable to the participant's organization.

user acceptance testing. The LSNA would coordinate these activities in conjunction with the LSNARP.

## 5. Current State of the Public ADAMS LSN Library

The public ADAMS LSN Library contains 11,732 header-only entries and 3,680,574 header/document entries for a grand total of 3,692,306 entries.<sup>17</sup> As mentioned in Section 1.1, the source of the headers and documents in the public ADAMS LSN Library were the LSN participant collections provided to SECY in 2011. The NRC added those headers/documents to the public ADAMS LSN Library without making any changes to the bibliographic information provided, with the exception of the 130 header/document anomalies that were found and addressed during the audit and verification process discussed briefly above.

The Uniform Resource Locator (URL) of the public ADAMS LSN Library home page is <https://www.nrc.gov/reading-rm/lsn/index.html>.

The size of the public ADAMS LSN Library is approximately 8.5 terabytes,<sup>18</sup> and the breakdown of headers/documents by participant is as follows:

**Table 5-1 - Public ADAMS LSN Library Header/Document Collection Count**

Participant Collection	Number of Entries
U.S. Department of Energy	3,651,457
U.S. Nuclear Regulatory Commission	30,510
State of Nevada	5450
Nye County, NV	2351
Nuclear Energy Institute	797
California Energy Commission	616
Inyo County, CA	429
White Pine County, NV	99
Clark County, NV	92
Joint Timbisha Shoshone Tribal Group <sup>19</sup>	88
Lander County, NV	75
Eureka County, NV	64
Churchill County, NV	61
Lincoln County, NV	61
Mineral County, NV	58
Esmeralda County, NV	37

<sup>17</sup> Header-only entries represent (1) physical items such as videotapes, photographs, or rock samples; or (2) privileged, confidential, safeguards, or other type of limited access documentary material. See 10 C.F.R. § 2.1003, "Availability of material," for additional information.

<sup>18</sup> Generally, header-only entries do not have PDF documents associated with them; however, the NRC Staff and some other participants added placeholder PDF documents for header-only entries.

<sup>19</sup> The Timbisha Shoshone Yucca Mountain Oversight Program Non-Profit Corporation and the Timbisha Shoshone Tribe have, to date, participated in the adjudication as the Joint Timbisha Shoshone Tribal Group.

Participant Collection	Number of Entries
City of Caliente, NV	25
Aiken County, SC	13
State of Washington	10
State of South Carolina	5
Prairie Island Indian Community	3
Native Community Action Council	3
City of Las Vegas, NV	1
National Association Of Regulatory Utility Commissioners	1

## **6. Option 1 - Traditional Discovery**

As discussed in Section 5, the public ADAMS LSN Library provides access to the collection of headers/documents that were available through the original LSN at the time it was decommissioned in September 2011. The public ADAMS LSN Library is fully searchable by both content and original LSN header information. Under this option, for any new documentary material identified by the HLW hearing participants, the participants would exchange those documents with each other through traditional methods such as regular mail, fax, a delivery service, or e-mail. This option does not offer any central mechanism for new discovery material to be distributed to all participants or made available for review by the public. Further, this option does not provide a mechanism to revise or remove headers/documents that reside in the public ADAMS LSN Library.

### **6.1 Assumptions**

The following assumptions are made for the “Traditional Discovery” option:

- Hearing participants will have a small volume of new documentary material.
- The NRC continues to maintain the public ADAMS LSN Library.

### **6.2 IT System General Description**

Not Applicable.

### **6.3 IT System Implementation Costs**

Not Applicable.

### **6.4 IT System Implementation Timeframe**

Not Applicable.

### **6.5 IT System Implementation Risks/Challenges**

Not Applicable.

### **6.6 IT System Implementation Benefits**

While there are no IT system benefits to this option, it does have advantages and disadvantages. The most significant advantage of this option is that it requires no additional implementation time or cost. The public ADAMS LSN Library is operational and available for

use by the parties and the public. Operations and maintenance costs for the library are included in budget plans as the library is a component of the larger ADAMS environment.<sup>20</sup> The lack of an IT system supporting the distribution of, and availability to, new documentary material, as well as the lack of any ability to make modifications and deletions to existing headers/documents in the public ADAMS LSN Library, results in a number of disadvantages. As shown in the table below, those disadvantages would impact discovery and would place an increased burden on the HLW hearing participants, should the HLW proceeding resume.

**Table 6-1 - "Traditional Discovery" Pros/Cons**

<b>Pros</b>	<b>Cons</b>
Immediate implementation	Members of the public may not have access to any new documentary material
No implementation costs	HLW hearing participants would be required to distribute new documentary material to multiple other participants
	Any new documentary material would not be searchable electronically using a centralized search system
	New documentary material would lack a consistent/uniform numbering system
	No ability to modify or delete existing headers/documents currently available electronically in the public ADAMS LSN Library

## **7. Option 2 - Use of Existing Public ADAMS LSN Library**

As discussed in Section 5, the public ADAMS LSN Library provides access to the collection of headers/documents that were available through the original LSN at the time it was decommissioned in September 2011. The public ADAMS LSN Library is fully searchable by both content and original LSN header information. This option continues to leverage the investment made in making the LSN collection available to the parties and the public and provides two alternative mechanisms to add new headers/documents to the public ADAMS LSN Library or modify or delete existing headers/documents in the public ADAMS LSN Library.<sup>21</sup> The first alternative is a fully automated process in which the existing Electronic Information Exchange (EIE) system is utilized by a party while the second is a semi-manual process in which a designated NRC official receives additions, modifications, or deletions of documentary material from a party on electronic media and subsequently makes the appropriate changes to the public ADAMS LSN Library.

<sup>20</sup> The ADAMS environment encompasses the file storage system for the NRC's Main Library, Legacy Library, internal LSN Library, and external LSN Library as well as the Electronic Information Exchange system, the Electronic Hearing Docket, Web-Based ADAMS, and the infrastructure required to operate those systems.

<sup>21</sup> Under this option, any header or document added to the public ADAMS LSN Library must also be added to the internal ADAMS LSN Library, as those headers or documents would become federal records when received by the NRC.

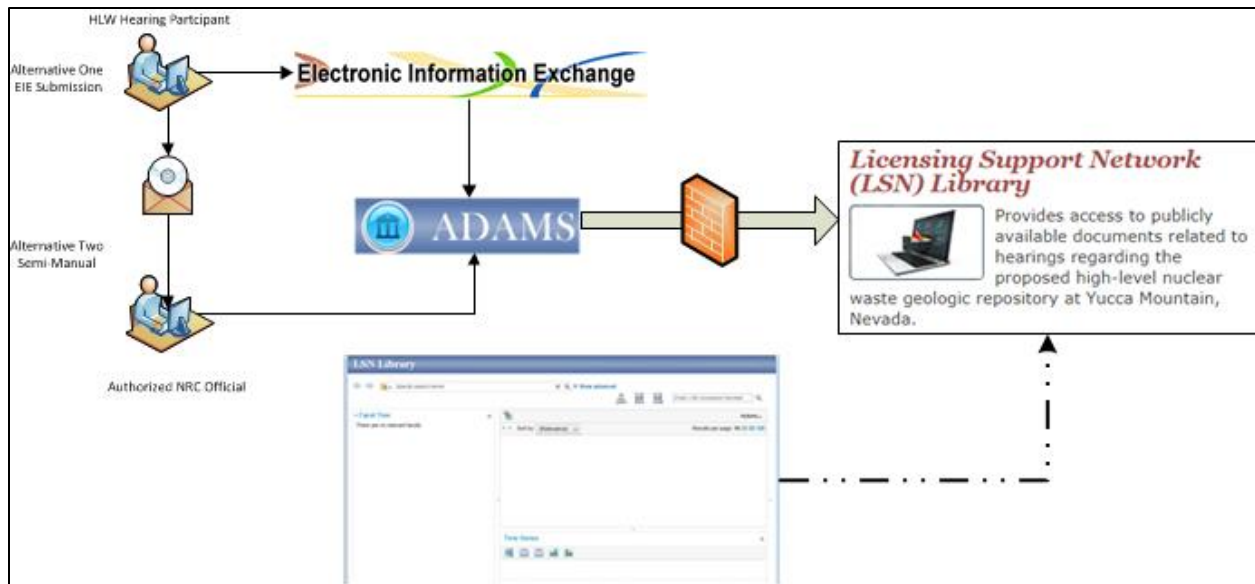


Figure 1 - Use of Existing Public ADAMS LSN Library (Conceptual)

## 7.1 Assumptions

The following assumptions are made for the “Use of Existing Public ADAMS LSN Library” option:

- For Alternative One (EIE System Modification), the total number of expected header/document actions (i.e., new headers/documents, modifications, and deletions) averages more than 1000 per month for the duration of the HLW proceeding.
- For Alternative Two (Semi-Manual Process), the total number of expected header/document actions (i.e., new headers/documents, modifications, and deletions) averages less than 1000 per month for the duration of the HLW proceeding.
- Not all original LSN functional requirements will be met as noted in Appendix A.

## 7.2 IT System General Description

The public ADAMS LSN Library is built upon an IBM suite of products including, but not limited to, IBM FileNet Object Store, IBM FileNet P8 Content Engine, and IBM Watson Content Analytics with Enterprise Search. The implementation of this option would not make any substantive changes to the current public ADAMS LSN Library interface and only touches the processes by which (1) new headers/documents would be added to the public ADAMS LSN Library; (2) existing headers/documents would be modified; or (3) headers/documents would be removed.

Under this option, there are two alternatives for the intake, modification, and removal processes of headers/documents. The first is a fully automated solution in which the existing EIE system would provide an intake mechanism for additions, modifications, or deletions. The second is a semi-manual process in which the headers/documents for addition, modification, or deletion would be provided to a designated NRC official on electronic media for processing. Both alternatives would require the submission of header files in Extensible Markup Language (XML) format that meet the technical requirements developed for the original LSN. Documents would

need to be submitted in PDF in agreed upon formatting standards developed by the LSNA in conjunction with the LSNARP.

For either alternative, to meet federal records requirements, newly submitted headers/documents would first be added to the internal ADAMS LSN Library and then, through a subsequent process, copied to the public ADAMS LSN Library.

The process for the modification of an entry will depend on whether the bibliographic information is being modified or the document is being modified. A bibliographic information modification would first capture the original value of the field being modified and then replace it with the new value. Next, a log would be generated that captures the old value and the new value. The updated log file would then be published to the public ADAMS LSN Library home page. For a document update, the updated document would be added to the internal ADAMS LSN Library as a new version (i.e., revision) of the existing document. When copied to the public ADAMS LSN Library, the original document would be removed and replaced with the updated document. The comment field in the header information would be amended to indicate that the document was revised.

Deletion requests would only be applied to the public ADAMS LSN Library. The header/document entry would be removed from the public ADAMS LSN Library and the internal ADAMS LSN Library would have the comment field amended to indicate that the header/document has been removed from the public ADAMS LSN Library. A log would be generated that provides a listing of deleted headers/documents that would then be published to the public ADAMS LSN Library home page.<sup>22</sup>

Because they would already be official agency records in ADAMS, for either alternative, as described in Section 7.3.4, a new NRC Staff header or document would be handled through a separate process. NRC Staff modifications and deletions would be handled through the process described below in Sections 7.3.1.2 and 7.3.1.3, or Sections 7.3.2.2 and 7.3.2.3.

### **7.3 IT System Intake Alternatives**

#### **7.3.1 Alternative One - EIE System Modification**

The first alternative for the intake, modification, and removal utilizes the EIE system. The EIE system is the agency's e-filing intake system that is used, as relevant here, for adjudicatory filings. It is a mature IT system that has well-developed configuration management and change control processes in place. The EIE system currently requires the use of digital certificates to submit adjudicatory filings to the NRC or to gain access to issuances made by the presiding officer or a hearing participant.<sup>23</sup> The use of digital certificate technology would be used for a new EIE HLW discovery document submission module that would be limited to authorized

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<sup>22</sup> Deleted headers and documents would remain subject to the Freedom of Information Act consistent with federal records requirements.

<sup>23</sup> A digital certificate, as defined in National Institutes of Standards and Technology (NIST) Special Publication (SP) 800-32 "Introduction to Public Key Technology and the Federal PKI Infrastructure," is a digital representation of information that at least (1) identifies the certification authority issuing it; (2) names or identifies its subscriber; (3) contains the subscriber's public key; (4) identifies its operational period; and (5) is digitally signed by the certification authority issuing it.



representatives of each HLW adjudication participant. The use of the issued digital certificate would be the primary mechanism to ensure that an action to modify or delete a document is being made to a header/document in a participant's collection. This would prevent an unauthorized user from adding a document to, or modifying or deleting a document from, another participant's collection.

### 7.3.1.1 Submission of New Material

A new material submission module would offer authorized participants three options for the submission of new material. The first option would be via an interface that allows the user to input the bibliographic information for the entry and attach an associated PDF document to the entry, if applicable. The second option would be to add individual bibliographic information files, formatted as XML, and an associated PDF document, if applicable. The third option would be a bulk upload of bibliographic information files, formatted as XML, and associated PDF documents, if applicable. As the headers/documents are added to the internal ADAMS LSN Library, they would be assigned LSN accession numbers consistent with the numbering scheme employed by the original LSN.

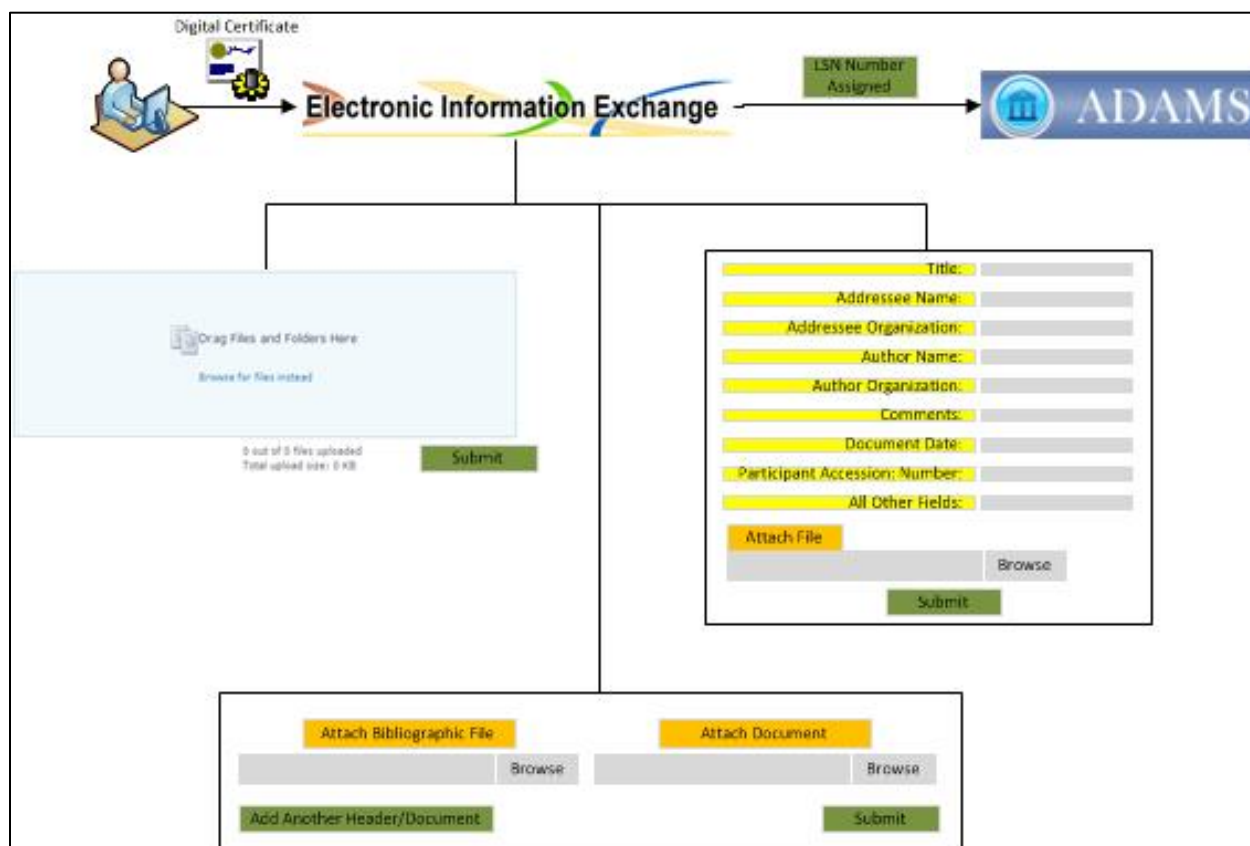


Figure 2 - Use of Existing Public ADAMS LSN Library - Additions (EIE Method) (Non-NRC Staff)

### 7.3.1.2 Submission of Modification Requests

The modification request module would utilize the same three mechanisms that the submission module offers. In the first instance, the authorized user could modify a single LSN entry. The user would enter in a valid LSN accession number and a screen would be presented that displays the current bibliographic information along with an entry text box for each bibliographic field. Changes to the bibliographic information would be made on the screen. A document

upload option would also be available. The system would make changes to the properties based on the entries and update the PDF document, should one be attached.

In the case of XML/PDF uploads under options two and three, the modification request module would step through each entry to first verify that the LSN/Participant accession number is valid. It would then display the original information and require confirmation of the changes.

Relative to NRC Staff modifications, the changes that would be required to be made would be placed in a queue for processing by the routine described in Section 7.3.4 below. This difference in the processing of NRC Staff modifications is due to the fact that NRC Staff headers/documents are not maintained in the internal ADAMS LSN Library.

All modifications, whether by the NRC Staff or other authorized users, would be captured in a log file that would be published to the public ADAMS LSN Library home page. The log would capture the LSN accession number of the modified header/document. In the instance of a header change, the log would capture the old value and the new value. In the instance of a modified document, the log would note that the document has been replaced.

