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Functional Requirements for an Electronic Work Package System

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Functional Requirements for an Electronic Work Package System

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ACRONYMS

API	Application program interface
BOM	Bill of Material
CMMS	Computerized Maintenance Management System
EAM	Enterprise Asset Management
EDMS	Electronic Document Management System
EPRI	Electric Power Research Institute
eWP	Electronic Work Package
LWRS	Light Water Reactor Sustainability
M&TE	Measuring and Test Equipment
NEWPER	Nuclear Electronic Work Packages - Enterprise Requirements
NITSL	Nuclear Information Technology Strategic Leadership
OCR	Optical Character Recognition
PDF	Portable Document Format
QA	Quality Assurance
REP	Radiation Exposure Permit
RFID	Radio Frequency Identification
TOC	Table of Content
WMS	Work Management System

Functional Requirements for an Electronic Work Package System

1. INTRODUCTION

This document provides a set of high level functional requirements for a generic electronic work package (eWP) system. The requirements have been identified by the U.S. nuclear industry as a part of the Nuclear Electronic Work Packages - Enterprise Requirements (NEWPER) initiative. The functional requirements listed in this document should be viewed as a starting point for the utility to use when considering a eWP solution. Depending on the utility's specific needs and work processes the list of requirements will most likely be revised. Some of the requirements listed in this report may not be applicable and new additional requirements may be identified.

The functional requirements are mainly applied to eWP system supporting Basic and Moderate types of smart documents, i.e., documents that have fields for recording input such as text, dates, numbers, and equipment status, and documents which incorporate additional functionalities such as form field data "type" validation (e.g. date, text, number, and signature) of data entered and/or self-populate basic document information (usually from existing host application metadata) on the form when the user first opens it.

All the requirements are categorized by the roles; Planner, Supervisor, Craft, Work Package Approval Reviewer, Operations, Scheduling/Work Control, and Supporting Functions. The categories Statistics, Records, Information Technology are also included used to group the requirements. All requirements are presented in Section 3 through Section 12.

Examples of more detailed requirements are provided for the majority of high level requirements. These examples are meant as an inspiration to be used as each utility goes through the process of identifying their specific requirements.

The report's table of contents provides a summary of the high level requirements.

1.1   Nuclear Electronic Work Packages - Enterprise Requirements

The Nuclear Electronic Work Packages - Enterprise Requirements (NEWPER) initiative is a step toward a vision of implementing an electronic work package (eWP) framework that includes many types of eWPs. This will enable immediate paper-related cost savings in work management and provide a path to future labor efficiency gains through enhanced integration and process improvement in support of the Delivering the Nuclear Promise (Nuclear Energy Institute 2016).

The NEWPER initiative was organized by the Nuclear Information Technology Strategic Leadership (NITSL) group, which is an organization that brings together leaders from the nuclear utility industry and regulatory agencies to address issues involved with information technology used in nuclear-power utilities. NITSL strives to maintain awareness of industry information technology-related initiatives and events and communicates those events to its membership. NITSL and Light Water Reactor Sustainability (LWRS) Program researchers have been coordinating activities, including joint organization of NEWPER-related meetings and report development.

The main goal of the NEWPER initiative was to develop a set of utility generic functional requirements for eWP systems. This set of requirements will support each utility in their process of identifying plant-specific functional and non-functional requirements. The overall goals of the initiative are as follows:

- Define core components of an eWP system

- Define functional requirements for these core components, covering the full spectrum of eWPs from basic pdfs to dynamic smart documents

- Share operational experience that is related to ongoing eWP implementation activities in industry (e.g., benefits gained and identified issues)

- Communicate utilities needs and wants to vendors

- Standardize terminology related to eWP and smart documents.

In addition, the NEWPER initiative provided an opportunity for establishing new or reinforcing existing relationships between utilities and eWP vendors. The NEWPER initiative was started in October 2015 and is planned to be closed by December 2016.

The NEWPER initiative has 139 members. Figure 1 illustrates the distribution of members. The largest group of members consists of 19 commercial nuclear utilities that represent the vast majority of the U.S. commercial nuclear industry. The second largest member group includes 11 of the most prominent vendors of eWP solutions, along with two management consultant companies. The "other organizations" group consists of organizations such as the Electric Power Research Institute (EPRI), the Institute of Nuclear Power Operations, and EDF Energy. Three national research laboratories are also included in this group: Idaho National Laboratory, Los Alamos National Laboratory, and Savannah River National Laboratory. In addition to NITSL, the Nuclear Information and Records Management Association and the Procedure Professionals Association are also represented in the member pool.

Distribution of NEWPER members

- Vendors 24%
- Other Organizations 24%
- Non-US Utilities 5%
- U.S. Utilities 47%
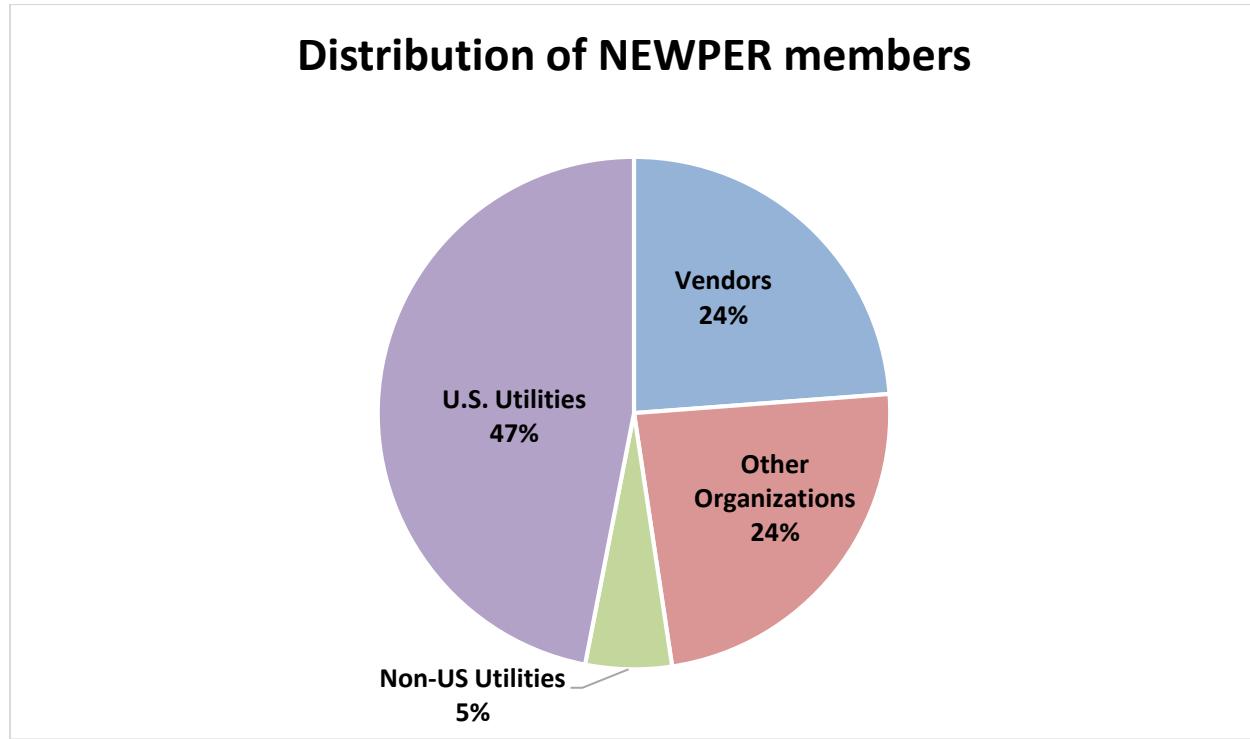
Figure 1. NEWPER member distribution.

