Canada Energy Regulator | Régie de l'énergie du Canada

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File OF-Surv-OpAud-E101-2019-2020-01
11 March 2020

Mr. Guy Jarvis
President, Liquid Pipelines
Accountable Officer under the NEB Act
Enbridge Pipelines Inc.
3000 Fifth Avenue Place
425 – 1st Street S.W.
Calgary, AB T2B 3L8
Email: [redacted]

Dear Mr. Jarvis:

Canada Energy Regulator (CER) Final Audit Report
Enbridge Pipelines Inc. (Enbridge) – Control Room Management

Please find attached a copy of the Final Audit Report for the audit of Enbridge's Control Room Management conducted during the period from 7 June 2019 to 12 September 2019. The audit was initially conducted by the National Energy Board (NEB or the Board) in accordance with subsection 49(3), of the *National Energy Board Act* (NEB Act).

During the period of these audit activities, the federal government's *Bill C-69* came into force. On 28 August 2019, the NEB Act was replaced by the *Canadian Energy Regulator Act* (CER Act). The results of the transition are considered minimal to the substance of this compliance verification activity. The Board was replaced by the Commission of the Canada Energy Regulator (Commission) and NEB staff became staff of the CER. The audit was continued by the CER and its staff under the authority of subsection 103(3) of the CER Act. The wording of this audit report reflects the NEB to CER transition. More details regarding the transition and its effects are found on the CER website.

On 28 November 2019, the CER sent Enbridge the Draft Audit Report documenting the evaluation of Enbridge's Control Room Management for review and comment. Enbridge submitted its response on 23 December 2019. The CER has considered Enbridge's comments and has made changes to the Final Audit Report, where appropriate. The CER has now finalized its audit report and has attached it and its various appendices to this letter.

Corrective and Preventive Action (CAPA) Plan

Enbridge is ordered to file, with the Secretary of the Commission, a CAPA Plan for approval within 30 calendar days of receipt of this Final Audit Report which describes the methods, timing and rationale for addressing the Non-Compliant finding identified in the audit report.

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The CER will post the Final Audit Report and the approved CAPA Plan on its website. Prior to publishing the report or CAPA Plan, Enbridge will be offered an opportunity to review any documents intended to be posted and request redactions based on the *Access to Information Act and Privacy Act*.

The CER will monitor and assess Enbridge's corrective and preventive actions until they are fully implemented. Additionally, it is ordered that, where applicable, the approved CAPA Plan requirements will be implemented on a system-wide basis to address similar deficiencies. In addition, the CER will continue to monitor the implementation and effectiveness of Enbridge's management system and programs through targeted compliance verification activities as a part of its on-going regulatory approaches to oversee the Project's construction and operation.

If you require any further information or clarification, please contact Mark Tinney, Lead Auditor, Systems Operations Business Unit at 403-966-1065 or at 1-800-899-1265 toll free.

Yours sincerely,

Mark Tinney
Lead Auditor
Inspection Officer Number: 2777

Attachment

c.c. [redacted], Director, Regulatory Affairs
Email: [redacted]

[redacted], Manager Regulatory Affairs
Email: [redacted]

Canada Energy Regulator | Régie de l'énergie du Canada

Suite 210, 517 Tenth Avenue SW
Calgary, Alberta
T2R 0A8

Final Audit Report
Audit of Control Room Management

Compliance Verification Activity: CV1920 - 400
File: OF-Surv-OpAud-E101-2019-2020-01

Enbridge Pipelines Inc.
Suite 200, 425 1 Street SW
Calgary, AB T2P 3L8

Date: 11 March 2020

Canada

Executive Summary

In accordance with subsection 49(3) of the *National Energy Board Act* (NEB Act), the National Energy Board (NEB) began a compliance audit of Enbridge Pipelines Incorporated's (Enbridge) control room management (the audit) on 7 June 2019.

On 28 August 2019, through the coming into force of *Bill C-69*, the NEB Act was replaced by the *Canadian Energy Regulator Act* (CER Act), and the NEB was replaced by the Canada Energy Regulator (CER). NEB audit staff became CER audit staff, who continued the audit under the authority of subsection 103(3) of the CER Act, until its completion on 12 September 2019.

The objectives of the audit were to verify that Enbridge had developed and implemented a pipeline control system and leak detection system in accordance with the requirements of the *National Energy Board Onshore Pipeline Regulations* (SOR/99-294) (OPR) and the *CSA Z662 Oil and Gas Pipeline Systems* standard (CSA Z662), and to verify that control system operation and maintenance processes are effectively integrated within the company's management system.