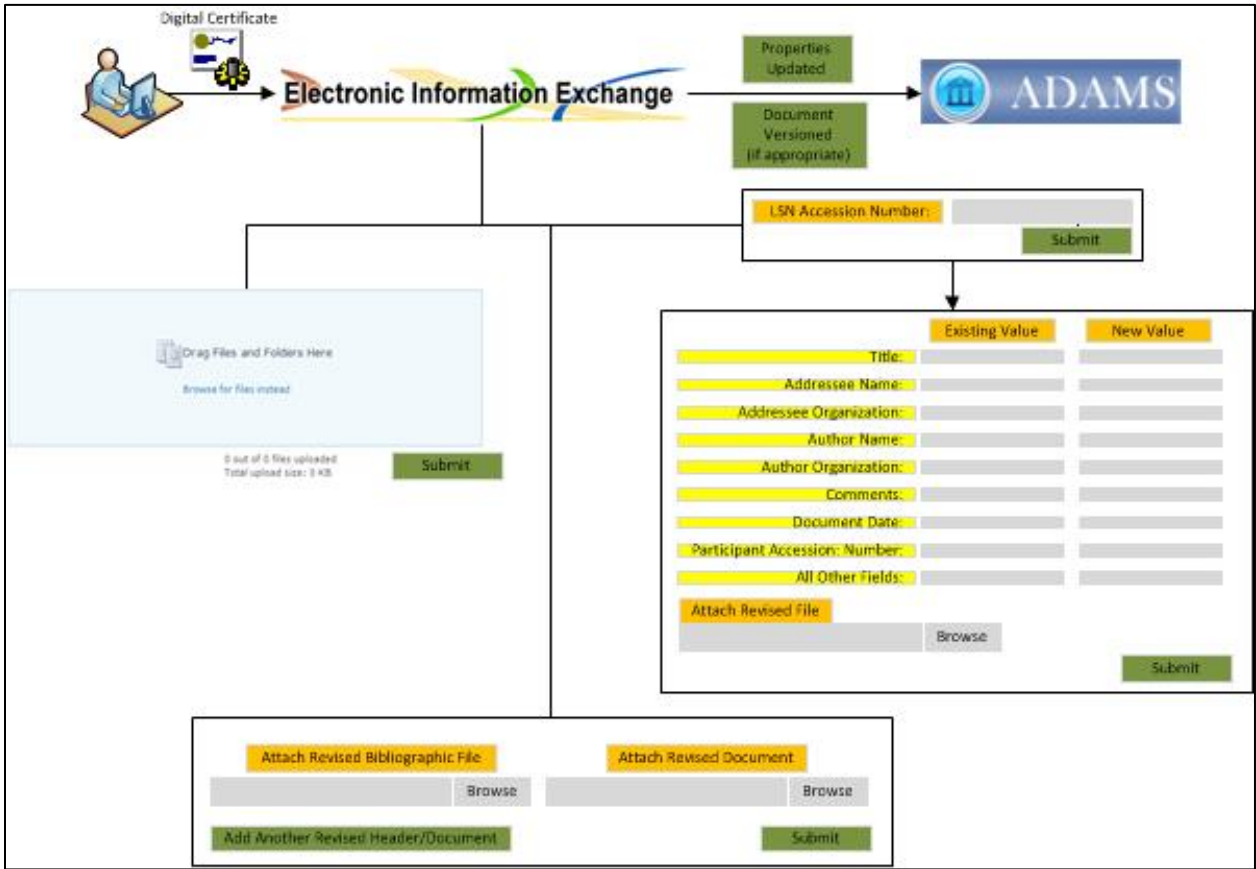


Figure 3 - Use of Existing Public ADAMS LSN Library - Modifications (EIE Method)

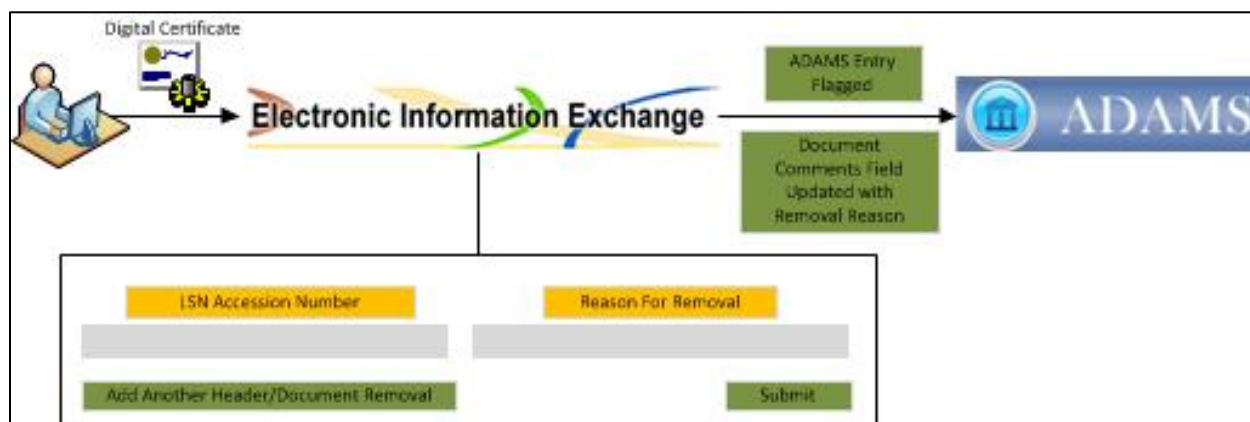
7.3.1.3 Submission of Deletion Requests

The deletion request module would only provide a mechanism for the authorized user to provide a list of LSN accession numbers. For each LSN accession number provided, the system would

verify that the LSN accession number was valid. In addition, each individual header/document deletion request would require a description of why the header/document needs to be removed.

Relative to NRC Staff deletions, the changes that would be required to be made would be placed in a queue for processing by the routine described in Section 7.3.3 below.

All deletions, whether by the NRC Staff or other authorized users, would be captured in a log file that would be published to the public ADAMS LSN Library home page. The log would capture the LSN accession number of the deleted header/document and the justification for the deletion.



**Figure 4 - Use of Existing Public ADAMS LSN Library - Deletions (EIE Method)**

### 7.3.2 Alternative Two - Semi-Manual Process

The second alternative for intake, modification, and removal utilizes a semi-manual process. In this alternative, a participant would be required to submit the headers/documents to an authorized NRC individual on a compact disk (CD) or Digital Versatile/Video Disc (DVD) formatted as read-only. Use of a read-only CD/DVD would provide some assurance that a submission has not been altered during transit. While other submission methods such as e-mail or Universal Serial Bus (USB) storage devices could be used, they do not offer that same assurance unless other methods, such as encryption, are employed. Further, NRC IT policy prohibits the use of non-NRC issued or approved USB devices in connection with NRC IT systems and limits the file size of inbound e-mails to 25 megabytes. Accordingly, to avoid confusion, a participant would submit a CD/DVD for each class of action requested.

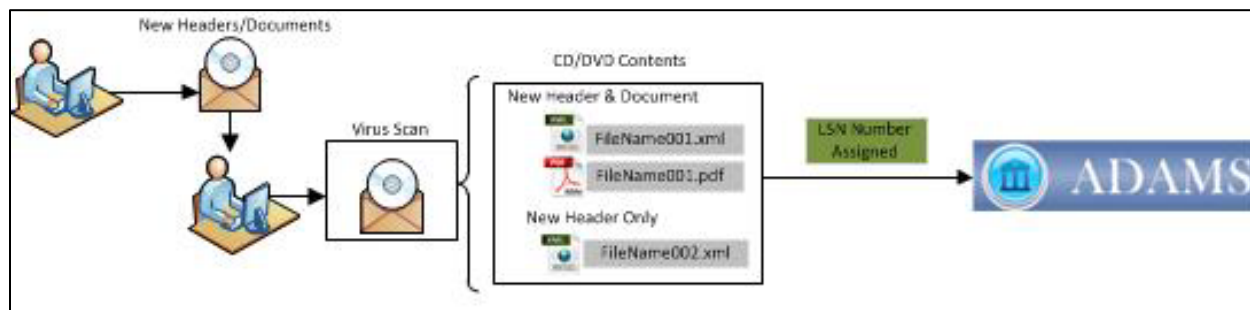
The authorized NRC individual would then take several steps to ensure the completion of the requested action that would include, but not be limited to:

1. Scanning the CD/DVD submission for viruses,
2. Vetting the XML files for compliance with the system, and
3. Validating that the modifications or deletions are being made to headers/documents under the submitting participant's control.

#### 7.3.2.1 Submission of New Material

For new material, the CD/DVD would contain a compliant XML file with the bibliographic information for each new document and a PDF document, if applicable. As the

headers/documents are added to the internal ADAMS LSN Library, they would be assigned LSN accession numbers consistent with the numbering scheme employed by the original LSN.



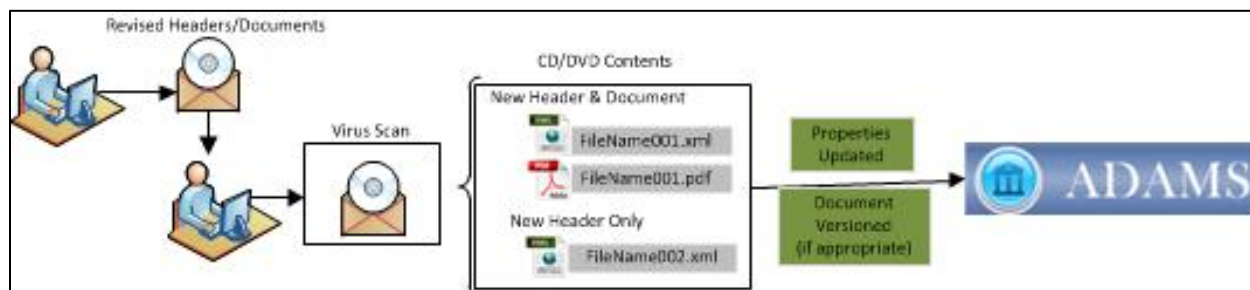
**Figure 5 - Use of Existing Public ADAMS LSN Library - Additions (Semi-Manual Method)**

### 7.3.2.2 Submission of Modification Requests

For header/document modifications, the XML file would only need to include the LSN accession number and the field(s) that was being modified and a revised document, if applicable.

Relative to NRC Staff modifications, the changes that would be required to be made would be placed in a queue for processing by the routine described in Section 7.3.3. This difference in the processing of NRC Staff modifications is due to the fact that NRC Staff headers/documents are not maintained in the internal ADAMS LSN Library.

All modifications, whether by the NRC Staff or other authorized users, would be captured in a log file that would be published to the public ADAMS LSN Library home page. The log would capture the LSN accession number of the modified header/document. In the instance of a header change, the log would capture the old value and the new value. In the instance of a modified document, the log would note that the document has been replaced.



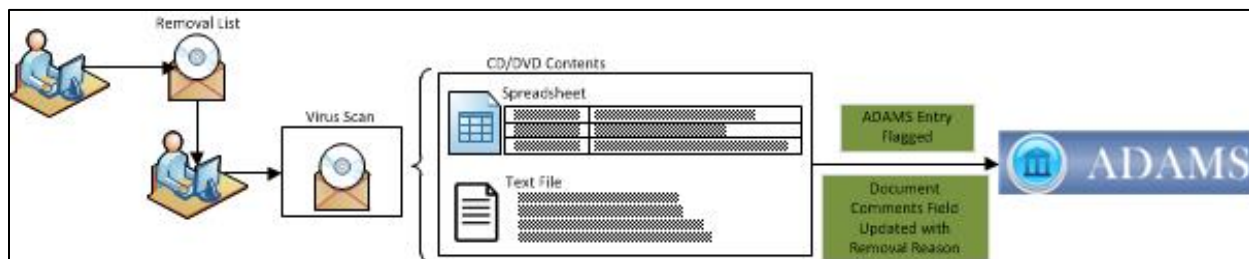
**Figure 6 - Use of Existing Public ADAMS LSN Library - Modifications (Semi-Manual Method)**

### 7.3.2.3 Submission of Deletion Requests

For header/document deletions, the CD/DVD would only need to contain a list (comma separated text file or spreadsheet) that includes the LSN accession number and a description of why the header/document needs to be removed.

Relative to NRC Staff deletions, the changes that would be required to be made would be placed in a queue for processing by the routine described in Section 7.3.3 below. This difference in the processing of NRC Staff deletions is due to the fact that NRC Staff headers/documents are not maintained in the internal ADAMS LSN Library.

All deletions, whether by the NRC Staff or other authorized users, would be captured in a log file that would be published to the public ADAMS LSN Library home page. The log would capture the LSN accession number of the deleted header/document and the justification for the deletion.

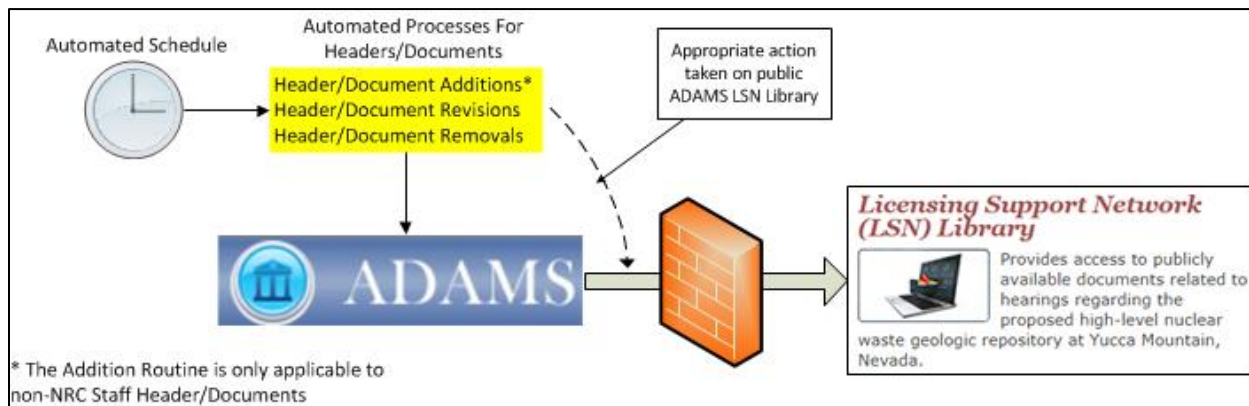


**Figure 7 - Use of Existing Public ADAMS LSN Library - Deletions (Semi-Manual Method)**

### 7.3.3 Publication to the Public ADAMS LSN Library

On a nightly basis, a process would be run that would take any new header/document additions and copy the header and document (if applicable) to the public ADAMS LSN Library and index the bibliographic information and document content. Similarly, header/document entries that have been identified for modification would be modified, as appropriate, and bibliographic information and document content re-indexed. Header/document deletions would be processed by removing the header/document and any index information from the public ADAMS LSN Library.

Once all of the header/document actions were processed, a list of changed headers/documents and deleted headers/documents would be generated and posted to the ADAMS LSN Library home page.



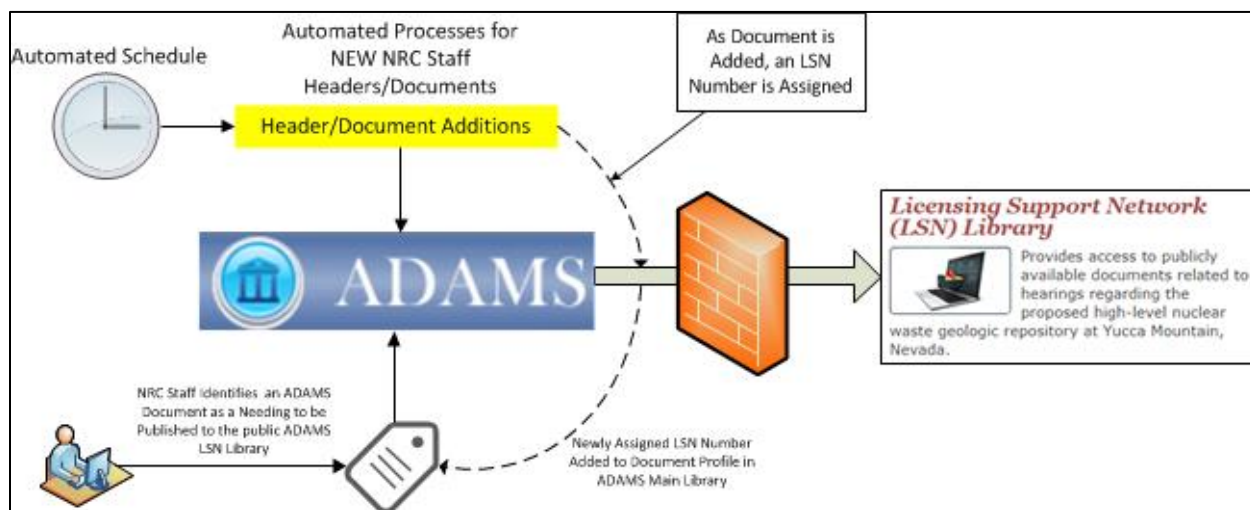
**Figure 8 - Use of Existing Public ADAMS LSN Library - Publication**

### 7.3.4 NRC Staff Headers/Documents

In general, the NRC Staff is required to place all headers/documents into the ADAMS Main Library to meet federal records requirements. To eliminate duplication, therefore, a process for the submission of new headers/documents would be developed that would allow the NRC Staff to identify relevant material in the internal ADAMS Main Library and have them copied to the public ADAMS LSN Library. During this process, which likewise would run on a nightly basis, an LSN accession number would be assigned and the header/document would be added and indexed in the public ADAMS LSN Library. The NRC Staff would still be required to follow the processes laid out in Alternatives One and Two for modifications or deletions of



headers/documents. Once a header/document has been added to the public ADAMS LSN Library, the newly assigned LSN accession number would be added to the properties of the header/document in the internal ADAMS Main Library to maintain consistency.



**Figure 9 - Use of Existing Public ADAMS LSN Library - NRC Staff Additions**

#### 7.4 IT System Implementation Costs

The following tables provide an estimate for the costs associated with the implementation and operation of the “Use of Existing Public ADAMS LSN Library” option. They are based on current information and are intended to provide a consistent comparison basis between options.