Activities in NEWPER were mainly conducted via telephone conferences and face-to-face workshops. The NEWPER planning committee (see Figure 2) planed and organized all NEWPER activities in 2016.

The first NEWPER workshop was hosted by Arizona Public Service and was conducted from December 8 to 10, 2015, in Avondale, Arizona. The 68 participants represented 63% of the U.S.

commercial nuclear industry, 10 vendors, and other organizations such as the Institute of Nuclear Power Operations, EPRI, the Advanced Test Reactor at Idaho National Laboratory, and Los Alamos National Laboratory.

The workshop successfully established a dialogue between all parties (i.e., utilities and vendors), where valuable operational experience was shared and ideas and concerns were discussed. The main workshop objectives were to define a vision statement for eWP system implementation, define a common taxonomy for eWPs and the documents included in these eWPs, and identify generic minimum requirements for eWP systems.

The following vision statement was developed during the workshop: "Implement an open eWP framework, which covers the entire eWP spectrum, enabling immediate paper-related cost savings in work management and providing a path to future labor efficiency gains through enhanced integration and process improvement in support of the nuclear promise."

Figure 2. The NEWPER Planning Committee: P. Muller (Exelon), C. Williams (APS), N. Camilli (EPRI), A. Bly (INL), B. Gordon (APS), E. Jurotich (Southern Company), and J. Oxstrand (INL). Also, the LWRS Program Pathway Lead, B. Hallbert (INL).

The participants agreed to use a slightly revised version of EPRI's taxonomy for smart documents that is described in EPRI (2015). Figure 3 represents the revised version of the taxonomy. The part of the eWP that is most affected as the level of incorporated technical solutions increase will be the documents. Hence, the taxonomy only refers to documents and not to the work package as a whole.
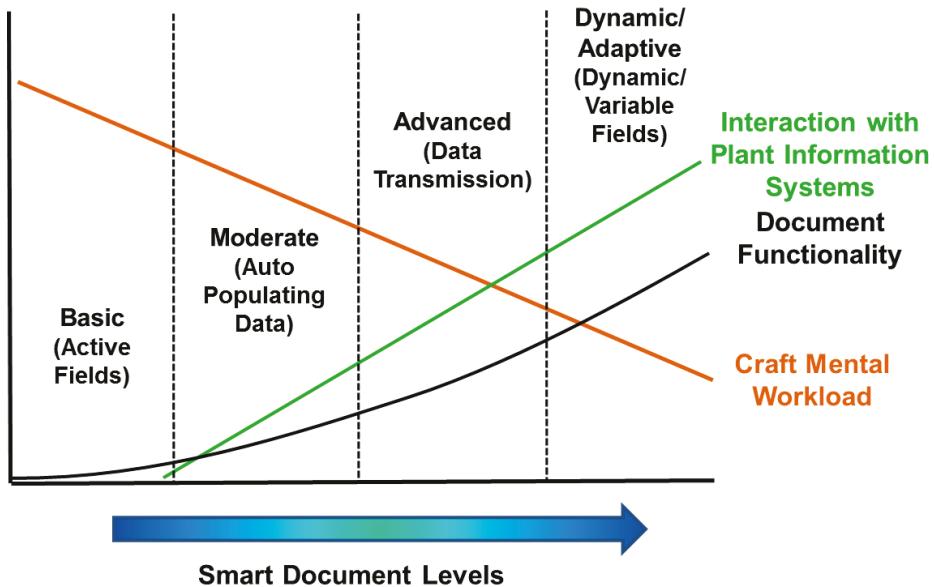
Figure 3. The NEWPER taxonomy for smart documents, which is based on a taxonomy developed by EPRI, EPRI (2015).

One of the main differences between the NEWPER taxonomy and EPRI's taxonomy is the exclusion of wireless network needs. It was concluded that other solutions (such as docking stations and Wi-Fi hot spots) could be sufficient for gaining benefits from different types of smart documents. The taxonomy consists of four levels: (1) basic, (2) moderate, (3) advanced, and (4) adaptive. Table 1 summarizes each of the levels.

Table 1. Summary of smart document levels.

Level	Summary
Basic (Active Fields)	The document has fields for recording input such as text, dates, numbers, and equipment status.
Moderate (Automatic Population of Data)	The document incorporates additional functionalities such as form field data "type" validation (e.g. date, text, number, and signature) of data entered and/or self-populated basic document information (usually from existing host application meta data) on the form when the user first opens it.
Advanced (Data Transmission)	The document provides the capability to transmit data entered into other data systems.
Adaptive (Dynamic/Variable Fields)	The document uses variable (i.e., dynamic) field options based on previously completed data entries or links to other electronic documents or media.

The identified minimum requirements include an authoring tool, compatibility with legacy plant systems, a human-factored user interface, and the system has to be operational in both online and offline modes. These minimum requirements served as starting point for the next NEWPER activity, where utility generic functional requirements for eWP systems (more specifically for basic and moderate levels of smart documents) were identified.

A second workshop was hosted by EPRI in Charlotte from March 22 to 23, 2016. The purpose of the workshop was for utility representatives to define a set of utility generic functional requirements for a eWP system and capture any non-functional requirements identified in the process. The outcome of the March workshop was a set of high-level functional requirements for a generic eWP system, which are documented in this report.

A need for a set of functional requirements for advanced and dynamic smart documents was also identified during the March 2016 workshop. The development of the requirements for advanced and dynamic smart documents became a parallel activity within the initiative. Two sets of requirements were developed of the smart documents; a set of high level requirements, and a set of detailed functional requirements.

Examples of high level requirements are optimized for human performance, optimized for worker efficiency, optimized for navigation, and digital data entry with backend system data utilization. The detailed functional requirements are grouped into different categories, such as step types, branching and referencing, data management, attachments and tables, and record requirements. Below are five examples of detailed functional requirements identified for advanced and dynamic smart documents.

1. Provides the ability to perform the appropriate portion of a Smart Document (either partially or completely executed).

2. Provides the ability for a specific data entry occurrence to be configured to automatically populate the same data in multiple locations throughout the Smart Document.

3. Provides the ability for calculations to be set up and performed based on entered data.

4. Provides the ability to always know what step is the Active Step and its position within the Smart Document.

5. Provides the ability to easily navigate to any section or attachment.

The functional requirements for advanced and adaptive Smart Documents will be published in 2017. In addition, in September 2016 the researchers at INL published a Design Guidance for Computer-Based Procedures for Field Workers (Oxstrand, Le Blanc, & Bly). The design guidance can be used as a compliment to the functional requirements reports from NEWPER.

2. DEFINITIONS AND DESCRIPTIONS

Term	Description
Application program interface	Application program interface (API) is a set of routines, protocols, and tools for building software applications. An API specifies how software components should interact and APIs are used when programming graphical user interface components (API - application program interface, 2016).
Approval Review Process	Workflow review process for ensuring the work or testing is prepared, reviewed and authorized to begin. Workflow approvals continue after work or testing is complete through archiving.
Approver	Approvers authorize work, or use of a procedure, or an action.
Area Coordinator	An individual or Work Group Lead that reviews new work tasks and assigns the activity to a specific work group for task completion. This individual/lead determines priority of the work activity for scheduling purposes.
Archiving	A permanent method for storage of records, whether hard-copy or electronic, that ensures records are protected, legible, identifiable, and retrievable.
As-Found/As-Left Conditions	Documentation that records as found and as left conditions when performing maintenance or testing.
Bill of Material	A bill of materials or product structure (sometimes bill of material, BOM or associated list) is a list of the raw materials, sub-assemblies, intermediate assemblies, sub-components, parts and the quantities of each needed to manufacture an end product (Bill of materials, 2016).
Check-out/Check-in	To enforce ownership the user has to check-out a specific work package, work order, or work order task, which ensures that only this user can access the document. When the user checks in the document it will become available to everyone.
Clearance	A clearance (also known as lockout-tagout) is a safety procedure which is used to ensure that dangerous machines are properly shut off and not able to be started up again prior to the completion of the work order task.
Computerized Maintenance Management System	A computerized maintenance management system (CMMS) is a type of management software that performs functions in support of management and tracking of O&M activities. Examples of CMMS are Asset Suite and Maximo.
CMMS Hold Point	A restraint on a work activity generated in the electronic work management system due to problems encountered in field, clearance status, and interferences with planned work by other organizations or external situations such as material availability.
Concurrent Verification	A series of actions by two individuals working together at the same time and place to separately confirm the condition of a component before, during, and after an action, when the

