Q. **Reference: Application Rev. 1, Volume 1, page 1**

It is stated (lines 5 to 8) "*To balance the provision of reliable service with cost management, Hydro focuses on sound utility asset management practices, condition based investments (versus age based) where appropriate, and the use of operational and system requirements to inform the necessary level of capital investment required*."

a. Does Hydro have a formal asset management plan such as ISO55000?

b. Please provide examples of other jurisdictions that follow similar asset management practices as that currently used at Hydro.

c. What would it cost Hydro to implement a formal asset management plan such as ISO55000?

d. What benefits would Hydro expect as a result of implementation of a formal asset management plan such as ISO55000?

A.

a. Newfoundland and Labrador Hydro ("Hydro") has a formal Asset Management System ("AMS") as outlined in CA-NLH-001, Attachments 1 and 2. The current AMS is not ISO certified and continues to evolve but does align, in part, with ISO 55000.

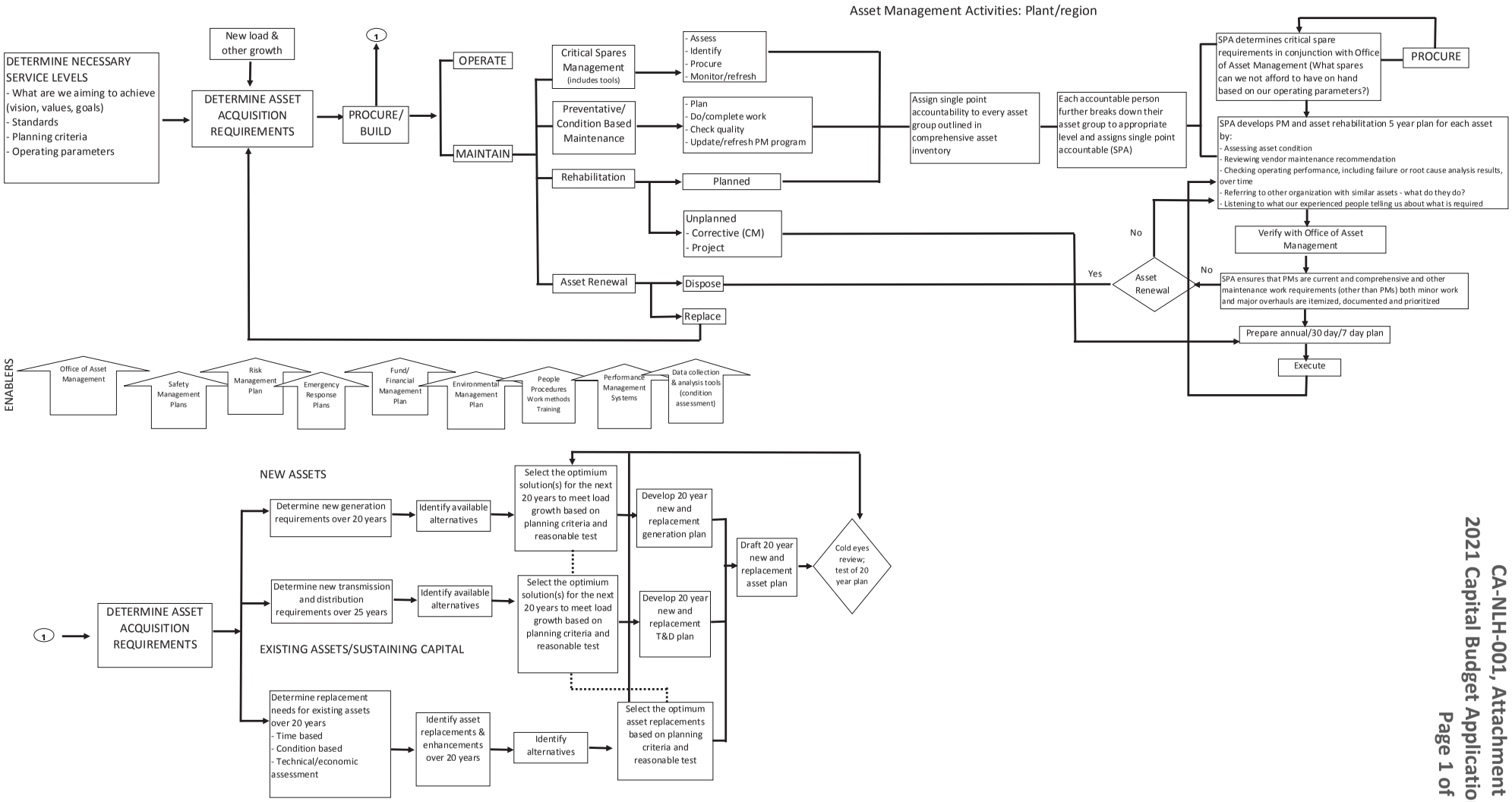
b. Hydro has not completed a jurisdictional scan to identify the similarities of AMS systems used by other utilities.