**Table 7-1 - Alternative One - EIE System Modification Cost Estimate**

System Development		
Activities	Initial Costs	Annual Recurring Costs
Modification to the EIE	Yes	
Auto Population from the EIE to the internal ADAMS LSN Library	Yes	
Development of automated publication/synchronization process from internal ADAMS LSN Library to public ADAMS LSN Library	Yes	
Direct copy from internal ADAMS Main Library to public ADAMS LSN Library for new NRC Staff headers/documents	Yes	
Records management	Yes	Yes
Cybersecurity authorization and continuous monitoring	Yes	Yes
Software and hardware (including licenses)	Yes	Yes
Project management, documentation, communication, and other logistics	Yes	Yes
Training (travel and delivery)	Yes	Yes

<b>System Development</b>		
<b>Activities</b>	<b>Initial Costs</b>	<b>Annual Recurring Costs</b>
Operations and maintenance (patches, upgrades, configuration management, etc.)		Yes
Total Cost Estimate (Range)	\$900K - \$1,525K	\$800K - \$1,500K

**Table 7-2 - Alternative Two - Semi-Manual Process Cost Estimate**

<b>System Development</b>		
<b>Activities</b>	<b>Initial Costs</b>	<b>Annual Recurring Costs</b>
Manual load process from Participant CD/DVD to internal ADAMS LSN Library	Yes	
Development of automated publication/synchronization process from internal ADAMS LSN Library to public ADAMS LSN Library	Yes	
Direct copy from internal ADAMS Main Library to public ADAMS LSN Library for new NRC Staff headers/documents	Yes	
Records management	Yes	Yes
Cybersecurity authorization and continuous monitoring	Yes	Yes
Software and hardware (including licenses)	Yes	Yes
Project management, documentation, communication, and other logistics	Yes	Yes
Training (travel and delivery)	Yes	Yes
Operations and maintenance (patches, upgrades, configuration management, etc.)		Yes
Total Cost Estimate (Range)	\$600K - \$1,100K	\$800K - \$1,500K

### 7.5 IT System Implementation Timeframe

The rough time estimate for implementation of the “Use of Existing Public ADAMS LSN Library - Alternative One - EIE System Modification” option is between eight and fifteen months.

The rough time estimate for implementation of the “Use of Existing Public ADAMS LSN Library - Alternative Two - Semi-Manual Process” option is between seven and twelve months.

It should be noted that time estimates associated with contract actions are significantly lower for either alternative of this option as compared to the other options outlined below. The Office of the Chief Information Officer (OCIO) has contracts in place for the operations and maintenance of the ADAMS LSN Library system that would be leveraged for either alternative under this option.

Activities associated with implementing each of the possible alternatives include, but are not limited to:

- IT governance and contract actions,
- Technical solution design,
- System development,
- Implementation, and
- Testing.

## **7.6 IT System Implementation Risks/Challenges**

Overall, the implementation risk for either alternative of this option is moderate. That moderate determination, however, is contingent upon the volume and file size of the documents that may be submitted. During the initial loading of headers/documents provided to SECY into the internal ADAMS LSN Library, OCIO found that indexing headers/documents in excess of one gigabyte can be problematic and making modifications to the library requires a comprehensive auditing process. Fortunately, a comprehensive auditing process is in place and was exercised routinely when headers/documents were added to the public ADAMS LSN Library.

File size limitations may also be an impediment to the intake process. The EIE has a 100 megabyte submission size limit, meaning that the aggregate size of all headers/documents in a submission cannot exceed 100 megabytes. The PDFs in the public ADAMS LSN Library average 2.3 megabytes in size. Given this average size, an EIE submission for new headers/documents would be limited to around 40 new additions. This aggregate size limitation might cause a participant have to make multiple submissions for new headers/documents. Additionally, there are over 2000 PDFs in the public ADAMS LSN Library that exceed 100 megabytes. Should a participant need to submit a PDF that exceeds 100 megabytes, a separate process may need to be developed.

Alternative Two also has a moderate risk related to the volume of header/document actions, albeit not a technical risk. For Alternative Two, the risk relates to the adequacy of staffing tasked with receipt and processing of submitted headers/documents, which could impact the timeliness with which additions/modifications/deletions are processed.

In terms of the specifics related to Alternatives One and Two, and excluding the volume and file size risks, the implementation risk for each alternative is low.

For Alternative One (EIE System), OCIO would modify an existing system that has mature change control and configuration management processes in place. The system also has a proven authentication module that has been functioning for many years and is supported by an existing helpdesk. For Alternative Two (Semi-Manual), OCIO would modify the processes that were developed when each non-NRC Staff participant's collection was loaded into ADAMS originally. Those processes are documented and under configuration control and would be the basis for the manual upload process.

For both alternatives, this option involves a second process to copy headers/documents from the internal ADAMS LSN Library and the ADAMS Main library (for NRC Staff headers/documents) to the public ADAMS LSN Library. Again, the processes to make these copies have already been developed and are under configuration control.



**Table 7-3 - Use of Existing Public ADAMS LSN Library - EIE System Modification Risk Score**

<b>Risk Factor*</b>	<b>Impact on Option</b>	<b>Likelihood of Occurrence</b>	<b>Risk Score (Impact x Likelihood)</b>
Acquisition	Low (1)	Low (1)	1
Technical Complexity	High (3)	Low (1)	3
Technical Obsolescence	High (3)	Low (1)	3
IT Policy	Low (1)	Low (1)	1
Technical Expertise	High (3)	Moderate (2)	6
Standardization	Low (1)	Low (1)	1
<b>Total</b>			<b>15</b>

\* See Appendix B for a definitions of risk factor, impact, likelihood, and risk score.

**Table 7-4 - Use of Existing Public ADAMS LSN Library - Semi-Manual Process Risk Score**

<b>Risk Factor*</b>	<b>Impact on Option</b>	<b>Likelihood of Occurrence</b>	<b>Risk Score (Impact x Likelihood)</b>
Acquisition	Low (1)	Low (1)	1
Technical Complexity	High (3)	Low (1)	3
Technical Obsolescence	High (3)	Low (1)	3
IT Policy	Low (1)	Low (1)	1
Technical Expertise	High (3)	Moderate (2)	6
Standardization	Low (1)	Low (1)	1
<b>Total</b>			<b>15</b>

\* See Appendix B for a definitions of risk factor, impact, likelihood, and risk score.

## 7.7 IT System Implementation Benefits

Using the already-operating public ADAMS LSN Library to provide access to both existing and new documentary material not only leverages the investment made in providing access to that library, but offers significant benefits to the participants in the adjudication as well as to the public. Because the public ADAMS LSN Library already is in place with a robust search capability, its use in the HLW adjudication can be quickly implemented with documentary material centralized into a single, publicly accessible repository. Use of the public ADAMS LSN Library will also enable continued use of the LSN accession numbering scheme, which is well understood by the participants and should avoid any confusion among public users as well.

Alternative One (EIE System) has no significant disadvantages.

**Table 7-5 - Alternative One - EIE System Modification Pros/Cons**

<b>Pros</b>	<b>Cons</b>
Relatively quick implementation	Additional costs associated with federal records responsibility for new headers/documents
Centralizes documentary material into a single repository	Aggregate size of all headers/documents in a submission cannot exceed 100 megabytes
Utilizes the investment made in providing access to the existing public ADAMS LSN Library	Additional steps required for a participant to make additions, modifications, or deletions to its collection
Allows for prompt processing of large volumes of documents	
Continues standardization of LSN accession numbering scheme	

Pros	Cons
Robust search engine built on IBM Watson	
Automated audit capabilities available for the entire collection	

Alternative Two (Semi-Manual) offers the same advantages as Alternative One (EIE System), but has a significant disadvantage associated with high volume header/document actions.

**Table 7-6 - Alternative Two - Semi-Manual Process Pros/Cons**

Pros	Cons
Relatively quick implementation	Partial manual process with potential processing delays for large volumes of headers/documents
Centralizes documentary material into a single repository	Additional costs associated with federal records responsibility for new headers/documents
Utilizes the investment made in providing access to the existing public ADAMS LSN library	Additional steps required for a participant to make additions, modifications, or deletions to its collection
Continues standardization of LSN accession numbering scheme	
Robust search engine built on IBM Watson	
Automated audit capabilities available for the entire collection	

## 8. Option 3 - Move to the Cloud

Option 3 involves the utilization of “cloud”-based technology to store, index, search, and retrieve the collection of HLW headers/documents. In its simplest terms, a cloud-based solution uses on-demand resources that are part of a provider’s shared cloud environment or infrastructure. Prominent examples of cloud-based services include Google Mail (Gmail), Microsoft Office 365, and Dropbox.

In National Institutes of Standards and Technology (NIST) Special Publication (SP) 800-145, “The NIST Definition of Cloud Computing,” cloud computing is described as “a model for enabling ubiquitous, convenient, on-demand network access to a shared pool of configurable computing resources (e.g., networks, servers, storage, applications, and services) that can be rapidly provisioned and released with minimal management effort or service provider interaction.”<sup>24</sup> Further, NIST SP 800-145 describes the cloud model as being comprised of the following five essential characteristics, three service models, and four deployment models:

- Essential characteristics
  - On-demand self-service - A consumer can unilaterally set up computing capabilities, such as network storage, as needed automatically without requiring human interaction with each service provider.
  - Broad network access - Capabilities are available over the network and accessed through standard mechanisms that promote use by various client platforms (e.g., mobile phones, tablets, laptops, and workstations).

<sup>24</sup> <http://nvlpubs.nist.gov/nistpubs/Legacy/SP/nistspecialpublication800-145.pdf>.

- Resource pooling - The provider's computing resources are pooled to serve multiple consumers using a multi-tenant model, with different physical and virtual resources dynamically assigned and reassigned according to consumer demand. There is a sense of location independence in that the customer generally has no control or knowledge over the exact location of the provided resources but may be able to specify location at a higher level of abstraction (e.g., country, state, or datacenter). Examples of resources include storage, processing, memory, and network bandwidth.
- Rapid elasticity - Capabilities can be quickly provisioned and released, in some cases automatically, to scale rapidly outward and inward commensurate with demand. To the consumer, the capabilities available often appear to be unlimited and can be used in any quantity at any time.
- Measured service - Cloud systems automatically control and optimize resource use by metering, at some level, the type of service (e.g., storage, processing, bandwidth, and active user accounts). Resource usage can be monitored, controlled, and reported, providing transparency for both the provider and consumer of the utilized service.
- Service models
  - Software as a Service - The capability provided to the consumer is to use the provider's applications running on a cloud infrastructure. The applications are accessible from various client devices through either a web browser (e.g., web-based email), or a program interface. The consumer does not manage or control the underlying cloud infrastructure including network, servers, operating systems, storage, or even individual application capabilities, with the possible exception of limited user specific application configuration settings.
  - Platform - The capability provided to the consumer is to deploy onto the cloud infrastructure consumer-created or acquired applications created using languages, libraries, services, and tools supported by the provider. The consumer does not manage or control the underlying cloud infrastructure including network, servers, operating systems, or storage, but has control over the deployed applications and possibly configuration settings for the application-hosting environment programming.
  - Infrastructure - The capability provided to the consumer is to set up processing, storage, networks, and other fundamental computing resources where the consumer is able to deploy and run arbitrary software, which can include operating systems and applications. The consumer does not manage or control the underlying cloud infrastructure but has control over operating systems, storage, and deployed applications; and possibly limited control of select networking components (e.g., host firewalls).
- Deployment models
  - Private cloud - The cloud infrastructure is set up for exclusive use by a single organization comprising multiple consumers (e.g., business units). It may be owned, managed, and operated by the organization, a third party, or some combination of them, and it may exist on or off premises.
  - Community cloud - The cloud infrastructure is set up for exclusive use by a specific community of consumers from organizations that have shared concerns (e.g., mission, security requirements, policy, and compliance considerations). It

may be owned, managed, and operated by one or more of the organizations in the community, a third party, or some combination of them, and it may exist on or off premises.

- Public cloud - The cloud infrastructure is set up for open use by the general public. It may be owned, managed, and operated by a business, academic, or government organization, or some combination of them. It exists on the premises of the cloud provider.
- Hybrid cloud - The cloud infrastructure is a composition of two or more distinct cloud infrastructures (e.g., private, community, or public) that remain unique entities, but are bound together by standardized or proprietary technology that enables data and application portability (e.g., cloud bursting for load balancing between clouds).

## 8.1 Assumptions

The following assumptions are made for the “Move to the Cloud” option:

- Once the header/document collection is available through the cloud-based solution, the NRC would decommission the public ADAMS LSN Library.<sup>25</sup>
- Not all original LSN functional requirements will be met as noted in Appendix A.
- The total number of header/document actions (i.e., new headers/documents, modifications, and deletions) will average more than 1000 per month for the duration of the HLW proceeding.
- For Alternative One (NRC-Maintained Cloud-Based Solution), the EIE intake process for new documents described in Section 7.3.1, would be utilized. Because of the potential header/document volume, the semi-manual intake process, described in Section 7.3.2 would not be practical.
- The cloud-based solution provider would be Federal Risk and Authorization Management Program (FEDRamp) certified.<sup>26</sup>

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<sup>25</sup> Under this option, the NRC would continue to maintain the internal ADAMS LSN Library to comply with federal records requirements.

<sup>26</sup> FedRAMP is a government-wide program that provides a standardized approach to security assessment, authorization, and continuous monitoring for cloud products and services, <https://www.fedramp.gov/>.

## **8.2 IT System General Description**

The general premise of the “Move to the Cloud” option is to transfer the collection of headers/documents from the public ADAMS LSN Library to a shared cloud-based storage solution, which is NRC-maintained in Alternative One and HLW participant-maintained in Alternative Two. In the NRC-maintained alternative, the agency would develop a cloud-based single entry point that provides a unified search mechanism for the collection. Additionally, the participants would use methods described in Section 7.3.1 above, for the addition, modification, or deletion of headers/documents.

In the HLW participant-maintained alternative, the NRC would either provide a cloud-based single entry point that indexes participant collections and provides a unified search mechanism or provide a single webpage with pointers to each participant’s cloud-based collection.<sup>27</sup> Each participant would have control of its own collection allowing each participant to develop its own processes for adding, modifying, and deleting documents in accord with guidelines developed by the LSNA in coordination with the LSNARP.

### **8.2.1 Alternative One – NRC-Maintained Cloud-Based System**

An NRC-maintained cloud-based storage system would move the headers/documents that are currently stored in the public ADAMS LSN Library to the cloud. This would eliminate the need for continued maintenance of the public ADAMS LSN Library. During the movement of the headers/documents to the cloud, the bibliographic header information that currently resides as properties in the public ADAMS LSN Library could either be embedded into custom PDF properties or added to a structured data set associated with the cloud-based storage solution. The choice between those two possibilities will be dependent upon the weight placed on original LSN requirements related to the capability to search and retrieve bibliographic header information.

Since the NRC would be maintaining the cloud-based storage system, a process would be developed to allow participants to submit new headers/documents, make modifications to existing headers/documents, or remove headers/documents. For the purpose of this alternative, the assumption is that the process described in Section 7.3.1 above would be employed to facilitate header/document actions.

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<sup>27</sup> A unified search portal that indexes a participant’s collection is similar in concept to the “Rebuild the Original LSN” option described below under Section 9. The biggest difference with the cloud-based option is that costs associated with the purchase, configuration, and maintenance of the hardware and software are included in the cloud-based system provider’s cost of service.

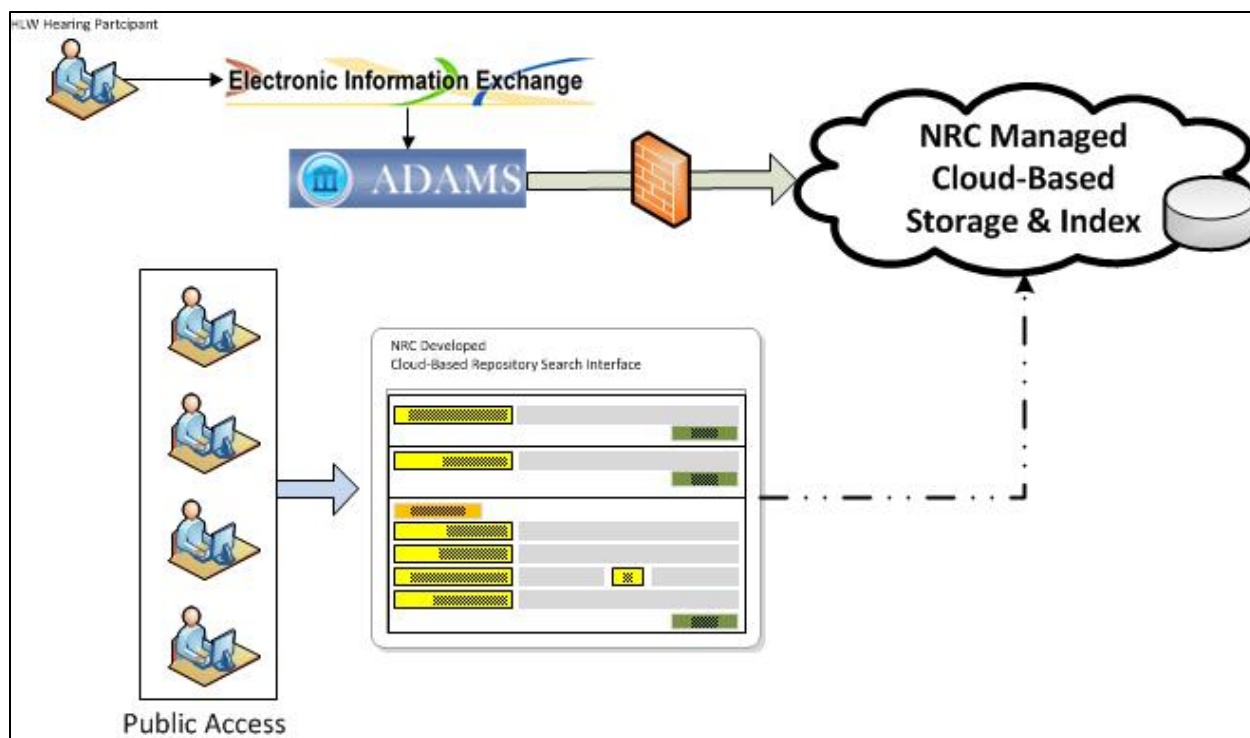


Figure 10 - NRC-Maintained Cloud-Based Solution (Conceptual)

#### 8.2.1.1 Publication to the Cloud-Based System

As headers/documents are added, modified, or marked as a deleted header/document, they would be flagged for processing. On a regular basis, an automated routine would take appropriate actions on those flagged headers/documents. New headers/documents would be added, modifications made, or header/documents deleted. As noted in Section 8.2.1, the bibliographic information would either be embedded into custom PDF properties or added to a structured data set.