	consequences of an incorrect action would lead to immediate and possibly irreversible harm to the plant or personnel.
Continuous Work, Fix-It-Now, Skill of the Craft, or Minor Maintenance	Work processes that typically do not require detailed work instructions due to low risk or only requiring craft skill (e.g., change light bulbs and inspections). These are usually defined in station procedures.
Craft	All disciplines that will support the identified work (e.g., Electrical, Mechanical, and Welder). Craft is a higher level than Crew.
Crew	Team of personnel from a specific work group (i.e., Craft) that perform maintenance or testing in the field.
Critical Steps	Steps in a work document, when performed, execute an irreversible action.
Dashboard	In information technology, a dashboard is a user interface that, somewhat resembling an automobile's dashboard, organizes and presents information in a way that is easy to read. Some products that aim to integrate information from multiple components into a unified display refer to themselves as dashboards (Dashboard, 2016).
Data Points	A data point is a discrete unit of information. In a general sense, any single fact is a data point. In a statistical or analytical context, a data point is usually derived from a measurement or research and can be represented numerically and/or graphically (Data point, 2016).
Delay Codes	Delay codes are special codes indicating causes of work stoppage. Examples are Parts, Engineering, Scheduling, and Lack of Resources.
Derivative Classifier	Classifying a document as part of a Program Protection Plan (i.e., Security Plan). This plan details how information will be classified and marked for Records purposes. It's the written record of an original classification decision or series of decisions regarding a system, plan, program, or project.
Digital Media	Digital media refers to audio, video, and photo content that has been encoded (digitally compressed). Encoding content involves converting audio and video input into a digital media file such as a Windows Media file. After digital media is encoded, it can be easily manipulated, distributed, and rendered (played) by computers, and is easily transmitted over computer networks (What is Digital Media, 2016).
Digital signature	A type of electronic signature that gives a recipient reason to believe that the message was created by a known sender, that the sender cannot deny having sent the message (authentication and non-repudiation), and that the message was not altered in transit (integrity).
Document Expiration Date	Certain documents may only have a certain time frame that they are valid and must be renewed, i.e., they have an expiration date. For example, confined space permits have a limited time frame.

Electronic Document Management System	An Electronic Document Management System (EDMS) is a collection of technologies that work together to provide a comprehensive solution for managing the creation, capture, indexing, storage, retrieval, and disposition of records and information assets of the organization (Enterprise Document Management System (EDMS), 2016).
eWP	An application where work packages can be created, authorized, used in the field, and be submitted to the long term records management system process.
Hold Points	A pre-selected step in a procedure that identifies a point beyond which work may not proceed until the required action is performed.
Independent Verification	A series of actions by two individuals working independently to confirm the condition of a component after the original act that placed it in that condition.
Just In Time Training	Training scheme in which the required knowledge and skills are imparted for immediate application, to avoid loss of retention due a time gap (Just in time instruction, 2016).
Lessons Learned	A Lesson Learned is knowledge or understanding gained by experience that has a significant impact for an organization (Molton, 2016).
Measuring & Test Equipment	Measuring & Test Equipment (M&TE) includes all devices or systems used to calibrate, certify, measure, gauge, troubleshoot, test, or inspect in order to control data or to acquire data to verify conformance to specified requirements (Sullivan et al., 2010).
Master and Duplicate Documents	Master document is the original work order or procedure for field work or testing. Duplicate can be produced when additional work groups participate in the same document and need it in a different location. Duplicates are merged back into the Master document.
Metadata	Metadata is a set of data that describes and gives information about other data. Metadata summarizes basic information about data, which can make finding and working with particular instances of data easier. For example, author, date created and date modified and file size are examples of very basic document metadata. Having the ability to filter through that metadata makes it much easier for someone to locate a specific document (Metadata, 2016).
Mobile Device	The handheld device the Craft uses to access the work package and to complete the work order tasks in the field.
Mobile Device Management System	Mobile device management (MDM) is a type of security software used by an IT department to monitor, manage and secure employees' mobile devices that are deployed across multiple mobile service providers and across multiple mobile operating systems being used in the organization (Mobile device management, 2016).

Peer-checks	Peer checks or second party verifications allow another individual to observe or check the work of a performer to ensure correct performance of a specific set of actions.
Permits	A document allowing performance of a specific pre-defined activity. There are a variety of permits that support plant activities. Examples are open door, hot work, confined space, and temporary combustible storage permits.
Planner	Author of procedures or work instructions
Pre-Job Brief	The purpose of the pre-job briefing is to ensure that everyone involved understand the scope of the work to be performed by discussing the tasks involved.
Quality assurance	Quality assurance (QA) is a way of preventing mistakes or defects in manufactured products and avoiding problems when delivering solutions or services to customers; which ISO 9000 defines as "part of quality management focused on providing confidence that quality requirements will be fulfilled" (Quality assurance, 2016).
Record Retention Requirements	The Record retention requirements are industry standards, legal rules of evidence, federal regulations, insurance requirements, and other federal, state, or local laws or regulations which provide general or specific guidance on particular records to be created and maintained by an organization (NIRMA, 2011). The Record retention requirements are commonly defined in Station Procedures, which determines the length of time a record is required to be retained.
Records	Information, regardless of physical form or characteristics, appropriate for preservation as evidence of the organization, functions, policies, decisions, procedures, operations, or other activities of the organization. Examples of where this information may reside are: books, papers, maps, photographs, machine readable electronic files, or other documentary materials. (NIRMA, 2011).
Required Document	A required document is a document necessary to be used when performing a work activity. Many utilities will refer to this as an Implementing Document (e.g., Procedure and Vendor Tech Manual).
Reviewer	Responsible for ensuring all documentation related to the work package meets the required rigor and accuracy.
Route List	Work flow routing for sequential or parallel approvals of work order tasks or work orders.
Scheduled Start Date	Date that is typically derived from a scheduling application (e.g. Primavera) or internally from a WMS that indicates the beginning date of the work.
Status Markers	Ability to place tags/flags in an electronic work document to trigger notifications or alerts to systems. A visual aid in an electronic document that gives a reviewing party the ability to determine if a specific action has been performed.

Superseded Document	A revision to a document or procedure.
Supervisor	Authority for releasing work to Craft personnel.
Table of Content	A table of content (TOC) is an electronic list of documents that are associated with a given work package.
Task Priority	Priority of the work that is typically derived from the work order although individual work order tasks can have their own priority assigned.
Task Queues	A list of work activities awaiting completion or assignment.
Task Status	Indication of where a work order task is in the workflow process.
Unplanned Tasks	Unplanned tasks are work order tasks that are still in the development process or returned for amendment with the Planning organization.
Walkdown	Act of performing either a field walkdown of work or a tabletop review of a work package to ensure the maintenance or testing can be performed without issues.
Work Instructions	Set of detailed instruction steps that direct a maintenance or testing activity.
Work Order	Consists of all elements required to correct an identified problem or perform a maintenance/testing activity. Work order is considered the parent to individual work tasks. A work order can have one or more work order tasks.
Work Order Tasks	Distinct elements or sections that make an entire work order. A work order may be divided into individual work order tasks to separate one work discipline from another or work phases (e.g. Retest Task).
Work Package	Work package or work order package contains one or more work orders. This is the complete document set that is archived by Records Management.
Work Progress Information	Examples of work progress information are status, percent complete, and lessons learned (i.e., knowledge or understanding gained by experience that has a significant impact for an organization).
Work Request	Initiation request for work. Some utilities use a separate work request mechanism (e.g., a form) and for others this is the beginning step of the work order process

3. FUNCTIONAL REQUIREMENTS – PLANNER

3.1 Ability to view assigned tasks

The Planner should have access to a summary of assigned work order tasks as well as the associated work packages. Table 2 contains examples of detailed requirements.