c. Hydro does not have such information at this time. Until such time as Hydro develops a long-term plan for the development of an ISO 55000-aligned AMS, a preliminary estimate of costs cannot be completed. Hydro expects that the implementation of an ISO 55000-aligned AMS would require material investment.

d. If Hydro were to implement an ISO 55000-aligned AMS, the expected long-term benefits typically associated with such a system include:

- Improved financial performance;
- Better informed asset investment decisions;
- Improved management of asset risks;
- Increased value from assets;
- Increased ability to demonstrate and report compliance; and
- Improved efficiency and effectiveness.

Asset Management Framework



Corporate Policies and Procedures

Policy Title:	Asset Management	**Policy Number:**	PE2
Policy Group:	Project Execution and Technical Services Asset Management Asset Management	**Revision Number:**	1
Policy Number:	PE2	**Date Effective:**	February 12th, 2016
Policy Owner:	Mgr. Engineering & Asset Man.	**Approved Date:**	February 12th, 2016
Created By:	Michelle Edmunds/NLHydro	**Creation Date:**	December 15th, 2015
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		Date of Last Verification:	February 25th, 2016

nalcor energy Corporate Policies and Procedures

Policy Title: Asset Management

Policy Group: Project Execution and Technical Services
Asset Management
Asset Management

Policy Number: PE2

Policy Owner: Mgr. Engineering & Asset Man.

Policy Statement

The capital intensive nature of Nalcor's operations, coupled with high expectations and standards related to safe and reliable operations, require that Nalcor must plan and manage its physical asset base for both optimum performance and maximum useful life. Nalcor is committed to achieving these goals and high standards of operational excellence generally through a comprehensive asset management strategy which incorporates industry leading practices related to the planning, operation, maintenance, and renewal of its physical infrastructure in meeting the required standards of service as they evolve and change over time.

Purpose

The purpose of this policy is to confirm Nalcor's commitment to a comprehensive, best practice asset management strategy and to outline the key components of this strategy and the framework in which the functions of long-term asset planning; critical spares management; short-term planning and scheduling; operations; and work execution are performed.

Guiding Principles

1. Nalcor's operations are highly asset and capital intensive, and managing our physical infrastructure properly for optimum performance and maximum useful life is critical to our success.
2. Our mandate is to provide a highly reliable and cost effective service in our core business of electricity generation, transmission and distribution.
3. Achieving high standards of business excellence is a key enabler of Nalcor's corporate vision and goals as well as our future growth as a diversified and viable energy company.
4. Asset management excellence is enabled by the adoption of best practice processes and structures in a standardized and consistent manner across all areas of Nalcor's operations.
5. The operation of our assets to a high level of reliability and safety is a key factor in protecting our employees, contractors, visitors, and the general public from operational hazards.
6. Nalcor is committed to being an environmental leader and minimizing negative impacts on the environment caused by emissions, spills, and inefficiencies related to asset condition or energy use.

Definitions and Terms

Asset Management: This is the comprehensive management of asset requirements, including planning, procurement, operation, maintenance, rehabilitation, and disposal in order to achieve maximum value for the Company's stakeholders based on the required standard of service to current and future generations. It is a holistic, cradle to grave life cycle view on how Nalcor manages its assets.