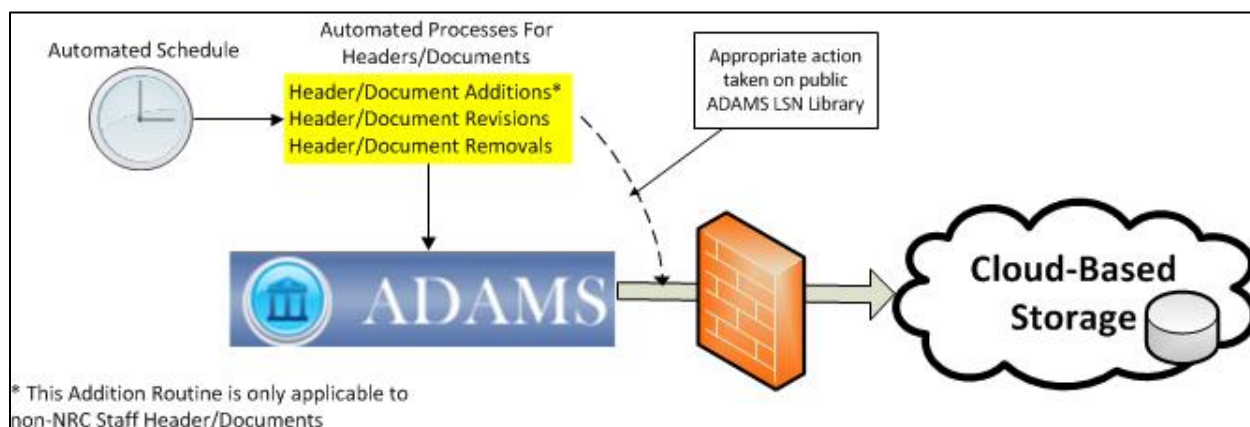
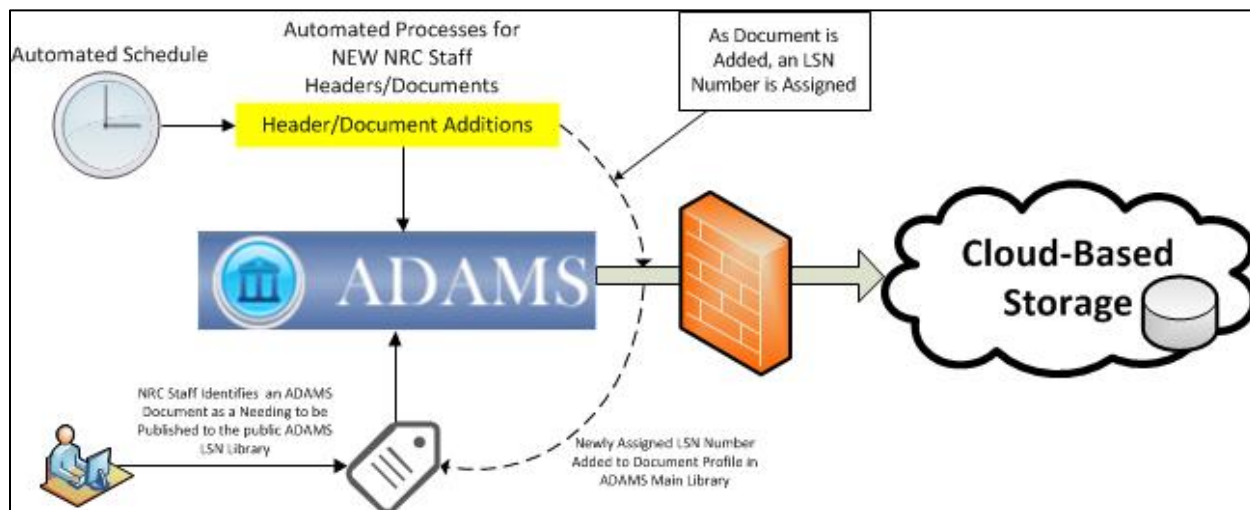


Figure 11 – NRC-Maintained Cloud-Based System - Publication

### 8.2.1.2 Publication of NRC Staff Headers/Documents to the Cloud-Based System

Since the NRC Staff headers/documents already reside in the internal ADAMS Main Library, a process would be put in place to have new headers/documents pushed out directly to the cloud-based system. The NRC Staff, however, would utilize the processes described in Section 7.3.1 above for modifications or deletions.



**Figure 12 – NRC-Maintained Cloud-Based System - Publication of NRC Staff Headers/Documents**

### 8.2.1.3 Search and Retrieval - NRC-Maintained

An NRC-developed search interface would provide a consistent mechanism to access the header/document collection that is housed in the NRC-maintained cloud-based storage system. As show in the figure below, headers/documents would be retrieved by specific header properties, by a content search, or by a combination of both.

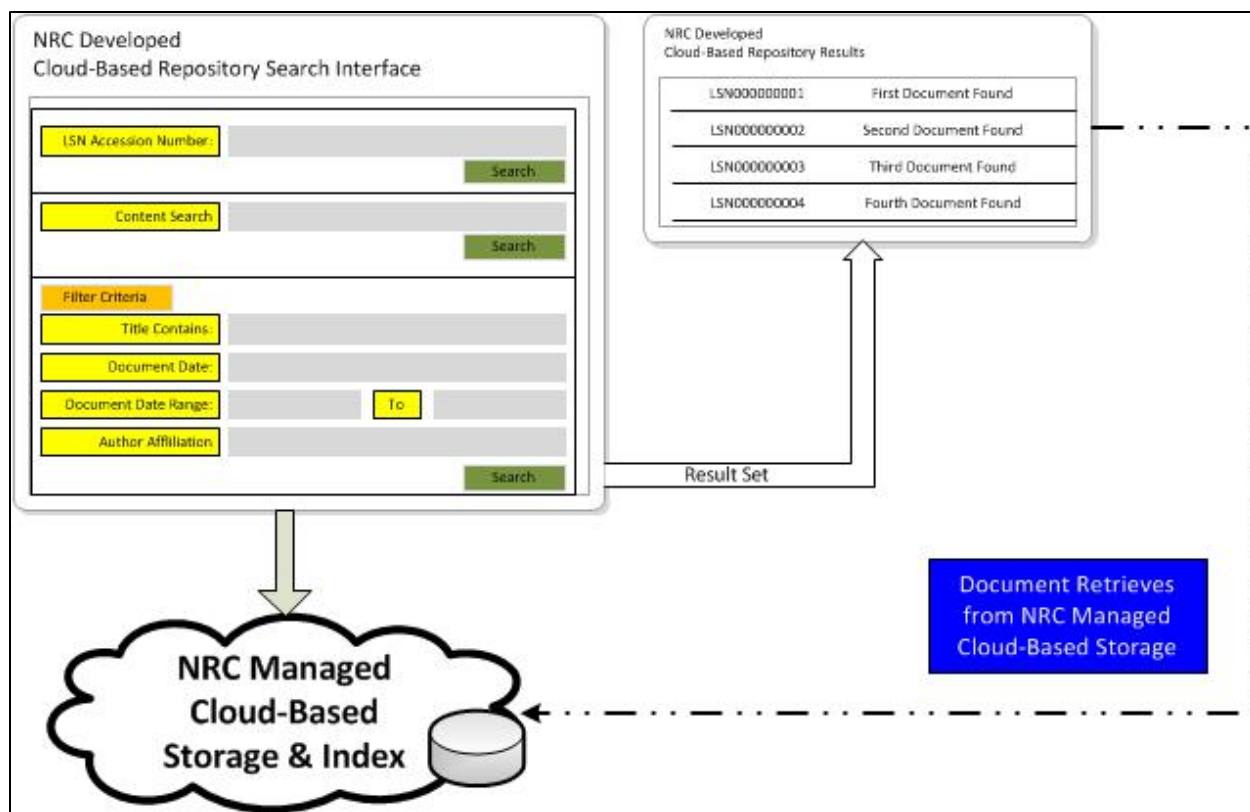


Figure 13 – NRC-Maintained Cloud-Based System - Search Interface

### 8.2.2 Alternative Two - HLW Participant-Maintained Cloud-Based System

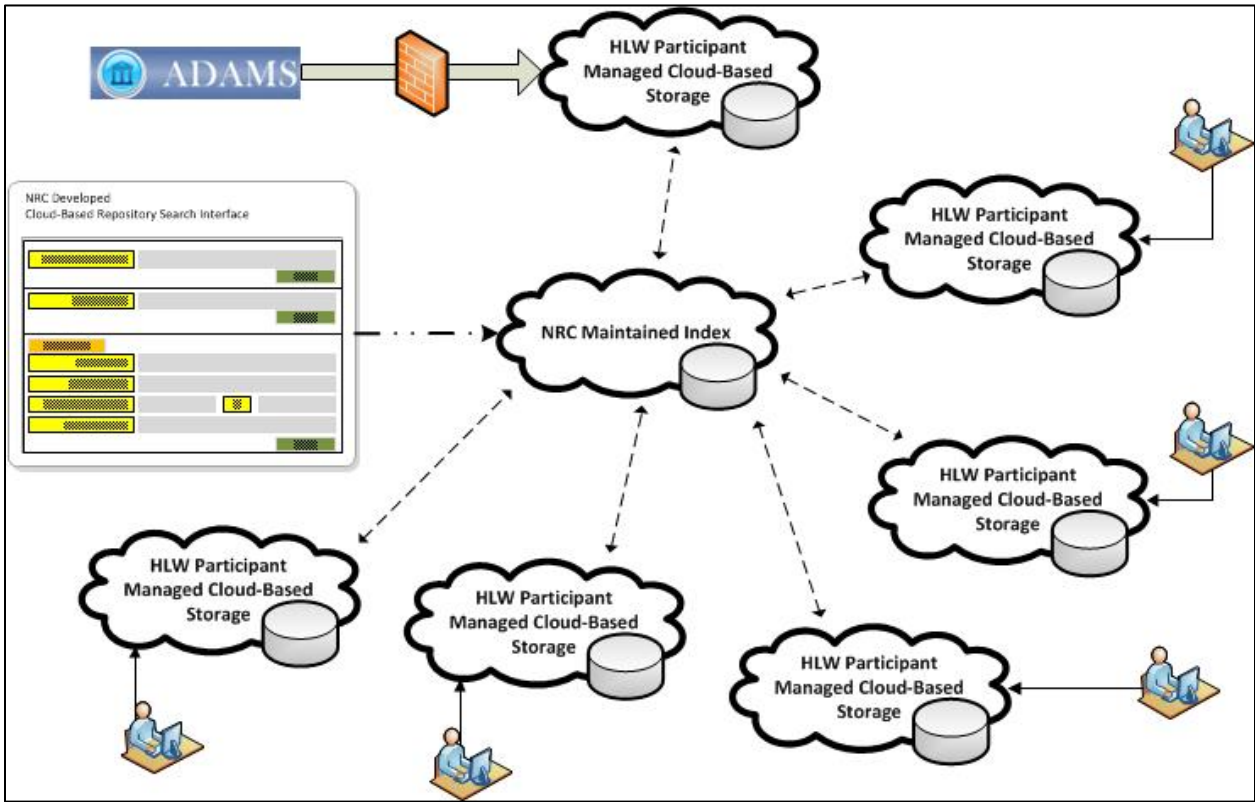
For Alternative Two, the ownership and maintenance of the cloud-based system is transferred to each participant in the HLW adjudication. The participant then would be responsible for contracting with a cloud-based storage provider having agreed-upon technical capabilities. To initiate this option, the NRC would provide to each HLW participant a copy of its collection from the public ADAMS LSN Library. Alternatively, a HLW participant could choose to use the copy it retained as directed by the April 11, 2011 CAB-04 order. A participant's existing LSN collection headers/documents and any new documentary material would be added to the participant-contracted cloud-based storage provider, with one of two methods being employed to provide search capabilities. In the first instance, the NRC could develop a centralized search engine that, in a fashion similar to the original LSN, would provide a centralized search portal into all the participants' documentary material collections, both existing documentary material and subsequent additions. The second method would be for the NRC to simply maintain a web-page with links to each participant's collection of existing and additional documentary material and the associated participant-procured, operated, and maintained search engine.

In the case of the "HLW Participant-Maintained, Cloud-Based System with NRC-Managed Search and Retrieval" alternative, the participant would be required to provide a listing to the LSNA of header/document modifications and deletions for posting on the NRC-maintained centralized search portal web-page as outlined in LSN Guideline 14.<sup>28</sup> In the case of the "HLW Participant-Maintained Cloud-Based System, Index, and Search" alternative, each HLW participant would be responsible for posting a list of changes and deletions on the home page

<sup>28</sup> <https://www.nrc.gov/docs/ML0503/ML050330198.pdf>.



for its document collection.



**Figure 14 - HLW Participant-Maintained, Cloud-Based System with NRC-Managed Search and Retrieval (Conceptual)**

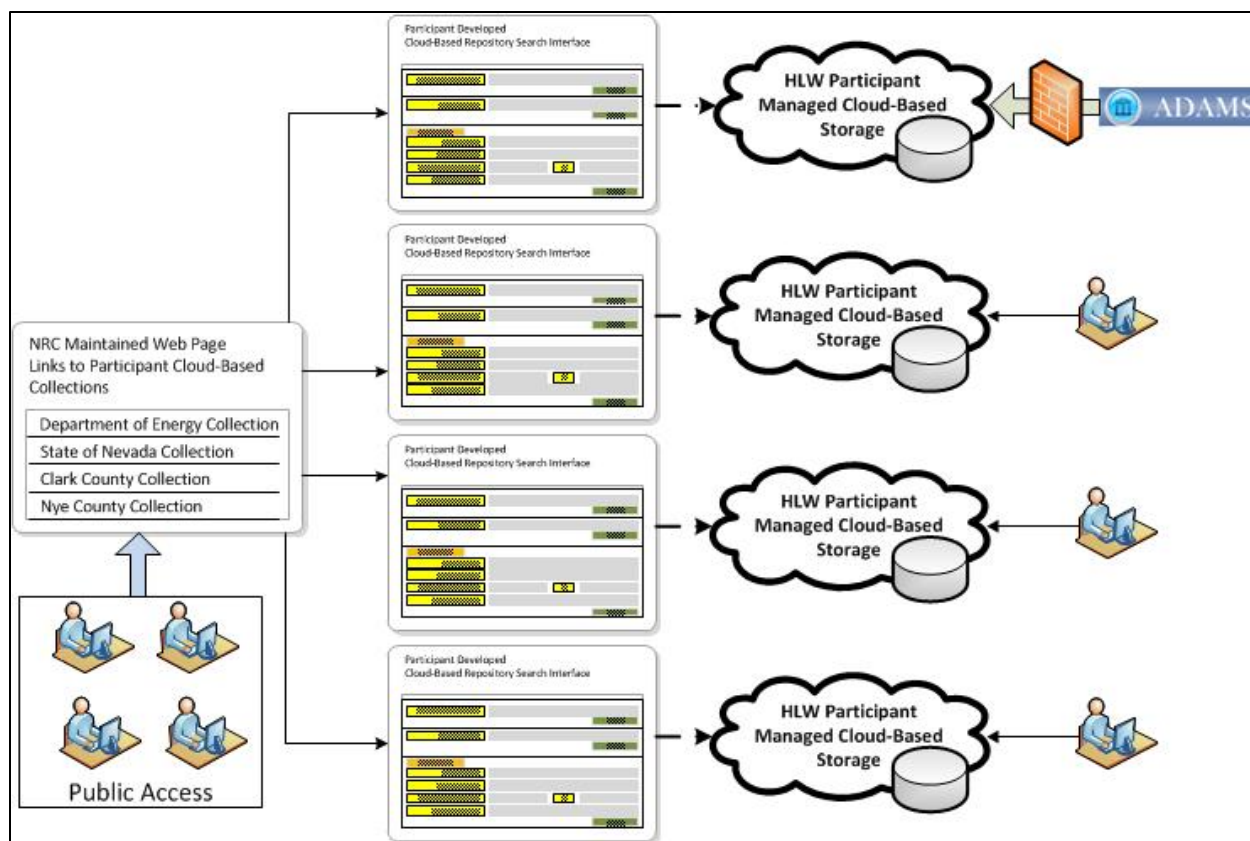


Figure 15 - HLW Participant-Maintained Cloud-Based System, Index, and Search

#### 8.2.2.1 Search and Retrieval - HLW Participant-Maintained

For Alternative Two (a), as depicted in the diagram below, the NRC would provide a cloud-based repository search interface that, when specific search criteria are entered, would search an NRC-maintained index of each participant's header/document collection. Much like the original LSN, when the request is made to view the document, the search interface would redirect the user to the participant's collection to present the document for viewing.

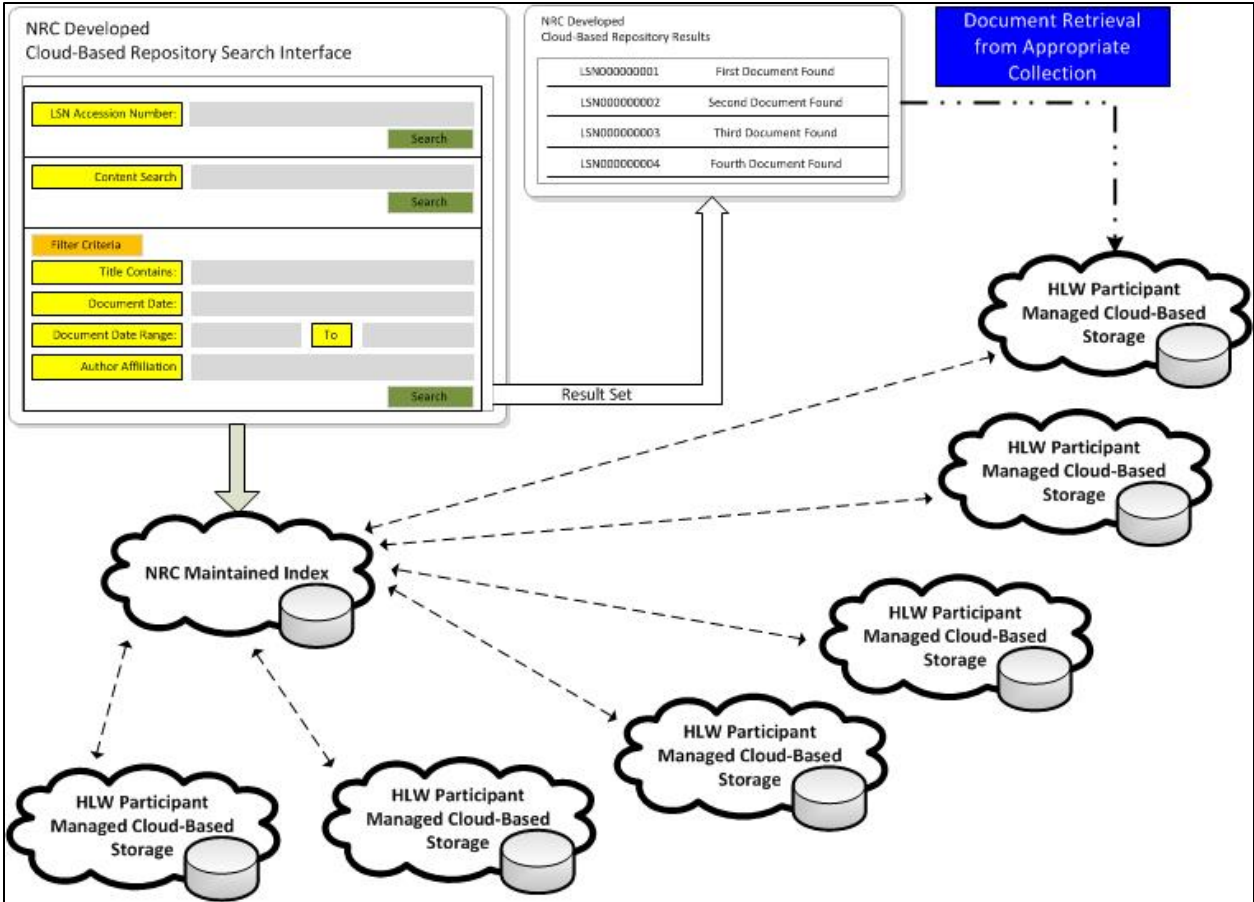


Figure 16 - HLW Participant-Maintained System with NRC Maintained Index - Search Interface

For Alternative Two (b), as depicted in the diagram below, the NRC would provide a single web page that provides links to each participant’s collection search interface. It is anticipated that the participant’s site would provide a standardized search interface that, in accord with LSNARP-adopted guidelines, would provide a user with the ability to enter specific search criteria to retrieve results and documents.