Table 2. Planner - Ability to view assigned tasks.

Examples of Detailed Requirements	Additional Information
Provide ability to view assigned work order tasks.	
Provide visibility to the task status for all assigned tasks.	Examples of task status can be the status for assigned eWPs or the Computerized Maintenance Management System (CMMS) status.
Provide visibility to the task priority for all assigned tasks.	
Provide visibility to the scheduled start date for all assigned tasks.	
Provide ability to select and view a work package for an assigned task.	

3.2 Ability to create a work package for an assigned task

The Planner should be able to create new work packages. This includes the creation of a list of documents associated with the Work Package, i.e., the TOC.

3.3 Ability to manage returned work packages

The Planner should be given the ability to manage work packages that were returned either through the review process or during work execution. Table 3 provides examples of detailed requirements.

Table 3. Planner - Ability to manage returned work packages.

Examples of Detailed Requirements	Additional Information
Provide ability to see work packages that have been returned.	
Provide ability to handle work packages that have been returned.	
Provide a way for the Planner to view Reviewer's comments as well as attachments that were added by the Reviewer.	
Provide a way for the Planner to add more reviewers to the route list.	Route list is defined as the work flow routing for sequential or parallel approvals of work order tasks or work orders.

Provide the ability for the Planner to put a hold on a work package so it cannot be issued or worked.	

3.4 Ability to manage continuous work

The Planner should be able to manage continuous activities such as minor maintenance, fix-it-now work, or skill of the craft activities. These are work processes that typically do not require detailed work instructions due to low risk or only requiring craft skill (e.g. change light bulbs and inspections). These tasks are usually defined in utilities' procedures. Examples of detailed requirements are listed in Table 4.

Table 4. Planner - Ability to manage continuous work.

Examples of Detailed Requirements	Additional Information
Provide ability to make tasks that belong to continuous work orders obvious to Approver.	Reviewed by area coordinator to decide whether it is a fix-it-now task.
Provide ability to allow work directly from a work request.	Specifically for continuous type of work activities.
	A work request is the initiation request for work. Some utilities use a separate work request mechanism (e.g., a form) and for others this is the beginning step of the work order process.

3.5 Ability to manage responsibility assignments of work packages

The Planner should be able to manage which discipline the work package will be assigned to. The Planner should also be able to manage the Planner assigned to a specific work package. For example, if the assigned Planner for some reason is not able to fulfill the Planner responsibilities, then there should be an option to assign another Planner to ensure adequate management of the work package. Table 5 provides examples of detailed requirements.

Table 5. Planner - Ability to manage responsibility assignments of work packages.

Examples of Detailed Requirements	Additional Information
Provide ability to assign a supervisor to a work package.	The Supervisor has the authority to releasing work to Craft personnel.
	If only one Supervisor in that group, then the planner can assign work package directly to that Supervisor.
Provide ability to reassign responsibilities.	This requirement is needed to ensure the work package will not unintentionally be locked down.

3.6 Ability to manage required documents in the work package

A required document is a document necessary to be used when performing a work activity. Many utilities will refer to this as an Implementing Document (e.g., Procedure and Vendor Tech Manual). The

Planner needs to be able to assign required documents, define their expiration date, and validate their revision as a part of assembling the work package. Certain documents may only have a certain time frame that they are valid and must be renewed, i.e., they have an expiration date. For example, confined space permits have a limited time frame.

Table 6 contains examples of detailed requirements.

Table 6. Planner - Ability to manage required documents in the work package.

Examples of Detailed Requirements	Additional Information
Provide ability to specify that a document is a required document.	
Provide ability to validate documents are in the most current revision.	
Provide ability to define the expiration date for a required document.	This includes permits and work instructions.
Provide ability to change the expiration date of a required document.	
Provide Planner full privileges over required documents during the planning stage.	Examples of privileges are to add, open, remove, supersede, or edit the required document.
Provide ability to give other users limited privileges over required documents when past the planning stage.	Examples of other users are Supervisors and Craft.
Provide ability to limit privileges for all users over superseded required documents.	A superseded document is a revision to a document or procedure.
Provide ability to specify that a document is a reference/information only document.	

3.7   Ability to integrate CMMS holds into the work package

The Planner should be able to integrate CMMS holds into the package to enable improved communication with craft by providing status of work, holds due to problems encountered in field, clearance status, and interferences with planned work by other organizations or external situations such as material availability.

3.8   Ability to add hold points, critical steps, and other status markers

To support Management's need to status ongoing work the Planner should be able to add hold points and other status markers as well as identify critical steps. A hold point is a pre-selected step in a procedure that identifies a point beyond which work may not proceed until the required action is performed.

3.9   Ability to modify a work package

To effectively conduct the assigned responsibilities the Planner needs to be able to make changes to work packages. These changes includes; open, add, delete, and save associated documents. Table 7 provides examples of detailed requirements.

Table 7. Planner - Ability to modify a work package.

Examples of Detailed Requirements	Additional Information
Provide ability to export documents to PDF.	For example, instructions, drawings, permit, and forms.
Provide ability to 'Save Document As'.	
Provide ability to 'Open' document.	
Provide ability to 'Edit' document.	
Provide ability to 'Add' a new document.	
Provide ability to 'Delete' document.	
Provide ability to 'Supersede' a document.	
Provide ability to determine which documents should be retained as records.	Not all documents in the work package have to be sent to records (e.g., two-minute drill, pictures, and drawings). This will help manage the file size of the package. It is important to make sure the revisions of all documents in the work package are captured.

3.10   Ability to manage Planner walkdowns

A task walkdown is conducted by the Planner in the early planning stage of the work package. It is the act of performing either a field walkdown of work or a tabletop review of a work package to ensure the maintenance or testing can be performed without issues. The Planner should be able to capture insights from the walkdown and incorporate them into the remaining planning of the work package. Table 8 provides examples of detailed requirements.

Table 8. Planner - Ability to manage Planner walkdowns.

Examples of Detailed Requirements	Additional Information
Provide ability to prepare the work package for Planner walkdown.	Walkdown - pre/during planning (conducted by Planner), Workability –post planning (done by Craft)
Provide ability for the Planner to make notes during walkdown.	

3.11 Ability to conduct verifications and inspections using the mobile device

The Planner needs to be able to identify and document checks (second party, peer), verifications (independent, concurrent), and inspections (regulatory required). Table 9 provides examples of detailed requirements.

Table 9. Planner - Ability to conduct verifications and inspections using the mobile device.

Examples of Detailed Requirements	Additional Information
Provide ability to conduct second party, concurrent, and independent verifications while using the eWP on a mobile device.	
Provide ability to conduct (sign-off) regulatory required inspections while using the eWP on a mobile device.	

3.12 Ability to enforce workability review before work execution

A task walkdown is conducted by the Planner in the early planning stage of the work package. When the planning is complete a workability review (or Craft walkdown) is conducted by the Craft before work can be authorized. The Planner should be able to prepare the work package for the workability review and assign Craft and Reviewers for the workability review. Table 10 lists examples of detailed requirements.