Long-term asset plan: This is the 20+ year plan for asset renewal (disposal, replacement), rehabilitation, preventative/condition-based maintenance, and critical spares, and includes the the identification of work for the Company's long-term capital plan.

Short-term plan: This is the one year view for assets (master work plan).

Short Term Scheduling: This refers to asset management work which is scheduled for a seven to 30 day period.

Work: This includes corrective maintenance; preventative maintenance, including any maintenance backlogs, and work performed in support of both capital and operating projects.

Asset Owner: This is the business unit leader who has custody and day-to-day control over an identified group of facility and/or regional assets and who is ultimately accountable for all long term asset planning; short-term planning and work scheduling; operations; and work execution activities which are performed to ensure the optimum performance and useful life of these assets.

Critical Spare: This is a part or asset component that, if unavailable in the event of an asset failure, will prevent a plant or unit from operating at a required level of service, and for which there is no viable alternative.

Scope of Application

This policy applies to all divisions and lines of business within Nalcor Energy.

Standards and Requirements

Components of Nalcor's Asset Management Framework

The flowchart shown in the Supporting and Related Documents Section of this Policy depicts the high level process flow of Nalcor's Asset Management (AM) framework. This diagram identifies the key elements of each of the three main components of this framework, and indicates how these components are integrated into an overall life cycle model for asset management.

A. Basis of Design - Determining Necessary Service Levels

This component is concerned with determining the standards, planning criteria and operating parameters which reflect the required level of quality and service an asset or group of assets are expected to deliver. These are formally documented and centrally maintained.

Standards

1. Outline the expected model for asset design
2. Ensure consistency among similar projects
3. Ensure that all legislative, safety, reliability and other design parameters are documented and available
4. Reflect the appropriate consideration of both Internal standards (e.g., generation planning criteria) and external standards (e.g., CSA, IEEE, ISO 14001, NERC/NPCC)

Planning Criteria

1. These guide the service levels required for new assets and provide an objective test for verifying asset/system compliance
2. Reflect efficiency, reliability, and quality considerations, and sometimes formal probabilistic analysis
3. Will usually differ by asset group

Operating Parameters

1. These include the limits within which the asset can be operated
2. Primarily based on the technical specifications of assets, e.g., nameplate ratings
3. Additional operating parameters may include established levels of reliability or efficiency

B. Asset Acquisition

This involves determining the assets in which the Company will invest for the purpose of procuring new or replacement assets or extending the life of existing assets.

New Assets
These are assets that are required to meet new demand or other growth needs.

Existing Assets/Sustaining Capital
Existing assets are regularly reviewed to ensure that the Company's 20 year plan will continue to provide required and anticipated service levels. Asset replacement or enhancement may be driven by one or more of the following:

- Age and condition of asset
- Condition only
- Technical or economic assessment
- Service expectations or standards for reliability or service duty may have changed

20 Year Planning Horizon
The 20 year plans for both new/replacement assets and sustaining capital are consolidated and subjected to a "cold eyes" review through the Company's capital budget planning process.

C. Operation, Maintenance and Asset Renewal

This involves ongoing operations, maintenance, critical spares management, asset rehabilitation, asset renewal/life extension, and asset disposal. Factors which are key to the Company's success in operationalizing and sustaining its Asset Management Framework on an ongoing basis:

- Comprehensive listing of all assets, constantly updated, and document controlled.
- Single point accountables are assigned for the operation & maintenance of each asset.
- Asset owners and other key Operations personnel understand their respective accountabilities in terms of:

    1. Understanding Nalcor's asset management approach.
    2. Knowing the assets for which they are accountable.
    3. Ensuring each of these assets has a long and short term maintenance plan.
    4. Ensuring these maintenance plans are executed on time and on budget.
    5. Ensuring each asset has an operating plan consistent with Nalcor's basis of design.

- Consistent organizational structure, including common titles.
- Line Operations people understand they are accountable for all elements of full life cycle management, not corporate staff.
- An "Office of Asset management" is in place to ensure consistency of approach and to represent the CEO in stewarding the Company's relentless drive for asset management excellence.