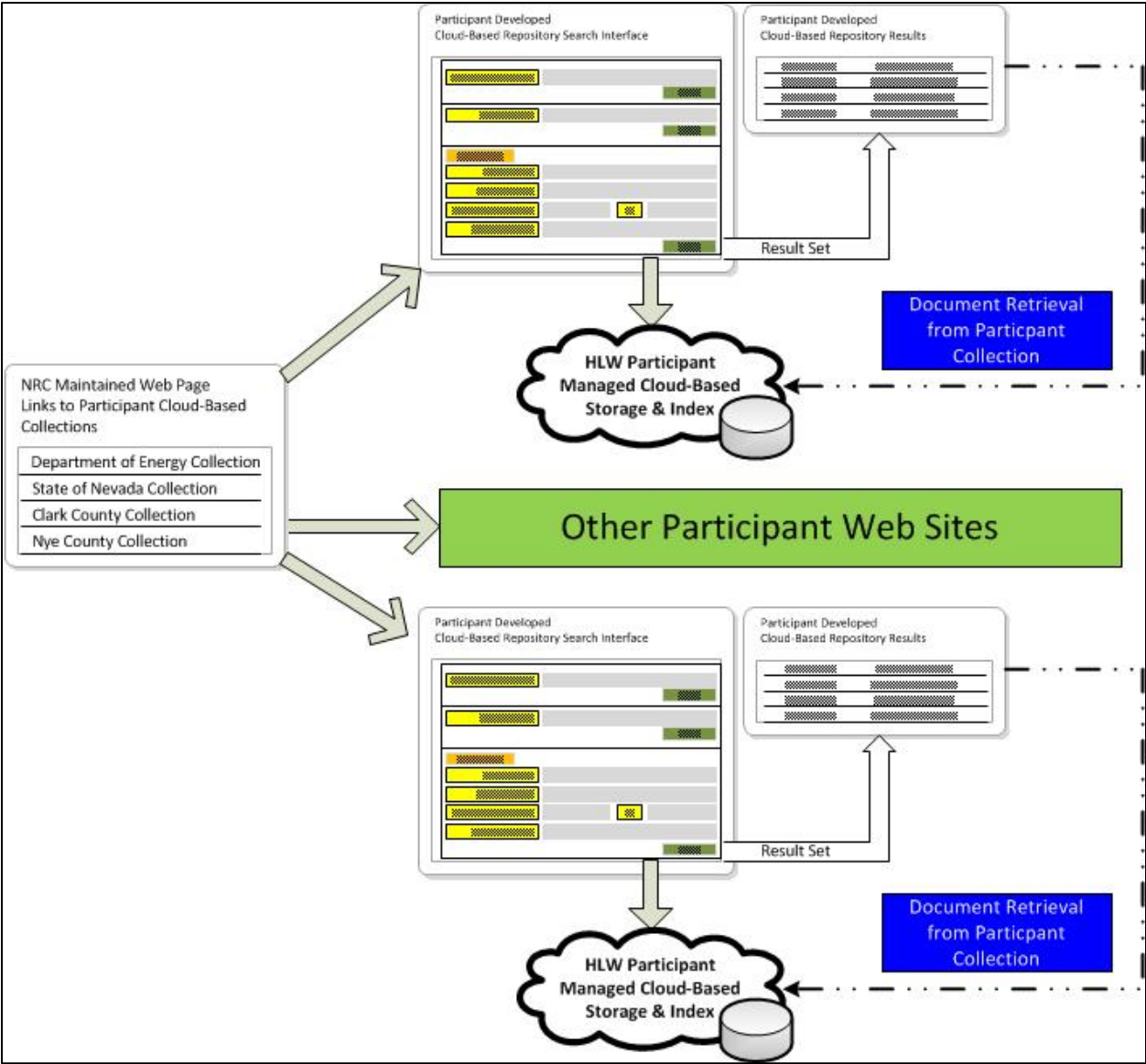


Figure 17 - HLW Participant-Maintained - Linked Only - Search Interface

8.3 IT System Implementation Costs

The following tables provide an estimate for the costs associated with each alternative cloud-based option. They are based on current information and are intended to provide a consistent comparison basis between options. For Alternative Two (a), the NRC provides a unified search portal, while for Alternative Two (b), the NRC provides a single web page with links to each participant’s cloud-based storage environment.

**Table 8-1 - Alternative One - NRC-Maintained Cloud-Based System Cost Estimate**

<b>System Development</b>		
<b>Activity</b>	<b>Initial Costs</b>	<b>Annual Recurring Costs</b>
Modifications to the EIE	Yes	
Auto Population from the EIE to the internal ADAMS LSN Library	Yes	
Direct copy from internal ADAMS Main Library to public ADAMS LSN Library for new NRC Staff headers/documents	Yes	
Development of automated publication/synchronization process from internal ADAMS LSN Library to cloud-based storage synchronization process	Yes	
Records management	Yes	Yes
Cloud-hosted repository	Yes	Yes
Centralized search interface	Yes	Yes
Cybersecurity authorization and continuous monitoring	Yes	Yes
Software and hardware (including licenses)	Yes	Yes
Project management, documentation, communication, and other logistics	Yes	Yes
Training (travel and delivery)	Yes	Yes
Operations and maintenance of NRC-managed systems (patches, upgrades, configuration management, etc.)		Yes
Total Cost Estimate (Range)	\$1,200K - \$1,950K	\$1,100K - \$1,750K

**Table 8-2 - Alternative Two (a) - HLW Participant-Maintained Cloud-Based System with NRC-Provided Search Portal Cost Estimate**

<b>System Development (NRC Search Portal)</b>		
<b>Activity</b>	<b>Initial Costs</b>	<b>Annual Recurring Costs</b>
Redistribute collection to originating party	Yes	
Implementation of indexing process	Yes	Yes
Development of standardized input mechanism	Yes	Yes
Cybersecurity authorization and continuous monitoring	Yes	Yes
Project management, documentation, communication, web announcements, other logistics	Yes	Yes
Training (travel and delivery)	Yes	Yes
Continued NRC Staff publication		Yes

<b>System Development (NRC Search Portal)</b>		
<b>Activity</b>	<b>Initial Costs</b>	<b>Annual Recurring Costs</b>
Records Management for internal ADAMS LSN Library		Yes
Total Cost Estimate (Range)	\$1,200K - \$2,000K	\$600K - \$1,100K
<b>NRC Staff Collection (as a Participant)</b>		
<b>Activity</b>	<b>Initial Costs</b>	<b>Annual Recurring Costs</b>
Develop an internal ADAMS LSN Library synchronization process for NRC Staff headers/documents	Yes	
Cloud-hosted repository for NRC Staff headers/documents	Yes	Yes
Software and hardware (including licenses)	Yes	Yes
Cybersecurity authorization and continuous monitoring	Yes	Yes
Project management, documentation, communication, and other logistics	Yes	Yes
Operations and maintenance of NRC-managed systems (patches, upgrades, configuration management, etc.)		Yes
Total Cost Estimate for NRC Staff Collection (Range)	\$350K - \$600K	\$525K - \$900K
<b>Non-NRC Staff HLW Participant Collections</b>		
<b>Activity</b>	<b>Initial Costs</b>	<b>Annual Recurring Costs</b>
Placement of initial collection in cloud-based storage	Yes	
Cloud hosted repository for each HLW participant's headers/documents	Yes	Yes
Cybersecurity authorization and continuous monitoring	Yes	Yes
Project management, documentation, communication, and other logistics	Yes	Yes
Software and hardware (including licenses)	Yes	Yes
Operations and maintenance of HLW participant-managed systems (patches, upgrades, configuration management, etc.)		Yes
Continued update of documentary material		Yes
Total Cost Estimate (Range) for Each non-NRC Staff HLW Participant Collection*	Undetermined	Undetermined

\* Each non-NRC Staff HLW participant, depending on the size of its collection, will have varying costs.

**Table 8-3 - Alternative Two (b) - HLW Participant-Maintained Cloud-Based System with NRC-Maintained Web Page of Participant Links Cost Estimate**

<b>System Development (NRC Link Page)</b>		
<b>Activity</b>	<b>Initial Costs</b>	<b>Annual Recurring Costs</b>
Centralized link web page	Yes	Yes
Redistribute collection to originating party	Yes	Yes
Software and hardware (including licenses)	Yes	Yes
Records Management for internal ADAMS LSN Library	Yes	Yes
Project management, documentation, communication, and other logistics	Yes	Yes
Training (travel and delivery)	Yes	Yes
Operations and maintenance of NRC-managed systems (patches, upgrades, configuration management, etc.)		Yes
Total Cost Estimate (Range) for NRC Link Page	\$400K - \$675K	\$250K - \$425K
<b>NRC Staff Collection (as a Participant)</b>		
<b>Activity</b>	<b>Initial Costs</b>	<b>Annual Recurring Costs</b>
Develop an internal ADAMS LSN Library synchronization process for NRC Staff headers/documents	Yes	
Cloud-hosted repository for NRC Staff headers/documents	Yes	Yes
Cybersecurity authorization and continuous monitoring	Yes	Yes
Software and hardware (including licenses)	Yes	Yes
Project management, documentation, communication, and other logistics	Yes	Yes
Operations and maintenance of NRC-managed systems (patches, upgrades, configuration management, etc.)	Yes	Yes
Total Cost Estimate (Range) for NRC Staff Collection	\$350K - \$600K	\$525K - \$900K
<b>Non-NRC Staff HLW Participant Collections</b>		
<b>Activity</b>	<b>Initial Costs</b>	<b>Annual Recurring Costs</b>
Placement of initial collection in cloud-based storage	Yes	
Cloud hosted repository for each HLW participant's headers/documents	Yes	Yes

<b>Non-NRC Staff HLW Participant Collections</b>		
<b>Activity</b>	<b>Initial Costs</b>	<b>Annual Recurring Costs</b>
Cybersecurity authorization and continuous monitoring	Yes	Yes
Project management, documentation, communication, and other logistics	Yes	Yes
Software and hardware (including licenses)	Yes	Yes
Travel and training	Yes	Yes
Operations and maintenance of HLW participant-managed systems (patches, upgrades, configuration management, etc.)		Yes
Continued update of documentary material		Yes
Total Cost Estimate (Range) for Each non-NRC Staff HLW Participant Collection*	Undetermined	Undetermined

\* Each non-NRC Staff HLW participant, depending on the size of its collection, will have varying costs.

#### **8.4 IT System Implementation Timeframe**

The rough time estimate for implementation of the “Move to the Cloud - Alternative One - NRC Maintained Cloud-Based System” option is between 22 and 38 months.

The rough time estimate for implementation of the “Move to the Cloud - Alternative Two (a) - HLW Participant-Maintained Cloud-Based System with NRC-Provided Search Portal” option is between 24 months and 42 months for NRC system development activities, between 16 and 28 months for NRC Staff collection (as a participant) activities, and undetermined for non-NRC Staff HLW participant collection activities.

The rough time estimate for implementation of the “Move to the Cloud - Alternative Two (a) - HLW Participant-Maintained Cloud-Based System with NRC-Maintained Web Page of Participant Links” option is between four and seven months for NRC system development activities, between 16 and 28 months for NRC Staff collection (as a participant) activities, and undetermined for non-NRC Staff HLW participant collection activities.

Non-NRC Staff HLW participant activities time estimates could not be estimated as each participant may have different IT policies in place for the procurement and implementation of an IT solution

Activities associated with implementing each of the possible alternatives include, but are not limited to:

- IT governance and contract actions,
- Technical solution design,
- System development,
- Implementation, and
- Testing.



## 8.5 IT System Implementation Risks/Challenges

The NRC-maintained cloud-based alternative has a moderate-to-high IT system implementation risk. The NRC is in the early stages of moving toward cloud-based computing and currently has limited experience with cloud-based system development.<sup>29</sup> There is also potential risk in developing the interface that pushes headers/documents from the internal ADAMS LSN Library out to the cloud-based system provider. Along these lines, the cloud-based system provider would need to be FEDRamp certified or a significant effort would be needed for cybersecurity authorization.

The participant-maintained cloud-based alternative has a high IT system implementation risk. While cloud-based technology systems have matured, there is uncertainty in developing custom interfaces for standard “off-the shelf” solutions. It is also expected that multiple cloud-based computing providers would be utilized. This offers potentially significant interface hurdles if a centralized search portal is developed. As compared to the original LSN where the participant responsible for the participant site could be contacted directly about technical issues, third-party supported environments may introduce additional management steps to alleviate connectivity issues. Such a situation may introduce significant challenges, especially if multiple cloud-based system providers are utilized. Additionally, coordinating multiple NRC and participant contracting and procurement actions along with individual participant-maintained cloud-based system development activities will impact this option.

**Table 8-4 - Alternative One - NRC-Maintained Cloud-Based System Risk Score**

<b>Risk Factor*</b>	<b>Impact on Option</b>	<b>Likelihood of Occurrence</b>	<b>Risk Score (Impact x Likelihood)</b>
Acquisition	High (3)	High (3)	9
Technical Complexity	Moderate (2)	High (3)	6
Technical Obsolescence	High (3)	Low (1)	3
IT Policy	Low (1)	Low (1)	1
Technical Expertise	High (3)	Low (1)	3
Standardization	Low (1)	Low (1)	1
<b>Total</b>			<b>23</b>

\* See Appendix B for a definitions of risk factor, impact, likelihood, and risk score.

**Table 8-5 - Alternative Two (a) - HLW Participant-Maintained Cloud-Based System with NRC-Provided Search Portal Risk Score**

<b>Risk Factor*</b>	<b>Impact on Option</b>	<b>Likelihood of Occurrence</b>	<b>Risk Score (Impact x Likelihood)</b>
Acquisition	High (3)	High (3)	9
Technical Complexity	High (3)	High (3)	9
Technical Obsolescence	High (3)	Low (1)	3
IT Policy	Low (1)	Low (1)	1
Technical Expertise	High (3)	Low (2)	6
Standardization	High (3)	High (3)	9
<b>Total</b>			<b>37</b>

\* See Appendix B for a definitions of risk factor, impact, likelihood, and risk score.

<sup>29</sup> June 20, 2017 Office of the Inspector General “Audit of NRC’s Adoption of Cloud Computing,” OIG-17-A-16, <https://www.nrc.gov/docs/ML1717/ML17171A136.pdf>.

**Table 8-6 - Alternative Two (b) - HLW Participant-Maintained Cloud-Based System with NRC-Maintained Web Page of Participant Links Time Estimate Risk Score**

<b>Risk Factor*</b>	<b>Impact on Option</b>	<b>Likelihood of Occurrence</b>	<b>Risk Score (Impact x Likelihood)</b>
Acquisition	Low (1)	Low (1)	1
Technical Complexity	Moderate (2)	High (3)	6
Technical Obsolescence	High (3)	Low (1)	3
IT Policy	Low (1)	Low (1)	1
Technical Expertise	High (3)	High (3)	9
Standardization	High (3)	High (3)	9
Total			29

\* See Appendix B for a definitions of risk factor, impact, likelihood, and risk score.

### 8.6 IT System Implementation Benefits

Moving the headers/documents to the cloud offers a number of advantages and disadvantages. The most significant advantage is the ability to leverage cloud-based resources, thus reducing the cost associated with the operations and maintenance of hardware and software. However, this advantage may be offset by the cost of developing a centralized cloud-based search portal.

**Table 8-7 - Alternative One – NRC-Maintained Cloud-Based System Pros/Cons**

<b>Pros</b>	<b>Cons</b>
Leverages current efficiency trends in technology by eliminating hardware costs	Complexity of implementation
Takes advantage of existing Internet search and other cloud resources	Cost of developing centralized cloud-based search portal
Continues standardization of LSN accession numbering scheme	Additional costs associated with federal records responsibility for new headers/documents
Locates documentary material in a single repository	Rudimentary search capability
Automated audit capabilities available for the entire collection	Document header information may not be viewable
Allows for prompt processing of large volumes of documents	Additional steps required for a participant to make additions, modifications, or deletions to its collection

**Table 8-8 - Alternative Two (a) - HLW Participant-Maintained Cloud-Based System with NRC-Provided Search Portal Pros/Cons**

<b>Pros</b>	<b>Cons</b>
Mimics original LSN concept and intent as decentralized, including cost shared by parties	Complexity and uncertainty of implementation
Leverages current efficiency trends in technology by eliminating hardware costs	Investment made in developing the external LSN library is not leveraged
Takes advantage of existing Internet search and other cloud resources	Rudimentary search capability
Continues standardization of LSN accession numbering scheme	Document header information may not be viewable
No NRC records responsibility for new headers/documents	No automated audit capabilities for the entire collection

Pros	Cons
Simpler process for a participant to make additions, modifications, or deletions to its collection	
Allows for prompt processing of large volumes of documents	

**Table 8-9 - Alternative Two (b) - HLW Participant-Maintained Cloud-Based System with NRC-Maintained Web Page of Participant Links Pros/Cons**

Pros	Cons
Simplified approach to maintenance of header/document collections	No consolidated search capability
Leverages current efficiency trends in technology by eliminating hardware costs	Document header information may not be viewable
Takes advantage of existing Internet search and other cloud resources	No standardization of LSN accession numbering scheme
No NRC records responsibility for new headers/documents	No automated audit capabilities for the entire collection
Simpler process for a participant to make additions, modifications, or deletions to its collection	
Allows for prompt processing of large volumes of documents	

## 9. Option 4 - Rebuild the Original LSN

Option 4 is to rebuild the original LSN, meeting all applicable functional requirements found in Appendix A.