Table 10. Planner - Ability to enforce workability review before work execution.

Examples of Detailed Requirements	Additional Information
Provide ability to prepare the work package for workability review.	Walkdown - pre/during planning (conducted by Planner), Workability –post planning (done by Craft)
Provide ability to assign workability Craft to the work package.	
Provide ability to assign workability reviewers.	
Provide ability to initiate the workability review.	
Provide ability to distinguish tasks that the workability reviewer have set to complete.	
Provide ability to view information related to the workability for a given task.	
Provide ability to generate work package TOC from workability TOC.	The TOC is an electronic list of documents that are associated with a given work package.
Provide ability for the Craft to make notes during walkdown.	Craft normally walks down job with a package and providing a place to note comments is critical.

3.13 Ability to route work package for approvals

Throughout the planning process the Planner needs to be able to route the work package for approvals. For example, the Planner needs to do this at the completion of the planning and at work completion. Table 11 lists examples of detailed requirements.

This could extend to being able to use workflows for predefined and special-case routings throughout the job, i.e., from planning, pre-job organizational reviews, walkdowns, execution, approvals, to archiving. The idea is that all work packages (including all related documentation) "flow" through the system rather than each having to be individually routed.

Table 11. Planner - Ability to route work package for approvals.

Examples of Detailed Requirements	Additional Information
Provide ability to see all the work order tasks that have completed the approval review process.	Completion status could be either approved or returned.
Provide ability to see whether a reviewer added a document to the TOC.	The TOC is an electronic list of documents that are associated with a given work package.
Provide ability to indicate that planning is complete for approved work packages.	
Provide ability to assign work completion Reviewers to support the work completion review process.	
Provide ability to indicate that a derivative classifier is required before work order task is sent to records.	

3.14 Ability to track work package status

The Planner need to be able to track the status of each assigned work package. This will enable the Planner to easily identify and resolve any potential bottlenecks in the planning and review process.

This could be extended to the ability to link the status markers to other work packages and schedule events, e.g., when a certain point or step is passed (signed off) it automatically enables downstream activities without human intervention or delay.

3.15 Ability to efficiently respond to needs to the Craft

Throughout the work execution the Planner needs to be able to efficiently address any questions or requests from the Craft. This can for example be requests for minor revisions (or pen and ink revisions).

3.16 Ability to assign Record retention requirements to documents

During the planning process the Planner should be able to assign Record retention requirements, unless pre-defined, to the documents assigned to the work package. The Record retention requirements are commonly defined in Station Procedures, which determines the length of time a record is required to be retained.

4. FUNCTIONAL REQUIREMENTS – SUPERVISOR

4.1 Ability to manage task queues

The Supervisor needs to be able to manage (view and sort) the queue of assigned work packages and work order tasks to be performed to efficiently assess and plan the work. Table 12 provides examples of detailed requirements.

Table 12. Supervisor - Ability to manage task queues.

Examples of Detailed Requirements	Additional Information
Provide ability to sort a task queue by any field.	
Provide ability to view work order type on all tasks queues.	
Provide ability to view and update work package information.	Examples of work package information are associated work order tasks, start date, and assigned Craft.

4.2 Ability to create and complete work packages for unplanned tasks

Unplanned tasks are work order tasks that are still in the development process or returned for amendment with the Planning organization. The Supervisor need to be able to plan for unplanned or continuous work (Section 2.4) such as fix-it-now tasks. The Supervisor will do so by view, create, and complete work packages for the unplanned tasks. It is important for the Supervisor to be able to manage the TOC (i.e., TOC is an electronic list of documents that are associated with a given work package) for this type of work packages. Table 13 provides examples of detailed requirements.

Table 13. Supervisor - Ability to create and complete work packages for unplanned tasks.

Examples of Detailed Requirements	Additional Information
Provide ability to view 'unplanned work' work order tasks that do not have a completed TOC.	
Provide ability to create a TOC for a 'unplanned work' task.	
Provide ability to complete the TOC for a 'unplanned work' task.	

4.3 Ability to accept or return work packages

The Supervisor should be able to manage the assigned work packages. This is enabled by the ability to view accepted work packages and the work order tasks as well as the ability to notify the Planner whether the Supervisor will accept or return newly assigned work packages. For example, the Supervisor should be able to return the work package to the Planner if inconsistencies or inaccuracies were identified. Table 14 lists examples of detailed requirements.

Table 14. Supervisor - Ability to accept or return work packages.

Examples of Detailed Requirements	Additional Information
Provide ability to view work order tasks that are ready to be accepted by the Supervisor.	
Provide ability to accept or return work package to the Planner.	

4.4   Ability to reassign Supervisor responsibilities

The Supervisor needs to be able to reassign the Supervisor responsibilities to ensure the work package will not unintentionally be locked down.

4.5   Ability to assign Craft or Crew to a work package

The Supervisor should be able to assign the work package to either a Craft or specific Crew who will be responsible to execute the work package. The Supervisor could also be able to assign the work package either to an individual or a mobile device (i.e., the handheld device the Craft uses to access the work package and to complete the work order tasks in the field). This would add flexibility to the process. Table 15 provides examples of detailed requirements.

Table 15. Supervisor - Ability to assign Craft or Crew to a work package.

Examples of Detailed Requirements	Additional Information
Provide ability to assign and un-assign Craft or Crew from a work package.	
Provide ability to view all of the Craft or Crews assigned to a given work package.	
Provide ability to assign a package for a pre-job walkdown/workability review.	The Craft conducts a pre-job walkdown by performing either a field walkdown of work or a tabletop review of a work package to ensure the maintenance or testing can be performed without issues.
Provide ability to assign a work package to a specific mobile device.	Have a check-in/check-out policy to enforce ownership of activity.

4.6   Ability to manage master and duplicate copies of a work package

To support multiple disciplines working on the same work package the Supervisor should be able to assign a master copy and duplicate copies to different disciplines. The also needs to be a way to merge these copies when the work is complete (i.e., when all work order tasks are completed).

Table 16 provides examples of detailed requirements.

Table 16. Supervisor - Ability to manage master and duplicate copies of a work package.

Examples of Detailed Requirements	Additional Information
Provide ability to assign a master copy copies of the work package to a Craft, Crew, or mobile device.	
Provide ability to assign duplicate copies of the work package to Craft, Crew, or mobile device.	
Provide ability to identify if a copy is a master or duplicate.	Use water marks or similar to indicate duplicate and master copies.

4.7   Ability to process work packages returned by the Craft

The Supervisor needs the ability to process work packages that have been returned by the Craft either at work completion or returned for other reasons.

4.8   Ability to support the completion review

Support the Supervisor during the completion review by providing functionality such the option to add additional comments and conduct sign-offs via a digital signature, i.e., a type of electronic signature that encrypts documents with digital codes that are particularly difficult to duplicate.

4.9   Ability to route the work package for additional reviews

The Supervisor should be able to route the work package for additional reviews. This includes the identification and assignment of Reviewers (responsible for ensuring all documentation related to the work package meets the required rigor and accuracy).

This could extend to being able to use workflows for predefined and special-case routings throughout the job, i.e., from planning, pre-job organizational reviews, walkdowns, execution, approvals, to archiving. The idea is that all work packages (including all related documentation) "flow" through the system rather than each having to be individually routed.

4.10   Ability to add status markers to the work package

The Supervisor should have the ability to add additional status markers to the work package as well as check the status of these markers throughout work execution and at work completion. Table 17 provides examples of detailed requirements.

This could be extended to the ability to link the status markers to other work packages and schedule events, e.g., when a certain point or step is passed (signed off) it automatically enables downstream activities without human intervention or delay.

Table 17. Supervisor - Ability to add status markers to the work package.

Examples of Detailed Requirements	Additional Information
Provide ability to add hold points to the work package.	