Key Asset Management Functions

This component of Nalcor's Asset Management Framework involves the following four key asset management functions:

1. **Long-Term Asset Planning:** This function is generally focused on "cradle to grave" asset life cycles and the development and continual refresh of 20+ year asset plans that anticipate and plan for future requirements related to asset rehabilitation/overhaul, asset renewal/life extension, asset replacement, and new asset acquisition.
2. **Short Term Planning and Work Scheduling:** The planning required to deliver the work outlined in the annual work plan through seven and 30 day work schedules, and the determination of people, material, and tool and equipment requirements to complete the planned work.
3. **Work Execution**: The safe, environmentally friendly, and effective (quality, cost, schedule) execution of weekly, monthly and annual asset work plans related to both maintenance (preventative and corrective) and project (both capital and operating) work activities.
4. **Operations:** The safe, environmentally friendly, and efficient operation of assets in accordance with the basis of design and established operating parameters.

Process / Procedure

Not applicable.

Responsibilities

Asset Owner

This is the business unit leader who has custody and day-to-day control over an identified group of facility and/or regional assets and who is ultimately accountable for all long term asset planning; short-term planning and work scheduling; operations; and work execution activities which are performed to ensure the optimum performance and useful life of these assets.

Manager, Long Term Asset Planning (LTAP)

This person leads long-term asset planning and critical spares management activities for the business unit, and is accountable for developing and refreshing the 20+ year asset plan addressing asset rehabilitation/overhaul, renewal and replacement. The Manager LTAP drives the development of the annual asset work plan and provides oversight and input into the effectiveness of asset maintenance activities including preventative & predictive maintenance.

Key responsibilities include the following:

1. Developing and continually refreshing 20+ year asset plans that reflect asset rehabilitation/overhauls to major assets and asset renewal requirements – what needs to be replaced, when and with what.
2. Creating/maintaining accurate & complete asset listings/hierarchies with supporting detail, location, history, financial information.
3. Translating the 20 year asset plan into detailed five year and annual asset work plans, and updating as required.
4. Recognizing the dynamic nature of long and short-term asset work plans and the expertise of others, obtaining input from work execution and operations functions when developing/refreshing long-term, five year and annual asset work plans.
5. Participating in technical councils and using councils to test long-term plans, and promoting their role in operational trouble-shooting.
6. Developing a high-level implementation strategy including financial leveling and resource planning for each year of the LTAP.
7. Driving the development of 20 year capital plan inputs for assets.
8. Checking/ensuring alignment with corporate long-term asset planning practices led by the Office of Asset Management.
9. Ensuring project scopes, estimates and quality are acceptable.
10. Identifying and monitoring asset reliability/service level requirements.
11. Developing and monitoring asset performance metrics and developing/ executing actions to address performance issues.
12. Completing root cause failure analyses and remedial action plans.
13. Completing risk assessments and reliability monitoring.
14. Developing, monitoring and continuously improving preventative and predictive maintenance programs.
15. Developing and implementing condition assessment tools and monitoring techniques, incorporating results into planning activities.
16. Monitoring and incorporating industry and technology trends impacting long-term asset plan.
17. Using the critical spares framework established by the Office of Asset Management to identify critical equipment/tools spares based on criteria which include acceptable downtime/service levels; impact to reliability; delivery time; failure history; and repair duration.
18. Determining stock quantities, lead times, and optimum inventory levels.
19. Initiating the procurement of critical spares and ensuring correct equipment is specified, ordered and received.
20. Developing necessary inspection/review/maintenance/location requirements on critical equipment, tools and spares to ensure readiness in the event of component failure, including monitoring OEM supplier support and equipment/tools availability.

<u>Supervisor, Short Term Planning and Work Scheduling</u>

This person leads the planning required to deliver the work outlined in the annual work plan by developing seven and 30 day work schedules. He/she determines resource, material, and tool and equipment requirements to complete the planned work and generates work orders and other documentation to support work execution.