### 9.1 Assumptions

The following assumptions are made for the “Rebuild the Original LSN” option:

- The basis for system development would be the Project Definition and Analysis Document for the Licensing Support Network.
- HLW participant web sites will be available on a timely basis for “crawling” by the new LSN.
- Once the header/document collection is available through a reconstituted LSN, the NRC would decommission the public ADAMS LSN Library.<sup>30</sup>

### 9.2 IT System General Description

The original LSN was a distributed system in which a centralized indexing system, operated and maintained by ASLBP, reached out to HLW participant sites and “crawled” each participant’s

<sup>30</sup> Under this option, the NRC would continue to maintain the internal ADAMS LSN Library to comply with federal records requirements.

collection of headers/documents.<sup>31</sup> The configuration of HLW participant IT systems met a certain set of standards to ensure compatibility with the original LSN “spidering” system.<sup>32</sup> A set of LSN Guidelines was developed and provided guidance to the HLW participants on the operation of LSN functionality.<sup>33</sup>

The original LSN comprised three major functions: auditing, indexing, and searching and retrieving available records. Auditing by the LSN ensured document integrity and reported various performance metrics. LSN spiders crawled the participant sites creating indexes that cataloged the various documents and headers. The original LSN provided the mechanisms to search headers/documents by key words, phrases, and important concepts in an easy and intuitive natural language manner.

The new LSN would be designed using the same components to undertake the three major functions:

- (1) LSN Spidering System: The spider would operate using the baseline concepts of a web crawler. Specifically, it would look for files stored on registered participant web sites, collect the bibliographic header information about each document, glean the content of each related document, and create a searchable index.
- (2) LSN Auditing System: Once a document is placed on the participant web site, it could not be modified or removed without notifying the LSN Administrator (LSNA). The LSN Auditing System would validate the header and document file information accumulated through the spidering process with the current files stored on the participant web site. Each document in the searchable index would be audited on an equivalent basis regardless of the site owner.
- (3) LSN Site Polling System: This system would check the status of each participant's web site on a regular basis to ensure the LSNA is notified of outages and other problems.<sup>34</sup>

The new LSN would also maintain the five major subsystems of the original LSN:

- (1) Fetch Participant Documents and Headers - This process would index the content of each participant site.<sup>35</sup>
- (2) Audit Participant Sites - This process would detect new and changed participant documents, measure participant site availability and build statistical reports from participant document activity.

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<sup>31</sup> “Crawling” is a process by which the header/documents stored on each HLW participant’s fetch server were indexed and added to the original LSN database.

<sup>32</sup> “Spidering” is a process by which the original LSN would go to each HLW participant’s fetch server to “crawl” the collection. The spidering process created a baseline for each site so that subsequent crawls could detect additions, modifications, and deletions.

<sup>33</sup> <https://www.nrc.gov/docs/ML0613/ML061380788.html>.

<sup>34</sup> “Site polling” is a process that ran at regular intervals to ascertain the availability of each HLW participant server and reported server status to the LSNA.

<sup>35</sup> “Fetch” is defined as a process by which the original LSN would retrieve documents from a participant’s collection. Fetch servers were configured as read-only servers and were only accessible by the original LSN. See LSN Guideline 22 for more information regarding the configuration of the “fetch” server, <https://www.nrc.gov/docs/ML0613/ML061380788.html>.

- (3) Search LSN Content - This process would provide priority and public users one central location from which to conduct simple and complex searches for documents across all Participant sites.
- (4) Administer LSN - This process would allow administrative users to view audit reports, maintain password lists, and sustain other LSN functions. It would run across a secure connection.
- (5) Access LSN Website - This process would provide a logon for priority and administrative access.

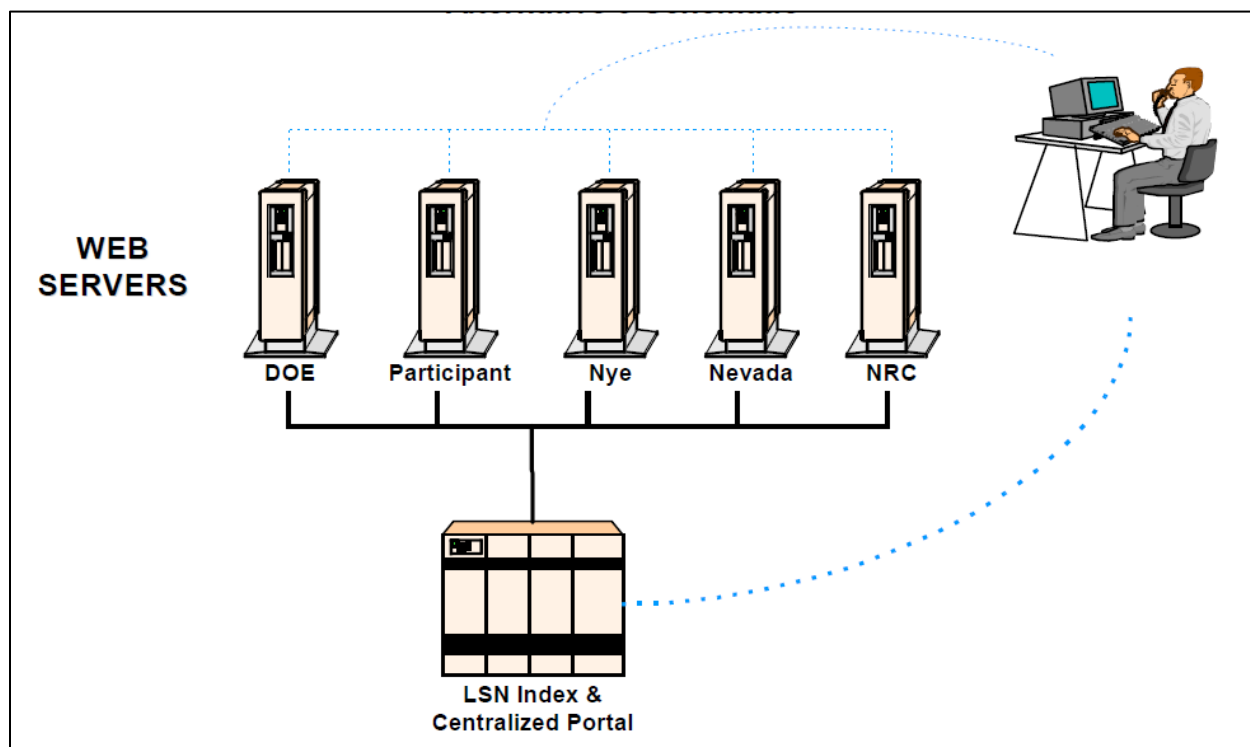


Figure 18 - Rebuild the Original LSN (Conceptual)

### 9.3 Search and Retrieval - Rebuild the Original LSN

As depicted in the diagram below, the NRC would provide a search interface that, when specific search criteria are entered, would search an NRC-maintained index of each participant's header/document collection. When the request is made to view the document, the search interface would redirect the user to the participant's collection to present the document for viewing.

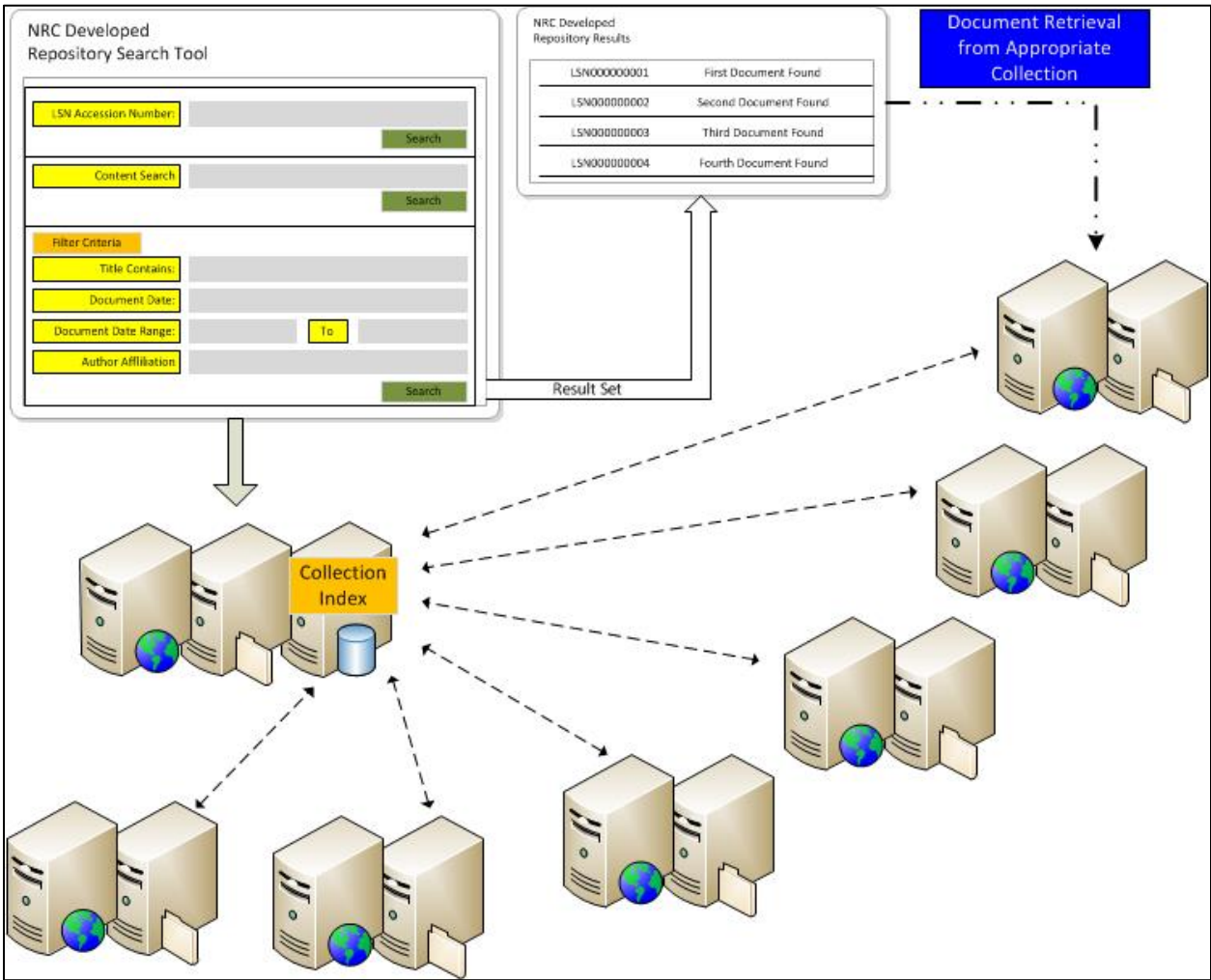


Figure 19 - Rebuild the Original LSN - Search Interface

9.4 IT System Implementation Costs

The following tables provide an estimate for the costs associated with rebuilding the original LSN. They are based on current information and are intended to provide a consistent comparison basis between options.

Table 9-1 - Rebuild the Original LSN - NRC Cost Estimate

System Development		
Activities	Initial Costs	Annual Recurring Costs
Hardware and software	Yes	
Development of technical standards	Yes	
Configuration of operating environment	Yes	
Implementation of indexing engine and audit system	Yes	

<b>System Development</b>		
<b>Activities</b>	<b>Initial Costs</b>	<b>Annual Recurring Costs</b>
Cybersecurity authorization and continuous monitoring	Yes	Yes
Software and hardware (including licenses)	Yes	Yes
Project management, documentation, communication, web announcements, other logistics	Yes	Yes
Training (travel and delivery)	Yes	Yes
Operations and maintenance of the platforms (patches, upgrades, operations, support)		Yes
Records Management for internal ADAMS LSN Library		Yes
Total Cost Estimate (Range)	\$2,600K - \$4,400K	\$850K - \$1,500K

**Table 9-2 - Rebuild the Original LSN - Participant Site Cost Estimate**

<b>Each HLW Participant Collection (Including the NRC Staff)</b>		
<b>Activities</b>	<b>Initial Costs</b>	<b>Annual Recurring Costs</b>
Software and hardware (including licenses)	Yes	
Configuration of operating environment	Yes	
Cybersecurity authorization and continuous monitoring	Yes	Yes
Project management, documentation, communication, and other logistics	Yes	Yes
Training (travel and delivery)	Yes	Yes
Operations and maintenance of the platforms (patches, upgrades, operations, support)		Yes
Total Cost Estimate (Range)*	Undetermined	Undetermined

\* Each HLW participant, depending on the size of its collection, will have varying costs.

### **9.5 IT System Implementation Timeframe**

The rough time estimate for implementation of the “Rebuild the Original LSN” is between 30 and 42 months for NRC system development activities, between 16 and 28 months for NRC Staff collection (as a participant) activities, and undetermined for non-NRC Staff HLW participant system implementation activities.

Non-NRC Staff HLW participant activities time estimates could not be estimated as each participant may have different IT policies in place for the procurement and implementation of an IT solution.

Activities associated with implementing each of the possible alternatives include, but are not limited to:

- IT governance and contract actions,
- Technical solution design,
- System development,
- Implementation, and
- Testing.

## 9.6 IT System Implementation Risks/Challenges

The model for the development of reconstituting the LSN in its original state is well documented and a validated set of functional requirements exist. Those functional requirements would only require minor updates, as noted in Appendix A. The IT system implementation risk of this option lies not with the ability to develop a solution, but with time and the cost associated with that development. It is estimated that the IT risk of this option is moderate; however, the risks associated with cost and schedule are high.

In this regard, perhaps the largest looming challenge exists in building an identical system environment given changes to federal IT policy since the early 2000s when the original LSN was designed and constructed. The LSN, as originally constituted, had a unique web domain name (LSNNET.gov), utilized multiple physical computer servers, and was housed in a non-government data center.

The federal government has adopted a “Cloud First” policy that “is intended to accelerate the pace at which the government will realize the value of cloud computing by requiring agencies to evaluate safe, secure cloud computing options before making any new investments.”<sup>36</sup> Further, Office of Management and Budget (OMB) Memorandum M-16-19 states that, “[c]onsistent with the Cloud First policy, agencies shall use cloud infrastructure where possible when planning new mission or support applications or consolidating existing applications.”<sup>37</sup> As discussed in Option 3 “Move to the Cloud”, a cloud-based system is a viable alternative to the original LSN design. Reconstitution of the original LSN, as designed and implemented in 2000, therefore, arguably would be inconsistent with the changes to federal IT policy that have occurred since the LSN was originally created.

**Table 9-3 - Rebuild the Original LSN Risk Score**

<b>Risk Factor*</b>	<b>Impact on Option</b>	<b>Likelihood of Occurrence</b>	<b>Risk Score (Impact x Likelihood)</b>
Acquisition	High (3)	High (3)	9
Technical Complexity	Moderate (2)	Moderate (2)	4
Technical Obsolescence	Moderate (2)	Moderate (2)	4
IT Policy	High (3)	High (3)	9
Technical Expertise	Moderate (2)	Moderate (2)	4
Standardization	Low (1)	Low (1)	1
<b>Total Score</b>			<b>31</b>

\* See Appendix B for a definitions of risk factor, impact, likelihood, and risk score.

<sup>36</sup> [https://obamawhitehouse.archives.gov/sites/default/files/omb/assets/egov\\_docs/federal-cloud-computing-strategy.pdf](https://obamawhitehouse.archives.gov/sites/default/files/omb/assets/egov_docs/federal-cloud-computing-strategy.pdf).

<sup>37</sup>

[https://obamawhitehouse.archives.gov/sites/default/files/omb/memoranda/2016/m\\_16\\_19\\_1.pdf](https://obamawhitehouse.archives.gov/sites/default/files/omb/memoranda/2016/m_16_19_1.pdf).



### 9.7 IT System Implementation Benefits

Reconstituting the LSN in its original form offers no significant advantages. It does, however, offer significant non-technical disadvantages in terms of cost, schedule, and federal IT policy.

**Table 9-4 - Rebuild the Original LSN Pros/Cons**

<b>Pros</b>	<b>Cons</b>
Simpler process for a participant to make additions, modifications, or deletions to its collection	Extended implementation
Continues standardization of LSN accession numbering scheme	High Cost
Robust search engine	Conflicts with federal IT policy
Allows for prompt processing of large volumes of documents	

## Appendix A - Comparison of Options to Original Licensing Support Network (LSN) Functional Requirements

The following table includes original LSN functional requirements, as finalized in the March 21, 2001 LSN Project Definition and Analysis Document (PDAD), that could not be met by all of the possible options or require a change due to updated Information Technology (IT) standards. Functional requirements that have been over-taken by events, provided by another system, or are not an IT system related requirement are not included. The entries in the table are taken from the following functional areas found in the LSN PDAD:

- Functional Area 1: General Characteristics of Servers and System
- Functional Area 3: Participant General Capabilities
- Functional Area 4: Document Production and Service
- Functional Area 5: Timeliness

The “Traditional Discovery” option would not meet any of the original LSN requirements for any new documentary material. The applicability of a functional requirement in relation to the “Traditional Discovery” option is to the existing public Agencywide Documents Access and Management System (ADAMS) LSN Library.

This appendix does not address these functional areas of the LSN PDAD:

- Functional Area 2: LSN Administrator (LSNA)-Related Capabilities
- Functional Area 6: Docket-Related Capabilities
- Functional Area 7: Electronic Information Exchange (EIE)-Related Capabilities

The requirements found in these functional areas have either (1) been over-taken by events; (2) are met by the EIE or the Electronic Hearing Docket (EHD); or (3) are related to programmatic requirements and are not applicable to IT system design.<sup>38</sup>

The original LSN PDAD is available in its entirety by clicking on the Portable Document Format (PDF) icon below



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<sup>38</sup> The LSN PDAD provided a comprehensive listing of functional, operational, performance, programmatic, and other special requirements for the original LSN. Many of these requirements, especially those identified in “Functional Area 2: LSNA-Related Capabilities,” are not IT system specific requirements, but provide the baseline the LSNA roles and responsibilities.