Provide ability to indicate that a hold point was performed.	
Provide ability to ensure that all hold points have been completed before setting task to FINISH.	

4.11 Ability to add additional documents to the work package

The Supervisor should be able to add additional documents such as permits (e.g., open door, hot work, confined space, and temporary combustible storage), just in time training (i.e., a training scheme in which the required knowledge and skills are imparted for immediate application, to avoid loss of retention due a time gap), and as-found/as-left conditions descriptions (i.e., documentation that records as found and as left conditions when performing maintenance or testing) to the work package.

4.12 Ability to hold a work package until conditions are met

The Supervisor should be able to lock or hold a work package to prevent work being initiated until conditions such as completed workability review and pre-job briefs are met.

4.13 Ability to monitor work and track status during execution

The Supervisor should be able to monitor and track the work package status throughout the work execution. The Supervisor should be able to suspend and resume work as needed. The system should notify the Craft if work has been suspended and when it is allowed to resume the work. Table 18 lists examples of detailed requirements.

Table 18. Supervisor - Ability to monitor work and track status during execution.

Examples of Detailed Requirements	Additional Information
Provide ability to track status during work execution.	
Provide ability to suspend work and notify Craft.	
Provide ability to send resume work notification to the Craft.	

4.14 Ability to capture media to use as part of shift turnovers

The Supervisor (or assigned Craft) should be able to capture digital media (e.g., photos or video) to document what point the task is at the time of a turnover (i.e., when the leaving shift hands over tasks to the oncoming shift). The media should be used as a supplement to the face-to-face turnover.

4.15 Ability to render the work package for backend review

The Supervisor should have the ability produce a copy or version of a work package for backend review at any time from any device.

5. FUNCTIONAL REQUIREMENTS – CRAFT

5.1 Ability to manage assigned tasks

The Craft needs to be able to manage the assigned tasks to be performed to efficiently assess and plan the work. Table 19 provides examples of detailed requirements.

Table 19. Craft - Ability to manage assigned tasks.

Examples of Detailed Requirements	Additional Information
Provide ability to view assigned work order tasks.	
Provide ability to check-out a work package in the list.	By checking out a work package, the specific work package will be locked and no other users can make changes to it.
Provide ability to view which work order tasks have been checked-out.	
Provide ability to sort the list of work order tasks by any field.	
Provide the ability to access the work package TOC for a work order task.	The TOC is an electronic list of documents that are associated with a given work package.
Provide ability to check-in a work package for a given work order task.	
Provide ability to access and review out-of-revision documents.	
Provide ability to add the most current revision of the documents and drawings to the work package.	

5.2 Ability to use the mobile device to determine workability and acceptability

The Craft needs the ability to use the mobile device to conduct a walkdown of the work package prior to the work execution to determine workability and acceptability. The Craft conducts a pre-job walkdown by performing either a field walkdown of work or a tabletop review of a work package to ensure the maintenance or testing can be performed without issues.

Table 20 lists examples of detailed requirements.

Table 20. Craft - Ability to use the mobile device to determine workability and acceptability.

Examples of Detailed Requirements	Additional Information
Provide ability to view assigned tasks that are ready for workability review.	
Provide ability to check-out tasks that are ready for workability review.	

Provide ability to update the workability TOC throughout the review process.	The TOC is an electronic list of documents that are associated with a given work package.
Provide ability to add workability comments to the TOC.	For example, ability to enter work performed and closure information if work is completed as "skill of the craft" during the walkdown or identified needed support resources, equipment, supplies, tooling, scaffolding, clearance requirements, REP requirements during the walkdown.
Provide ability to check-in the workability TOC.	
For the Walkdown process, provide a way for Walkdown Reviewer to indicate that the Walkdown is complete.	The Reviewer is responsible for ensuring all documentation related to the work package meets the required rigor and accuracy. A walkdown is the act of performing either a field walkdown of work or a tabletop review of a work package to ensure the maintenance or testing can be performed without issues.
For the Workability process, provide a way for the Workability Reviewers to either Approve or Return the Workability TOC.	

5.3 Ability to incorporate digital media into the work package

The Craft should be able to capture digital media in the field and incorporate this into the work package.

5.4 Ability to record work progress using the mobile device

The Craft must be able to execute the assigned task in the field, either by using a mobile device or a paper copy of the work order. If a mobile device is used during the task execution, the Craft should be able to record the work progress through this device. Table 21 provides examples of detailed requirements. Examples of work progress information are status, percent complete, and lessons learned (i.e., knowledge or understanding gained by experience that has a significant impact for an organization).

Table 21. Craft - Ability to record work progress using the mobile device.

Examples of Detailed Requirements	Additional Information
Provide ability to record work progress information for a given work order task.	Examples of work progress information are status, percent complete, and lessons learned (i.e., knowledge or understanding gained by experience that

	has a significant impact for an organization).
Provide ability to record labor information for a given work order task.	Examples of labor information are employee, work date, and task performance time.
Provide ability to record delay codes for a given work order task.	Delay codes are special codes indicating causes of work stoppage. Examples are Parts, Engineering, Scheduling, and Lack of Resources.
Provide the ability to save work progress information.	

5.5   Ability to sign clearances using the mobile device

The Craft needs to be able to use the mobile device (i.e., the handheld device the Craft uses to access the work package and to complete the work order tasks in the field) to access the clearances as well as both being able to sign-on and sign-off clearances. Table 22 provides examples of detailed requirements.

Table 22. Craft - Ability to sign clearances using the mobile device.

Examples of Detailed Requirements	Additional Information
Provide ability to access the electronic verification of the clearance being implemented from the operations electronic clearance system.	
Provide ability to download items such as tag assignment sheets and worker sign-on sheets onto the device.	
Provide ability to conduct an independent electronic verification between the component identified by the clearance computer and the eWP component to enhance personnel safety.	
Provide ability to sign-on/sign-off the clearance using the mobile device.	
Provide ability to sign-on/sign-off additional Craft to the clearance using the mobile device.	

5.6   Ability to conduct pre-job briefs using the mobile device

The Craft needs to be able to use the mobile device conduct pre-job briefs, this is especially important if digital media (e.g., photos and videos) are incorporated in the pre-job brief. The purpose of the pre-job briefing is to ensure that everyone involved understand the scope of the work to be performed by discussing the tasks involved. Table 23 provides examples of detailed requirements.

Table 23. Craft - Ability to conduct pre job briefs using the mobile device.

Examples of Detailed Requirements	Additional Information
Provide ability to send additional information or reference material to the specific device.	
Provide ability to pull reference material from the systems such as EDMS, WMS, Share Drive when network connected and store on device.	

5.7 Ability to conduct verifications and inspections using the mobile device

The Craft needs to be able to conduct second party (peer checks), concurrent, and independent verifications as well as the ability to sign-off regulatory required inspections. Table 24 provides examples of detailed requirements.

Table 24. Craft - Ability to conduct verifications and inspections using the mobile device.

Examples of Detailed Requirements	Additional Information
Provide ability to conduct second party, concurrent, and independent verifications while using the eWP on a mobile device.	
Provide ability to conduct (sign-off) regulatory required inspections while using the eWP on a mobile device.	

5.8 Ability to conduct placekeeping and sign-offs

The Craft needs to be able to conduct placekeeping and to be able to sign off work sections while using the mobile device to conduct the task. Table 25 lists examples of detailed requirements.

Table 25. Craft - Ability to conduct placekeeping and sign offs.

Examples of Detailed Requirements	Additional Information
Provide ability to (manually or automatically) place-keep the work order.	
Provide ability to sign off work sections or work order task using an electronic signature.	

5.9 Ability to conduct correct component verifications

The Craft should be able to conduct correct component verifications when conducting the task with the mobile device given that the device has a camera or barcode reader. Table 26 provides examples of detailed requirements.