Key responsibilities include the following:

1. Managing and updating the detailed annual asset work plan. Scope includes preventative maintenance; predictive maintenance; quality assurance activities; asset overhauls; asset replacements and project work (capital and operating) based on the long-term plan.
2. Recognizing the dynamic nature of long and short-term asset work plans and the expertise of others, providing input to the long-term planning function
   (developing/refreshing long-term, five year and annual asset work plans), and determining the resource, materials, tools and equipment requirements for
   the annual asset work plan.
3. Coordinating the timing of asset work plan in a manner consistent with the master outage schedule.
4. Developing seven 7 and 30 day work schedules.
5. Reviewing resource allocations to ensure the resources support the completion of scheduled work.
6. Coordinating work execution schedules with Operations.
7. Preparing work orders that are ready to implement in terms of people, equipment, tools and materials.
8. Generating performance metrics to assess the effectiveness of work planning.

Manager, Work Execution

This person is focused on the on the safe, environmentally friendly, and effective (quality, cost, schedule) execution of weekly, monthly and annual asset work plans. This includes the execution of both maintenance (preventative and corrective) and project (both capital and operating) work activities. Key responsibilities include the following:

1. Managing trades, tools and equipment resources required for work completion.
2. Integrating capital and operating project work including resource provisioning and associated commissioning coordination.
3. Prioritizing work and monitoring actual work completed against schedule, and taking recovery action when necessary.
4. Supervising frontline workers.
5. Maintaining cost control over maintenance budgets.
6. Monitoring maintenance execution productivity and effectiveness and monitoring and reporting on work execution metrics.
7. Managing and overseeing the renewal of major contracts for equipment overhauls and minor service contracts.
8. Maintaining effective record keeping (work order history and other work execution related documentation).
9. Recognizing the dynamic nature of long and short-term asset work plans and the expertise of others, providing input to the long-term planning function in relation to the development and refreshing of long-term, five year, and annual asset work plans.

Manager, Operations

This person leads the safe, environmentally friendly, and efficient operation of assets in accordance with the basis of design and established operating parameters. Key responsibilities include the following:

1. Monitoring asset performance for proper operation to minimize the potential for asset failure or reduced reliability.
2. Monitoring asset efficiency and performance and adjusting operations as required.
3. Leading/providing input for outage management with particular attention to customer requirements.
4. Administering the Company's Work Protection Code.
5. Collecting and maintaining appropriate operating (condition) data for technical analysis and other uses.
6. Maintaining effective relationships with customers.
7. Developing/maintaining operating procedures, drawings and other documentation.
8. Recognizing the dynamic nature of long and short-term asset work plans and the expertise of others, providing input to the long-term planning function related to the development and refresh of long-term, five year, and annual asset work plans.

Office of Asset Management

The Manager of Engineering and Asset Management is the Company's champion of asset management excellence throughout the organization. This person supports and coordinates the successful use of asset management principles and practices to realize Nalcor's commitment to business excellence.

Key responsibilities include:

1. Ensuring framework alignment in all areas throughout Nalcor through training and monitoring and/or audit, and ensuring that the Company's AM strategy is effectively translated into plans and actions for the various asset groups.
2. Testing and adapting the Company's AM framework and supporting organizational structure as necessary to address evolving requirements and organizational changes.
3. Coordinating organization-wide capital planning activities to ensure excellence and consistency.
4. Working with leadership to ensure that service standards and operating parameters are established and documented.
5. Coordinating internal and external skills/resources to address significant maintenance and operational issues.
6. Maintaining an "experts" list including internal subject matter experts, external consultants and company retirees.
7. Coordinating/facilitating internal "councils" to share best practices within identified operational areas.
8. Collecting, organizing and electronically documenting all pertinent corporate documentation related to Asset Management, and maintaining effective change
   management control over process documentation.
9. Driving consistent approaches to the implementation of asset management practices.
10. Ensuring that asset listings are documented and appropriately broken down to ensure a consistent level of detail across all asset areas.
11. Working with leadership and Operations management to ensure that the Company's organizational structure continues to ensure that asset management accountabilities are clear and are executed in a manner consistent with the Company's AM

framework.

Supporting and Related Documents

Process Flow Diagram – Nalcor's Asset Management Framework

Asset Management and Project Execution at Nalcor Energy (Powerpoint Presentation, March 2010)