Original LSN Req. No.	Description	Requirement Update or Option Applicability
<b>LSN DR B-1.1</b>	The system shall be capable of limiting access to only priority users in the event that spikes in usage occur.	It is anticipated that with current technology, priority user support will not be required for any option.
<b>LSN DR B-6.1</b>	The standard for network access shall be HTTP/1.1 (Hypertext Transfer Protocol) [ <a href="http://www.faqs.org/rfcs/rfc2068.html">http://www.faqs.org/rfcs/rfc2068.html</a> ] over TCP (Transmission Control Protocol), [ <a href="http://www.faqs.org/rfcs/rfc793.html">http://www.faqs.org/rfcs/rfc793.html</a> ] over IP (Internet Protocol), [ <a href="http://www.faqs.org/rfcs/rfc791.html">http://www.faqs.org/rfcs/rfc791.html</a> ].	<b>Requirement Update:</b> HTTP/1.1 has been superseded by HTTP/2 - <a href="https://tools.ietf.org/html/rfc7540">https://tools.ietf.org/html/rfc7540</a> .
<b>LSN DR B-6.2</b>	The standard for associating server names with IP addresses shall be the DNS (Domain Name System), [ <a href="http://www.faqs.org/rfcs/rfc1034.html">http://www.faqs.org/rfcs/rfc1034.html</a> ] and [ <a href="http://www.faqs.org/rfcs/rfc1035.html">http://www.faqs.org/rfcs/rfc1035.html</a> ].	Requirement Update: There are over 50 Requests for Comment (RFC) on DNS <a href="https://en.wikipedia.org/wiki/Domain_Name_System#RFC_documents">https://en.wikipedia.org/wiki/Domain_Name_System#RFC_documents</a> .
<b>LSN DR B-6.3</b>	The standard for web page construction shall be HTML (Hypertext Markup Language) version 4.01, [ <a href="http://www.w3.org/TR/REC-html40/">http://www.w3.org/TR/REC-html40/</a> ].	<b>Requirement Update:</b> HTML 4 has been superseded by HTML 5.1 - <a href="https://www.w3.org/TR/html51/">https://www.w3.org/TR/html51/</a> .
<b>LSN DR B-6.4</b>	The standard for electronic mail (e-mail) exchange between e-mail servers shall be SMTP (Simple Mail Transport Protocol), [ <a href="http://www.faqs.org/rfcs/rfc821.html">http://www.faqs.org/rfcs/rfc821.html</a> ].	<b>Requirement Update:</b> There are over 20 RFC's on SMTP <a href="https://en.wikipedia.org/wiki/Simple_Mail_Transfer_Protocol#Related_requests_for_comments">https://en.wikipedia.org/wiki/Simple_Mail_Transfer_Protocol#Related_requests_for_comments</a> .
<b>LSN DR B-6.5</b>	The standard for the format of an electronic mail message shall be per [ <a href="http://www.faqs.org/rfcs/rfc822.html">http://www.faqs.org/rfcs/rfc822.html</a> ] optionally extended by MIME (Multimedia Internet Mail Extensions) per [ <a href="http://www.faqs.org/rfcs/rfc2045.html">http://www.faqs.org/rfcs/rfc2045.html</a> ] to accommodate multimedia e-mail.	<b>Requirement Update:</b> There are over 6 RFC's on MIME <a href="https://en.wikipedia.org/wiki/MIME">https://en.wikipedia.org/wiki/MIME</a> .
<b>LSN DR B-8</b>	The LSN shall be capable of electronically storing and retrieving bibliographic headers in the system.	For Option 3 - "Move to the Cloud," this capability is dependent upon the cloud-based technology system and the weight given to this requirement by the LSN Advisory Review Panel (LSNARP).

Original LSN Req. No.	Description	Requirement Update or Option Applicability
<b>LSN DR B-8.2</b>	Bibliographic headers will be stored in a manner that they can be retrieved through reference to any field as designated in Table A.	For Option 3 - "Move to the Cloud," this capability is dependent upon the cloud-based technology system and the weight given to this requirement by the LSNARP.
<b>LSN DR B-8.3</b>	Bibliographic headers will be stored in a manner that the contents of their fields can be searched for specific data.	For Option 3 - "Move to the Cloud," this capability is dependent upon the cloud-based technology system and the weight given to this requirement by the LSNARP.
<b>LSN DR B-11</b>	The LSN shall be capable of storing electronic indexes for use in searching and retrieving digital images of each page of graphic-oriented documentary material made available by the participants.	<b>Requirement Update:</b> All material in the public ADAMS LSN Library is in PDF format. It is anticipated that for a reconstituted or replacement LSN, this requirement would be modified to require search and retrieval of PDF documents.
<b>LSN DR B-12</b>	The system shall allow users to easily view (by clicking) and print (by selecting "file/print" from the menu) documents of the following acceptable formats: ASCII (American Standard Code for Information Interchange), native word processing (Word and WordPerfect versions as requested by participants), PDF Normal, or HTML.	<b>Requirement Update:</b> All material in the public ADAMS LSN Library is in PDF format. It is anticipated that for a reconstituted or replacement LSN, this requirement would be modified to require search and retrieval of PDF documents.
<b>LSN DR B-13.3</b>	The LSN shall be capable of displaying bibliographic header information from the hit list resulting from a search.	For Option 3 - "Move to the Cloud," this capability is dependent upon the cloud-based technology system and the weight given to this requirement by the LSNARP.
<b>LSN DR B-14</b>	The LSN shall provide a user interface compatible with current browser technologies including access using both graphical and text-only browsers to documentary collections.	This capability would need to be added to the public ADAMS LSN Library for Option 1 - "Traditional Discovery" or Option 2 - "Use of Existing Public ADAMS LSN Library."
<b>LSN DR B-15</b>	The LSN shall support non-interactive access to the central LSN by web "crawlers."	Only applicable to Option 3 - "Move to the Cloud - Alternative Two – [high-level waste (HLW)] Participant-Maintained Cloud-Based System" and Option 4 - "Rebuild the LSN."

Original LSN Req. No.	Description	Requirement Update or Option Applicability
<b>LSN DR B-15.1</b>	Web pages must be authored in compliance with the Web Content Accessibility Guidelines for access by individuals with disabilities [ <a href="http://www.w3.org/TR/WAI-WEBCONTENT/">http://www.w3.org/TR/WAI-WEBCONTENT/</a> ].	<b>Requirement Update:</b> <a href="https://www.w3.org/WAI/intro/wcag">https://www.w3.org/WAI/intro/wcag</a> , <a href="https://www.w3.org/TR/WCAG21">https://www.w3.org/TR/WCAG21</a> .
<b>LSN DR B-16.1</b>	The system shall provide the LSNA with access to participant collections necessary and sufficient to allow the LSNA to independently verify the integrity of data available via the LSN.	Only applicable to Option 3 - "Move to the Cloud - Alternative Two - HLW Participant-Maintained Cloud-Based System" and Option 4 - "Rebuild the LSN."
<b>LSN DR B-16.2</b>	The system shall have the capability of non-interactively "crawling" participant LSN websites, and fetching a subset or the entire website for analysis.	Only applicable to Option 3 - "Move to the Cloud - Alternative Two - HLW Participant-Maintained Cloud-Based System" and Option 4 - "Rebuild the LSN."
<b>LSN DR B-16.3</b>	The system shall be able to access an electronic log of all retrievals of documentary material from each participant's LSN website. This log will contain the IP (Internet Protocol) address or DNS host name of the recipient's computer and the date and time of delivery. The log shall be in either the web standard "Common Log Format" or "Combined Log Format."	Only applicable to Option 3 - "Move to the Cloud - Alternative Two - HLW Participant-Maintained Cloud-Based System" and Option 4 - "Rebuild the LSN."
<b>LSN DR B-16.5</b>	The monitoring/audit station shall have the capability of tracking changes on participant LSN websites, monitoring participant LSN website responsiveness and other performance characteristics, and reporting this information to the LSNA.	Only applicable to Option 3 - "Move to the Cloud - Alternative Two - HLW Participant-Maintained Cloud-Based System" and Option 4 - "Rebuild the LSN."
<b>LSN DR B-16.7</b>	The LSN shall not use "persistent cookies" (i.e., ongoing capture of data that tracks a user's pattern of use and preferences) without the approval of the Chairman of the NRC.	<b>Requirement Update:</b> The NRC Chief Information Officer can approve the use of "persistent cookies" if there is a business need and a mitigating measure in place.
<b>LSN DR D-1</b>	Each LSN participant must obtain the computer system necessary to comply with the requirements for document production and service.	Only applicable to Option 3 - "Move to the Cloud - Alternative Two - HLW Participant-Maintained Cloud-Based System" and Option 4 - "Rebuild the LSN."

Original LSN Req. No.	Description	Requirement Update or Option Applicability
<b>LSN DR D-1.1</b>	The participant's system must provide the function of HTTP service. HTTP service may be provided by a dedicated computer, a virtual server (dedicated computer hosting multiple web sites), or be provided by a commercial web hosting service (that can comply with requirements).	Only applicable to Option 3 - "Move to the Cloud - Alternative Two - HLW Participant-Maintained Cloud-Based System" and Option 4 - "Rebuild the LSN."
<b>LSN DR D-1.2</b>	The participant's system must be configured with hardware sufficient to store and serve all documentary and associated materials (e.g., sufficient disk storage, RAM (Random Access Memory), processing power, network interface, etc.) at estimated usage levels and to be easily upgradeable should estimates fail to adequately characterize usage.	Only applicable to Option 3 - "Move to the Cloud - Alternative Two - HLW Participant-Maintained Cloud-Based System" and Option 4 - "Rebuild the LSN."
<b>LSN DR D-1.3</b>	The participant's system must be configured with software, licensed at sufficient levels, to store and serve all documentary and associated materials (e.g., networking-capable operating system, web server software, HTML authoring and site maintenance software, database server, etc.) at anticipated usage levels.	Only applicable to Option 3 - "Move to the Cloud - Alternative Two - HLW Participant-Maintained Cloud-Based System" and Option 4 - "Rebuild the LSN."
<b>LSN DR D-1.4</b>	The participant's system must be designed to maintain the integrity of the participant's discovery collection documentary material and provide for timely recovery in the event of hardware or software failure with complete restoration of the participant LSN website within three working days, or earlier if so specified within the parameters of the participant's disaster recovery plan.	Only applicable to Option 3 - "Move to the Cloud - Alternative Two - HLW Participant-Maintained Cloud-Based System" and Option 4 - "Rebuild the LSN."

Original LSN Req. No.	Description	Requirement Update or Option Applicability
<b>LSN DR D-1.5</b>	The participant's system shall allow monitoring of various parameters by a monitoring station established by the LSNA to track changes on the participant's LSN website, website responsiveness, and other performance characteristics. Specific access shall include SNMP monitoring of network utilization and ICMP (Internet Control Message Protocol) access for determination of certain performance characteristics as well as access to the normal web distribution facility.	Only applicable to Option 3 - "Move to the Cloud - Alternative Two - HLW Participant-Maintained Cloud-Based System" and Option 4 - "Rebuild the LSN."
<b>LSN DR D-1.6</b>	The participant's system shall allow LSNA access to their logs of electronic transactions in raw and summary formats to enable tracking of site usage.	Only applicable to Option 3 - "Move to the Cloud - Alternative Two - HLW Participant-Maintained Cloud-Based System" and Option 4 - "Rebuild the LSN."
<b>LSN DR D-1.7</b>	The participant's system must be designed to maintain the security of the participant's discovery collection, documentary material, and the system itself; including the ability to deny unauthorized access or update privileges, detect and defeat compromise attempts, and defend against denial of service attempts.	Only applicable to Option 3 - "Move to the Cloud - Alternative Two - HLW Participant-Maintained Cloud-Based System" and Option 4 - "Rebuild the LSN."
<b>LSN DR D-1.8</b>	The participant's system must be connected to the Internet with the capability of being accessed by any Internet user. The participant's system will allow Internet users the ability to retrieve documentary material from the participant's LSN website without utilizing a proxy from the LSN server. This connection shall be sufficient to provide reasonable responsiveness during periods of normal usage.	Only applicable to Option 3 - "Move to the Cloud - Alternative Two - HLW Participant-Maintained Cloud-Based System" and Option 4 - "Rebuild the LSN."
<b>LSN DR D-1.9</b>	Participants shall make textual (or, where non-text, image) versions of their discovery collection documents available on an Internet accessible server which is able to be canvassed by web indexing software (i.e., a "robot," "spider," or "crawler") and the participant's system must make both data files and log files accessible to this software.	Only applicable to Option 3 - "Move to the Cloud - Alternative Two - HLW Participant-Maintained Cloud-Based System" and Option 4 - "Rebuild the LSN."

Original LSN Req. No.	Description	Requirement Update or Option Applicability
<b>LSN DR D-1.10</b>	Non-LSN-related information may be maintained on the same participant website as LSN-related material, but must be kept logically separate. All LSN materials on a participant's site must be maintained together within a single hypertext sub-tree. The entire LSN-related sub-tree must be able to be navigated under a single URL (Uniform Resource Locator) reference. If a participant LSN website contains site navigation links on its LSN-related pages (e.g., a "home" button, or the result of a search), these links must point exclusively within the LSN-related sub-tree and not to another part of the World Wide Web site or off site.	Only applicable to Option 3 - "Move to the Cloud - Alternative Two - HLW Participant-Maintained Cloud-Based System" and Option 4 - "Rebuild the LSN."
<b>LSN DR D-2</b>	Each LSN participant must design and implement their web facility to ensure acceptable access and responsiveness consistent with performance specifications.	Only applicable to Option 3 - "Move to the Cloud - Alternative Two - HLW Participant-Maintained Cloud-Based System" and Option 4 - "Rebuild the LSN."
<b>LSN DR D-2.1</b>	Sites must be provisioned to be able to satisfy not less than 500 web page requests per minute.	Only applicable to Option 3 - "Move to the Cloud - Alternative Two - HLW Participant-Maintained Cloud-Based System" and Option 4 - "Rebuild the LSN."
<b>LSN DR D-2.2</b>	Sites must be provisioned to be able to deliver a web page or image page on average in not more than five seconds to a web browser located on the same LAN (Local Area Network) segment.	Only applicable to Option 3 - "Move to the Cloud - Alternative Two - HLW Participant-Maintained Cloud-Based System" and Option 4 - "Rebuild the LSN."
<b>LSN DR D-2.3</b>	Communications between the server and the Internet must be provisioned to be able to deliver interactive response.	Only applicable to Option 3 - "Move to the Cloud - Alternative Two - HLW Participant-Maintained Cloud-Based System" and Option 4 - "Rebuild the LSN."
<b>LSN DR D-3</b>	To facilitate data exchange, the participant's system shall adhere to established hardware and software standards appropriate to meet the intent of the LSN Rule.	Only applicable to Option 3 - "Move to the Cloud - Alternative Two - HLW Participant-Maintained Cloud-Based System" and Option 4 - "Rebuild the LSN."



Original LSN Req. No.	Description	Requirement Update or Option Applicability
<b>LSN DR D-3.1</b>	The standard for network access shall be HTTP/1.1, <a href="http://www.faqs.org/rfcs/rfc2068.html">[http://www.faqs.org/rfcs/rfc2068.html]</a> over TCP, <a href="http://www.faqs.org/rfcs/rfc793.html">[http://www.faqs.org/rfcs/rfc793.html]</a> over IP (Internet Protocol), <a href="http://www.faqs.org/rfcs/rfc791.html">[http://www.faqs.org/rfcs/rfc791.html]</a> .	Only applicable to Option 3 - “Move to the Cloud - Alternative Two - HLW Participant-Maintained Cloud-Based System” and Option 4 - “Rebuild the LSN.”  <b>Requirement Update:</b> HTTP/1.1 has been superseded by HTTP/2 - <a href="https://tools.ietf.org/html/rfc7540">https://tools.ietf.org/html/rfc7540</a> .
<b>LSN DR B-3.2</b>	The standard for associating server names with IP addresses shall be the DNS), <a href="http://www.faqs.org/rfcs/rfc1034.html">[http://www.faqs.org/rfcs/rfc1034.html]</a> and <a href="http://www.faqs.org/rfcs/rfc1035.html">[http://www.faqs.org/rfcs/rfc1035.html]</a> .	Only applicable to Option 3 - “Move to the Cloud - Alternative Two - HLW Participant-Maintained Cloud-Based System” and Option 4 - “Rebuild the LSN.”  <b>Requirement Update:</b> There are over 50 RFC’s on DNS <a href="https://en.wikipedia.org/wiki/Domain_Name_System#RFC_documents">https://en.wikipedia.org/wiki/Domain_Name_System#RFC_documents</a> .
<b>LSN DR B-3.3</b>	The standard for web page construction shall be HTML version 4.01, <a href="http://www.w3.org/TR/REC-html40/">[http://www.w3.org/TR/REC-html40/]</a> .	Only applicable to Option 3 - “Move to the Cloud - Alternative Two - HLW Participant-Maintained Cloud-Based System” and Option 4 - “Rebuild the LSN.”  <b>Requirement Update:</b> HTML 4 has been superseded by HTML 5.1 - <a href="https://www.w3.org/TR/html51/">https://www.w3.org/TR/html51/</a> .
<b>LSN DR B-3.4</b>	The standard for e-mail exchange between e-mail servers shall be SMTP, <a href="http://www.faqs.org/rfcs/rfc821.html">[http://www.faqs.org/rfcs/rfc821.html]</a> .	Only applicable to Option 3 - “Move to the Cloud - Alternative Two - HLW Participant-Maintained Cloud-Based System” and Option 4 - “Rebuild the LSN.”  <b>Requirement Update:</b> There are over 20 RFC’s on SMTP <a href="https://en.wikipedia.org/wiki/Simple_Mail_Transfer_Protocol#Related_requests_for_comments">[https://en.wikipedia.org/wiki/Simple_Mail_Transfer_Protocol#Related_requests_for_comments]</a> .
<b>LSN DR B-3.5</b>	The standard for the format of an e-mail message shall be per <a href="http://www.faqs.org/rfcs/rfc822.html">[http://www.faqs.org/rfcs/rfc822.html]</a> optionally extended by MIME per <a href="http://www.faqs.org/rfcs/rfc2045.html">[http://www.faqs.org/rfcs/rfc2045.html]</a> to accommodate multimedia e-mail.	Only applicable to Option 3 - “Move to the Cloud - Alternative Two - HLW Participant-Maintained Cloud-Based System” and Option 4 - “Rebuild the LSN”  <b>Requirement Update:</b> There are over 6 RFC’s on MIME <a href="https://en.wikipedia.org/wiki/MIME">[https://en.wikipedia.org/wiki/MIME]</a> .