Table 26. Craft - Ability to conduct correct component verifications.

Examples of Detailed Requirements	Additional Information
Provide ability to independently verify the craft have located the correct component (and unit) prior to beginning work.	
Provide ability to conduct digital correct component verification.	This can be achieved by using technology such as RFID, barcodes, or OCR.

5.10 Ability to undo unintended or incorrect action

The Craft must have the option (when applicable) to undo the recorded action in the case it was incorrectly recorded on the mobile device. All actions, included the ones revised should be logged and be included in the final documentation for the completed work package.

5.11 Ability to determine when and if all materials needed for the task are available

The Craft should be able to use the eWP system to determine when and if all needed material are available. This will be used to status all material in the Bill of Materials (BOM) from a procurement standpoint. This might be determined during the workability review.

5.12 Ability to capture what material was used in the BOM

The Craft should be able to use the eWP system to capture which of the material in the BOM was used and not used during task execution. Table 27 provides examples of detailed requirements needed to achieve this functionality.

Table 27. Craft - Ability to capture what material was used in the BOM.

Examples of Detailed Requirements	Additional Information
Provide ability to track M&TE and parts using barcode scanning.	
Provide ability to enter parts' tracking numbers in data field to track parts used.	
Provide ability to use barcode scanning to track parts used.	
Provide ability to enter M&TE and parts tracking numbers as data field entries in the work package.	
Provide ability to capture M&TE calibration information.	
Provide ability to create a return ticket for what needs to go back to storage	

5.13 Ability to take notes during work execution

The Craft should be able to use the mobile device to capture comments related to the task execution and instructions as well as be able to use an electronic note pad for notes that only are relevant to the Craft during the execution, but that should not be archived along with the rest of the work package. Example of such notes are short reminders and calculations. These notes should be easily accessible during the work execution. Table 28 provides examples of detailed requirements.

Table 28. Craft - Ability to take notes during work execution.

Examples of Detailed Requirements	Additional Information
Provide ability to capture comments related to a specific step in the instruction.	
Provide ability to capture comments related to the work order task.	
Provide ability to note on an electronic scratch pad or sticky note outside the eWP application while executing the task.	
Provide ability to capture annotations.	Examples of annotations are descriptions for photos or videos captured in the field.
Provide ability to add completion comments.	

5.14 Ability to launch a calculator from inside the eWP application

The Craft should be able to access a calculator from the eWP application, i.e., like a widget or embedded tool.

5.15 Ability to initiate a work request from mobile device in the field

The Craft should be able to either create a work request directly from the eWP system or be able to access the condition reporting system via the mobile device. A work request is the initiation request for work. Some utilities use a separate work request mechanism (e.g., a form) and for others this is the beginning step of the work order process.

5.16 Ability to access equipment history for components associated with the work package

The Craft should be able to access equipment history for the components required to complete the work order task.

5.17 Ability to access associated media for the components

The Craft should be able to access additional information for the components required to complete the work order task. Examples of such media are operation experience, just in time training, photos, and videos.

5.18 Ability to update status of a status marker

The Craft should have the ability to update status markers, e.g., set as "Complete".

5.19 Ability to use three-way communication

The Craft should be able to use three-way communication when conducting work in the field. By using the mobile device during the three-way communication could allow the use of the built-in camera to email photos of the field situation to appropriate parties, such as engineers, outage control, and supervisor. The user in the field would also be able to receive response from both all appropriate parties within the organization and from outside organizations (e.g., the manufacturer) to address the potential issue. In other words, this would provide flexibility for real-time troubleshooting in "video/photo" mode if needed.

5.20 Ability to use multiple types of input

The Craft should be able to use multiple types of input when conducting work using a mobile device. Examples of input types to consider are text, camera, barcodes, and voice-to-text. As indicated in Requirement 11.3 - Ability to use a calibration sheet on a mobile device, the system could/should verify the input value is within acceptable range and notify the user if the value is out of range.

6. FUNCTIONAL REQUIREMENTS – WORK PACKAGE APPROVAL REVIEWER (BACKEND CLOSURE)

6.1 Ability to route records for post execution validation

There should be a process to route the records to post execution validation. As a part of this process, the Approval Reviewer needs to be able to access, review, and add to the work package (i.e., the work instructions and all documentation associated with a work order task) via the eWP system. Table 29 provides examples of detailed requirements.

Table 29. Approval Reviewer - Ability to route records for post execution validation.

Examples of Detailed Requirements	Additional Information
Provide the Approval Reviewer the ability to access the assigned work package.	
Provide the Approval Reviewer the ability to add documents to the TOC.	The TOC is an electronic list of documents that are associated with a given work package.
Provide the Approval Reviewer the ability to either approve or return the review.	This can be achieved either by using the eWP solution directly or by using the CMMS functionality depending on implementation.
Provide the Approval Reviewer the ability to send the work package to other disciplines for review.	This can be achieved either by using the eWP solution directly or by using the CMMS functionality depending on implementation.

7. FUNCTIONAL REQUIREMENTS – OPERATIONS

7.1 Ability to create pre-authorization of work order tasks

The Operations needs to be able to pre-authorize work order tasks that can be initiated before the work package (i.e., the work instructions and all documentation associated with a work order task) is fully approved and authorized for work execution. This is mainly applicable to support tasks in a task based work order.

7.2 Ability to conduct sign-offs prior to task execution (remote)

The Operations should be able to use the eWP system to conduct remote sign-offs prior to task execution.

7.3 Ability to use the eWP System for Operations

The Operation organization could be able to use the eWP system for their own activities, such as rounds, auxiliary operator activities in the field, or activities in the main control room. However, this might require a specific configuration of the system.

8.   FUNCTIONAL REQUIREMENTS – SCHEDULING/WORK CONTROL

8.1   Ability to view work orders

The Work Control needs to have access to the planned work orders in order to be able to prioritize the tasks for scheduling purposes. Table 30 provides examples of detailed requirements.

Table 30. Work Control - Ability to view work orders.

Examples of Detailed Requirements	Additional Information
Provide ability to view list of relevant work orders.	
Provide ability to filter the list of work orders by specific fields.	For example filter by assigned Craft.

8.2   Ability to view work orders tasks

The Work Control needs to have access to the planned work orders tasks in order to be able to prioritize the tasks for scheduling purposes. Table 31 provides examples of detailed requirements.

Table 31. Work Control - Ability to view work order tasks.

Examples of Detailed Requirements	Additional Information
Provide ability to view list of relevant work orders tasks.	These work order tasks should be associated to specific work orders.
Provide ability to sort the list of work order tasks by specific fields.	For example filter tasks by work order or filter by assigned Craft.
Provide information necessary to prioritize tasks.	Examples of information needed to prioritize tasks are planning % complete, planner priority, operations priority, and task priority (Task priority of the work that is typically derived from the work order although individual work order tasks can have their own priority assigned).

8.3   Ability to update priority information

The Work Control needs to be able to update the priority information for individual work order tasks. Table 32 provides examples of detailed requirements.

Table 32. Work Control - Ability to update priority information.

Examples of Detailed Requirements	Additional Information
Provide ability to update planning percent complete.	This is usually a CMMS functionality. The eWP solution should allow access to the CMMS functionality.
Provide ability to update planner priority.	The system should notify the Planner upon change.

Provide ability to update planner priority comments.	The system should notify the Planner upon change.
Provide ability to update operations priority.	The system should notify Operations upon change.

9. FUNCTIONAL REQUIREMENTS – SUPPORTING FUNCTIONS

9.1 Ability for recorded inputs/data to be routed to other organizations for review

Provide the ability to route recorded inputs and data to organizations and users who might need to review the input and/or use it for trending purposes. If the CMMS functionality exist to route documents for review, the CMMS functionality should be utilized.