Original LSN Req. No.	Description	Requirement Update or Option Applicability
<b>LSN DR D-5.2</b>	[HLW Participant] Staff shall be trained in operation and maintenance of the web server system.	Only applicable to Option 3 - "Move to the Cloud - Alternative Two - HLW Participant-Maintained Cloud-Based System" and Option 4 - "Rebuild the LSN."
<b>LSN DR D-5.3</b>	[HLW Participant] Staff shall be trained in operation and maintenance of the participant LSN website.	Only applicable to Option 3 - "Move to the Cloud - Alternative Two - HLW Participant-Maintained Cloud-Based System" and Option 4 - "Rebuild the LSN."
<b>LSN DR D-5.4</b>	[HLW Participant] Staff shall be trained in performing the user assistance or help desk function, if applicable.	Only applicable to Option 3 - "Move to the Cloud - Alternative Two - HLW Participant-Maintained Cloud-Based System" and Option 4 - "Rebuild the LSN."
<b>LSN DR D-6.1</b>	Access must be provided no later than eight months in advance of the Department of Energy (DOE) submitting its license application to receive and possess high-level radioactive waste at a geologic repository operations area.	Only applicable to Option 3 - "Move to the Cloud - Alternative Two - HLW Participant-Maintained Cloud-Based System" and Option 4 - "Rebuild the LSN."  <b>Requirement Update:</b> Access to participant sites to be coordinated by the LSNA in conjunction with the LSNARP.
<b>LSN DR D-6.2</b>	Access to the central LSN site is to be provided to the public on computers equipped with a web browser.	Only applicable to Option 3 - "Move to the Cloud - Alternative Two - HLW Participant-Maintained Cloud-Based System" and Option 4 - "Rebuild the LSN."
<b>LSN DR D-6.3</b>	Access to the central LSN site is to be provided to visually impaired and otherwise disabled individuals as needed through appropriate hardware and software or by provision of user assistance.	Only applicable to Option 3 - "Move to the Cloud - Alternative Two - HLW Participant-Maintained Cloud-Based System" and Option 4 - "Rebuild the LSN."
<b>LSN DR D-7</b>	The NRC must provide electronic access to the central LSN site at the NRC Public Document Room no later than eight months in advance of DOE's submitting its license application to receive and possess HLW at a geologic repository operations area.	Only applicable to Option 3 - "Move to the Cloud - Alternative Two - HLW Participant-Maintained Cloud-Based System" and Option 4 - "Rebuild the LSN."  <b>Requirement Update:</b> Access to participant sites to be coordinated by the LSNA in conjunction with the LSNARP.
<b>LSN DR D-7.1</b>	Access to the central LSN site is to be provided to the public on computers equipped with a web browser.	Only applicable to Option 3 - "Move to the Cloud - Alternative Two - HLW Participant-Maintained Cloud-Based System" and Option 4 - "Rebuild the LSN."

Original LSN Req. No.	Description	Requirement Update or Option Applicability
<b>LSN DR D-7.2</b>	Access to the central LSN site is to be provided to visually impaired and otherwise disabled individuals as needed through appropriate hardware and software or by provision of user assistance.	Only applicable to Option 3 - "Move to the Cloud - Alternative Two - HLW Participant-Maintained Cloud-Based System" and Option 4 - "Rebuild the LSN."
<b>LSN DR D-8</b>	Participants should provide items of interest about their LSN website (hours of availability, scheduled outages, etc.) to the LSNA to post on the central LSN site. These items may also be posted on the participant's LSN website.	Only applicable to Option 3 - "Move to the Cloud - Alternative Two - HLW Participant-Maintained Cloud-Based System" and Option 4 - "Rebuild the LSN."
<b>LSN DR E-2</b>	Each LSN participant must prepare and publish its documentary collection in a manner that allows access by Internet users who have access to the LSN search and retrieval capabilities.	Only applicable to Option 3 - "Move to the Cloud - Alternative Two - HLW Participant-Maintained Cloud-Based System" and Option 4 - "Rebuild the LSN."
<b>LSN DR E-2.1</b>	All participating entities must provision their web servers with enough storage to accommodate all headers plus text and/or images of their entire collection of relevant documents as specified in the LSN Rule.	Only applicable to Option 3 - "Move to the Cloud - Alternative Two - HLW Participant-Maintained Cloud-Based System" and Option 4 - "Rebuild the LSN."
<b>LSN DR E-2.2</b>	All participating entities shall ensure access to their documentary collection through electronic means. Participant capabilities should be such that any Internet user using a web browser and the LSN search and retrieval capabilities will be able to locate, identify, and retrieve documents of interest in relevant formats (header, text, and/or image).	Only applicable to Option 3 - "Move to the Cloud - Alternative Two - HLW Participant-Maintained Cloud-Based System" and Option 4 - "Rebuild the LSN."
<b>LSN DR E-2.3</b>	Each participant must provide documents in a format that allows their presentation through a web server, including a header plus text and/or image portion.	<b>Requirement Update:</b> All documents to be provided as PDF, text searchable in a format agreed upon by the LSNARP.

Original LSN Req. No.	Description	Requirement Update or Option Applicability
<b>LSN DR E-2.4</b>	All participating entities must provide the LSN with access to its full text or image files as required by the LSN Rule.	Only applicable to Option 3 - "Move to the Cloud - Alternative Two - HLW Participant-Maintained Cloud-Based System" and Option 4 - "Rebuild the LSN"  <b>Requirement Update:</b> All documents to be provided as PDF, text searchable.
<b>LSN DR E-2.5</b>	Documents presented on a participant web server must be an accurate representation of the source document.	<b>Requirement Update:</b> Accurate representation of the source document.is applicable to all options
<b>LSN DR E-2.6</b>	All participating entities must store each TIFF (Tagged Image File Format) document image in a page per file format.	<b>Requirement Update:</b> All documents to be provided as PDF, text searchable in a format agreed upon by the LSNARP.
<b>LSN DR E-2.7</b>	All participating entities must provide the capability to retrieve and deliver documents identified through searching or browsing performed at the LSN portal site.	Only applicable to Option 3 - "Move to the Cloud - Alternative Two - HLW Participant-Maintained Cloud-Based System" and Option 4 - "Rebuild the LSN"
<b>LSN DR E-4.1</b>	Textual material shall be formatted to comply with the ISO/IEC (International Organization for Standardization / International Electrotechnical Commission) 8859-1 character set and be in one of the following acceptable formats: ASCII, native word processing (Word and WordPerfect versions as requested by participants), PDF Normal, or HTML. As a goal, textual documents should be accurately represented with an overall error rate of no more than 0.5 percent based on character accuracy and a per page error rate of no more than 1.5 percent. Documents converted through means other than OCR (Optical Character Recognition) should have an error rate of less than 0.05 percent.	<b>Requirement Update:</b> All documents to be provided as PDF, text searchable in a format agreed upon by the LSNARP.  <b>Requirement Update:</b> UTF-8 is the main character set on the web and is the default for HTML 5/5.1 <a href="https://en.wikipedia.org/wiki/UTF-8">[https://en.wikipedia.org/wiki/UTF-8]</a> and <a href="https://www.w3schools.com/tags/ref_charactersets.asp">[https://www.w3schools.com/tags/ref_charactersets.asp]</a> . Additional native word processing programs would include open source (e.g., OpenOffice, LibreOffice) as well as cloud-based products (e.g., Google Docs, Microsoft Office365).

Original LSN Req. No.	Description	Requirement Update or Option Applicability
<b>LSN DR E-4.2</b>	Image file format shall be TIFF Consultative Committee for International Telephony and Telegraphy (CCITT) G4 for bi-tonal images or PNG (Portable Network Graphics) per <a href="http://www.w3.org/TR/REC-png-multi.html">[http://www.w3.org/TR/REC-png-multi.html]</a> format for grey scale or color images, or PDF (Portable Document Format). TIFF, PDF, or PNG images will be stored at 300 dpi (dots per inch) or greater, grey scale images at 150 dpi or greater with eight bits of tonal depth, and color images at 150 dpi with 24 bits of color depth. Images shall be stored as single image-per-page to facilitate retrieval of no more than a single page. Alternatively, images may be stored in a page-per-document format if software is incorporated in the web server that allows single-page representation and delivery.	<b>Requirement Update:</b> All documents to be provided as PDF, text searchable in a format agreed upon by the LSNARP.  The CCITT is now known as the Telecommunication Standardization Sector of the International Telecommunications Union (ITU-T).
<b>LSN DR E-5.1</b>	Bibliographic header data shall be available in an HTTP accessible, ODBC (Open Database Connectivity) and SQL (Structured Query Language)-compliant (ANSI IX3.135-1992/ISO 9075-1992) database management system (DBMS). Alternatively, the structured data containing the bibliographic header may be made available in a standard database readable (e.g., XML Extensible Markup Language <a href="http://www.w3.org/xml/">http://www.w3.org/xml/</a> ), comma delimited, or comma separated value (.csv) file).	<b>Requirement Update:</b> SQL is now in its 8 <sup>th</sup> revision [SQL:2016 - <a href="https://en.wikipedia.org/wiki/SQL:2016">https://en.wikipedia.org/wiki/SQL:2016</a> ]
<b>LSN DR E-5.2</b>	Bibliographic headers shall contain all fields as described in Table A, as applicable to participants (i.e., all fields except the LSN Accession Number which is generated by the LSN).	For Option 3 - "Move to the Cloud", this capability is dependent upon the cloud-based technology system and the weight given to this requirement by the LSNARP.
<b>LSN DR E-5.3</b>	Headers for limited access documentary material will be as those for full access documentary material.	For Option 3 - "Move to the Cloud", this capability is dependent upon the cloud-based technology system and the weight given to this requirement by the LSNARP.

Original LSN Req. No.	Description	Requirement Update or Option Applicability
<b>LSN DR E-6</b>	Participants may correct or revise documentary already made available on their LSN websites.	Not applicable to Option 1 - "Traditional Discovery" as no enhancements are expected to be made to the public ADAMS LSN Library.
<b>LSN DR E-6.1</b>	Changes to documentary material previously provided are permitted if (1) a corrected or updated version is noted as superseding a previously provided version; and (2) the previous version is not removed.	Not applicable to Option 1 - "Traditional Discovery" as no enhancements are expected to be made to the public ADAMS LSN Library.
<b>LSN DR E-6.2</b>	The participant must notify the LSNA of the change, identified by LSN Accession Number, with a description of what the change was and why it was necessary, so it can be posted on the central LSN site. Notification may also be posted on the participant's LSN website.	Not applicable to Option 1 - "Traditional Discovery" as no enhancements are expected to be made to the public ADAMS LSN Library.
<b>LSN DR F-1.1</b>	The computer system providing document production and service must be designed, specified, acquired, integrated, and installed sufficiently in advance of the specified date to meet the availability criteria. Customary funding and procurement lead times must be considered when scheduling these actions.	Only applicable to Option 3 - "Move to the Cloud - Alternative Two - HLW Participant-Maintained Cloud-Based System" and Option 4 - "Rebuild the LSN."
<b>LSN DR F-1.2</b>	Document conversion and participant LSN website page authoring and document collection population must be begun sufficiently in advance of the specified date to meet the availability criteria. Collection size and resource availability must be considered when scheduling these actions.	Only applicable to Option 3 - "Move to the Cloud - Alternative Two - HLW Participant-Maintained Cloud-Based System" and Option 4 - "Rebuild the LSN."

Original LSN Req. No.	Description	Requirement Update or Option Applicability
<b>LSN DR F-1.3</b>	Each participating entity must ensure their site availability and integrate it into the overall LSN sufficiently in advance of the specified date to meet the availability criteria. The availability of other participant staff must be considered when scheduling these actions.	Only applicable to Option 3 - "Move to the Cloud - Alternative Two - HLW Participant-Maintained Cloud-Based System" and Option 4 - "Rebuild the LSN."
<b>LSN DR F-1.4</b>	Each participating entity must complete site and LSN integration testing acceptable to the LSNA sufficiently in advance of the specified date to meet the availability criteria.	Only applicable to Option 3 - "Move to the Cloud - Alternative Two - HLW Participant-Maintained Cloud-Based System" and Option 4 - "Rebuild the LSN."

## Appendix B - Risk Score Table Definitions

- **Risk Factors**
  - Acquisition: Defined as process and procedures associated with procurement and Information Technology (IT) governance. Activities associated with acquisition include, but are not limited to:
    - Development of a business case,
    - IT governance board presentations,
    - Contract document development,
    - Bid review,
    - Award justification,
    - Vendor longevity, and
    - Contract award length and renewal process.
  - Technical Complexity: Defined as an IT system with high usage, multiple interfaces, and the management and processing of large data sets.
  - Technical Obsolescence: Defined as the aging of operating systems, hardware, and software for an IT system that requires continued use.
  - IT Policy: Defined as federal, state, tribal, and local IT regulations and guidelines (inclusive of cybersecurity) that are required in the procurement, development, and implementation of IT systems.
  - Technical Expertise: Defined as the availability of personnel skilled in the configuration and programming of hardware and software required to develop, implement, and maintain an IT system.
  - Standardization: Defined as adherence to agreed-upon parameters for data exchange, search mechanisms, and user interfaces.
- **Impact**
  - High (3): Will likely cause major delays in all aspects of system development.
  - Moderate (2): Will likely cause delays in one or more functions required to develop or operate the system.
  - Low (1): Will cause only minor delays in system development.
- **Likelihood**
  - High (3): Likely to occur.
  - Moderate (2): May occur.
  - Low (1): Unlikely to occur.
- **Risk Score**
  - Calculated by multiplying impact by likelihood.
  - High: Greater than 38.
  - Moderate: Between 16 and 38.
  - Low: Less than 16.

Low 0 - 15	Moderate 16 - 38	High 39 - 54
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## Appendix C - Proposed New Functional Requirements

The following table provides a list of proposed new functional requirements that are related to submission of evidentiary hearing exhibits and mobile access.

The new functional requirements prefixed with “LSN-EX-G” would be applicable to Option 2, “Use of Existing Public [Agencywide Documents Access and Management System (ADAMS) Licensing Support Network (LSN)] Library”; Option 3, “Move to the Cloud” U.S. Nuclear Regulatory Commission (NRC) maintained cloud-based system (Alternative 1); and Option 4, “Rebuild the Original LSN.”

The new functional requirements prefixed with “LSN-MO-H” would be applicable to Option 2, “Use of Existing Public ADAMS LSN Library”; Option 3, “Move to the Cloud”; and Option 4, “Rebuild the Original LSN.”

For Option 1, “Traditional Discovery,” these requirements would not be applicable as no enhancements are expected to be made to the public ADAMS LSN Library.

These proposed new functional requirements would be added to the design specifications as part of the IT system development process facilitated by the LSN Administrator (LSNA) in coordination with the LSN Advisory Review Panel (LSNARP).

New Req. No.	Description	Notes
LSN-EX-G-1	The system shall have an automated mechanism that allows a user to submit a header/document to the Electronic Hearing Docket (EHD) as an exhibit. The system shall populate the properties of the exhibit with the information found in the header.	This functionality would require a modification to the Electronic Information Exchange (EIE) and/or EHD systems.
LSN-EX-G-2	The system shall have an automated mechanism that allows a user to submit a contiguous page range from a header/document to the EHD as an exhibit. The system shall populate the properties of the exhibit with the information found in the header.	This functionality would require a modification to the EIE and/or EHD systems.

New Req. No.	Description	Notes
LSN-EX-G-3	The system shall place a cover sheet on each Portable Document Format (PDF) document identified for submission to the EHD that includes, at a minimum, the following information: <ul style="list-style-type: none"> <li>• Submitter-provided exhibit number</li> <li>• Document title</li> <li>• LSN Accession Number</li> <li>• Participant Accession Number</li> </ul>	This functionality would require a modification to the EIE and/or EHD systems.
LSN-EX-G-4	The system shall provide an authentication mechanism that ensures that the user submitting a header/document to the EHD is an authorized submitter.	This requirement is related to the submission of LSN documents as exhibits and would require a modification to the EIE and/or EHD systems.
LSN-EX-G-5	The system shall provide notification to all high-level waste hearing participants when an LSN document is added to the EHD as an exhibit.	This requirement is related to the submission of LSN documents as exhibits and would require a modification to the EIE and/or EHD systems.
LSN-MO-H-1	The system shall provide a mobile device interface such that devices with smaller screens can utilize the LSN search interface.	The ability to implement this requirement is dependent upon the interest and resources available to each party and interested government participant.
LSN-MO-H-2	The mobile interface shall, at a minimum, permit searching by LSN Accession Number, by Participant Accession Number, and by using a content search.	The ability to implement this requirement is dependent upon the interest and resources available to each party and interested government participant.

Appendix D - Option Summary Comparison

The following table provides a summary comparison of the options.

	Option 1 - Traditional Discovery	Option 2 - Use of Existing Public ADAMS LSN Library		Option 3 - Move to the Cloud			Option 4 - Rebuild the Original LSN
		Alternative One - EIE System Modification	Alternative Two - Semi-Manual Process	Alternative One - NRC Maintained Cloud-Based System	Alternative Two (a) - HLW Participant-Maintained Cloud-Based System with NRC Maintained Search Index	Alternative Two (b) - HLW Participant-Maintained Cloud-Based System with Participant Maintained Search Index	
System Development Initial Cost (Range)	Not Applicable	\$900K - \$1,525K	\$600K - \$1,100K	\$1,200K - \$1,950K	\$1,200K - \$2,000K	\$400K - \$675K	\$2,600K - \$4,400K
System Development Annual Recurring Cost (Range)	Not Applicable	\$800K - \$1,500K	\$800K - \$1,500K	\$1,100K - \$1,750K	\$600K - \$1,100K	\$250K - \$425K	\$850K - \$1,500K
NRC Staff (as a participant) Initial Cost (Range)					\$350K - \$600K	\$350K - \$600K	
NRC Staff (as a participant) Annual Recurring Cost (Range)					\$525K - \$900K	\$525K - \$900K	
Non-NRC Staff Participant Initial Cost	Not Applicable				Undetermined	Undetermined	Undetermined
Non-NRC Staff Participant Recurring Cost	Not Applicable				Undetermined	Undetermined	Undetermined
System Development Time Estimate (Range)	Not Applicable	8 Months - 15 Months	7 Months - 12 Months	22 Months - 38 Months	24 Months - 42 Months	4 Months - 7 Months	30 Months - 52 Months
NRC Staff (as a participant) Time Estimate (Range)					16 Months - 28 Months	16 Months - 28 Months	
Non-NRC Staff Participant Time Estimate	Not Applicable				Undetermined	Undetermined	Undetermined
Option Risk Score	Not Applicable	15	15	23	37	29	31
Numeric Score for System Benefit*	-3	4	3	0	2	2	1

\* Numeric score for system benefit determined by subtracting the number of Cons from the number of Pros.