9.2 Ability to coordinate with additional disciplines and teams during work execution

Support the coordination between disciplines and teams needed to efficiently complete the work order tasks. This can be done via alerts or notifications.

9.3 Ability to share task status with relevant organizations

Provide the ability to share task status (i.e., the indication of where a work order task is in the workflow process) with other disciplines or organizations who might need it. For example, the task status can be displayed on an outage control center dashboard for the outage management or it can be tied to the radiological protection dose management application. The main purpose would be to provide the transparency of (critical) or time sensitive task status.

10. FUNCTIONAL REQUIREMENTS – RECORDS

10.1 Ability to generate a QA record

The eWP system must provide the ability to generate a quality assurance (QA) record of the completed work package (i.e., the work instructions and all documentation associated with a work order) in an industry standard format with the option of additional formats.

10.2 Ability to identify document types not required to be retained as QA records

Provide support the identification of document types that are not needed to be retained as QA records.

10.3 Ability for waiting period between task completion and archiving

Provide the option to add a waiting period between task completion and archiving to allow for post work completion and completion reviews. This could be based on the CMMS systems internal clock that sequences the work order to CLOSED.

10.4 Ability to supply the appropriate metadata from eWP system to allow for efficient record retention and retrieval

Allow for efficient record retention and retrieval by utilizing the metadata captured during work execution.
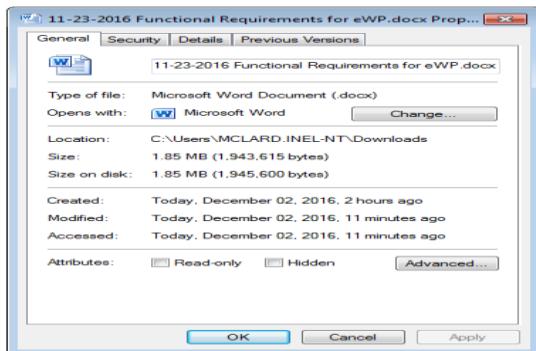
Figure 4. Example of Metadata.

10.5 Ability to capture data points recorded in the work package

Allow for the capture and easy access of data points recorded during work execution. These data points can be used for purposes such as trending.

11. FUNCTIONAL REQUIREMENTS – INFORMATION TECHNOLOGY

11.1 The eWP mobile application must work in Connected or Dis-Connected wireless mode

The entire issued work package (i.e., the work instructions and all documentation associated with a work order task) must be loaded on the mobile device to enable the application to work regardless of network connectivity mode. This is known as "store and forward". The mobile device must have the capability to automatically connect to a wireless signal when in range and receive information from the client eWP system. The mobile device should have the ability to manually refresh information from the client eWP system.

11.2 Ability to display and use the work package on dedicated mobile devices

The eWP system must be designed to function properly on the dedicated hardware.

11.3 Ability to use a calibration sheet on a mobile device

Tables on data sheets should be functional in the end device with the ability to display out of range conditions as user inputs information.

11.4 Provide a dashboard for each role with role specific information displayed

The eWP client should have a dashboard that can be filtered, sorted and grouped by date range, department, work team, work leader, individual assigned, device assigned. The eWP dashboard should display approved work, unapproved work, returned work, and issued work.

11.5 Ability to support multiple form factors

Each station should determine which mobile device(s) meet their needs. Where different form factors (e.g., devices and operation systems) are used, each device should have the ability to format work order tasks and attached docs correctly.

11.6 Ability to incorporate a calculator to the eWP application

Support embedded calculation capability/functionality in both work instruction steps (i.e., the set of detailed instruction steps that direct a maintenance or testing activity) and attached work sheets. A native calculator or home built calculator function should be available on the device.

11.7 Ability to incorporate forms from external party

Provide the ability to incorporate forms from parties not part of the actual eWP system. These forms should be accessible via the eWP system and it should be possible to send the captured data back to the external party.

11.8   Ability for eWP system to interface with legacy systems

Provide ability to interface with legacy systems via Application program interfaces (APIs), web services, or similar solutions.

11.9   Ability to interface with mobile device management system

Provide ability to interface with a mobile device management system.

11.10   Ability to manually sync the mobile device

There should be an option to manually sync the mobile devices with the eWP system when wireless network is not available.

11.11   Ability for the eWP system to adjust status in the EAM system

Provide ability to adjust the relevant status in the Enterprise Asset Management (EAM) system.

11.12   Ability for the eWP system to adjust status in WMS and/or work control systems

Provide ability to adjust the relevant statuses in the work management system (WMS) and or the work control systems used.

12. FUNCTIONAL REQUIREMENTS – STATISTICS

12.1   Ability to capture and track work package status

Provide the ability to both capture and track the status of the work package (i.e., the work instructions and all documentation associated with a work order task) throughout the work package process. The captured information can be used for dashboards mentioned in 11.4 as well as for trending and planning purposes.

The dashboards will be beneficial in an outage or system work window where real-time updates could be shared with control teams.

13. REFERENCES

API - application program interface. (2016, 12 07). Retrieved from webopedia: www.webopedia.com/TERM/A/API.html

Bill of materials. (2016, 12 07). Retrieved from Wikipedia: https://en.wikipedia.org/wiki/Bill_of_materials

Dashboard. (2016, 12 07). Retrieved from TechTarget: http://searchcio.techtarget.com/definition/dashboard

Data point. (2016, 12 07). Retrieved from WhatIs - TechTarget: http://whatis.techtarget.com/definition/data-point

Electric Power Research Institute. (2015). *Improving the Execution and Productivity of Maintenance with Electronic Work Packages.* TR-3002005363. Palo Alto, CA: Electric Power Research Institute.

Enterprise Document Management System (EDMS). (20116, 12 07). Retrieved from North Dakota Information Technology Department: https://www.nd.gov/itd/services/enterprise-document-management-system-edms

Just in time instruction. (2016, 12 07). Retrieved from BusinessDictionary: www.businessdictionary.com/definition/just-in-time-instruction.html

Metadata. (2016, 12 07). Retrieved from WhatIs - TechTarget: http://whatis.techtarget.com/definition/metadata

Mobile Device Management. (2016, 12 07). Retrieved from webopedia: www.webopedia.com/TERM/M/mobile_device_management.html

Molton, N. (2016, 12 07). *What is Lessons Learned?* Retrieved from Knoco stories: www.nickmilton.com/2009/05/what-is-lesson-learned.html

NIRMA. (2011). *NIRMA TG15-2011 Management of Electronic Records.* Nuclear Information & Records Management Association.

Nuclear Energy Institute. (2016). *Delivering the Nuclear Promise: Advancing Safety, Reliability, and Economic Performance.* Nuclear Energy Institute.

Oxstrand, J., Le Blanc, K., & Bly, A. (2016). *Design Guidance for Computer-Based Procedures for Field Workers.* Idaho Falls: Idaho National Laboratory (INL/EXT-16-39808).

Quality assurance. (2016, 12 07). Retrieved from Wikipedia: https://en.wikipedia.org/wiki/Quality_assurance

Sullivan, G. P., Pugh, R., Melendez, A. P., & Hunt, W. D. (2010). *Operations & Maintenance Best Practices - A Guide to Achieving Operational Efficiency, Release 3.0.* Richland: Pacific Northwest National Laboratory.

U.S. Department of Energy. (1993). *DOE-STD-1054-93: Guideline to Good Practicies for Control and Calibration of Measuring and Test Equipment (M&TE) at DOE Nuclear Facilities.* Oak Ridge: Office of Scientific and Technical Information.

What is Digital Media? (2016, 12 07). Retrieved from Microsoft: https://technet.microsoft.com/en-us/library/what-is-digital-media-2(v=ws.11).aspx