The scope of the audit included the personnel, processes, and activities used to operate and control the liquid pipeline control system and leak detection system. The scope applied to normal and abnormal operating conditions, including emergency shut down in place at the time of the audit and looking back for up to six months to verify that they were compliant with relevant sections of the OPR and CSA Z662.

The CER conducted the audit using the audit protocols, attached in Appendix 1 of this report, which are focused on control room management. The CER has assessed whether Enbridge's documentation, processes, and activities complied with legal and other requirements under the CER's authority listed below.

- The *Canadian Energy Regulator Act* (CER Act);
- The *National Energy Board Onshore Pipeline Regulations* (SOR/99-294) (OPR); and
- Any conditions contained within applicable certificates or orders issued by the CER.

Of the twenty-one (21) regulatory requirements listed in the audit protocol, the CER found no issues of concern with twenty (20), and found Enbridge to be non-compliant with one (1). The non-compliance is related to the fact that Enbridge was unable to demonstrate that it had conducted a pipeline control system audit with a maximum interval of three years in accordance with section 55 of the OPR. This is a repeat finding from a previous audit of Enbridge conducted during the 2014/2015 timeframe. Findings from the current audit are summarized in Table 1 and explained in detail in Appendix 1 of this report.

With respect to the identified non-compliance, based on interviews with Enbridge staff and a review of the information provided by the company, the CER is of the view that the non-compliant finding does not result in imminent or immediate safety or environmental protection issues.

Enbridge is ordered to file, with the Secretary of the Commission, a Corrective and Preventative Action (CAPA) Plan for approval which describes the methods and timing for addressing the non-compliance identified through this audit. The CAPA shall be filed within 30 days of this Final Audit Report being issued.

The CER will assess the implementation of Enbridge's CAPA to confirm compliance. The CER will continue to monitor the overall implementation and effectiveness of Enbridge's management system through targeted compliance verification activities as a part of its ongoing regulatory mandate.

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1.0 Introduction

In accordance with subsection 49(3) of the *National Energy Board Act* (NEB Act), the National Energy Board (NEB) began a compliance audit of Enbridge Pipeline Incorporated's (Enbridge) control room management (the audit) on 7 June 2019.

On 28 August 2019, through the coming into force of *Bill C-69*, the NEB Act was replaced by the *Canadian Energy Regulator Act* (CER Act), and the NEB was replaced by the Canada Energy Regulator (CER). NEB audit staff became CER audit staff, who continued the audit under the authority of subsection 103(3) of the CER Act, until its completion on 12 September 2019.

CER audit staff applied the audit protocol listed in Appendix 1 of this report. Abbreviations and terminology used in the report can be found in Appendix 3.

1.1 Audit Objectives

The objectives of the audit were:

- to verify that Enbridge had developed and implemented a pipeline control system and leak detection system in accordance with the requirements of the *National Energy Board Onshore Pipeline Regulations* (SOR/99-294) (OPR) and the *CSA Z662 Oil and Gas Pipeline Systems* standard (CSA Z662), and
- to verify that control system operation and maintenance processes were effectively integrated within the company's management system.

1.2 Audit Scope and Methodology

The scope of the audit included the personnel, processes and activities used to operate and control the liquid pipeline (LP) control system and leak detection system. The scope applied to normal and abnormal operating conditions, including emergency shut down, as in place at the time of the audit and looking back for up to six months, to verify that they were compliant with relevant sections of the OPR and CSA Z662.

To evaluate Enbridge's compliance, CER audit staff reviewed a sample of Enbridge's documents and records, visited the liquid pipeline primary and backup control rooms and conducted interviews with company personnel.

An audit notification letter was sent to Enbridge on 7 June 2019 advising Enbridge of the Board's plans to conduct the audit and detailing the audit's objectives and scope. The Lead Auditor provided the audit protocol and initial information request (IR) to Enbridge on 18 June 2019 and followed up on 21 June 2019 with an on-site meeting with Enbridge staff at Enbridge's offices in Edmonton to discuss the plans and schedule for the audit.

Document review began on 24 July 2019 and on-site interviews were conducted during the period 12 - 16 August 2019. CER audit staff visited the Enbridge LP Main Control Room and Back-up Control Room and also witnessed a shift changeover between incoming and outgoing Shift Supervisors; Senior Technical Advisors (STA); and Control Room Operators (CRO).

CER audit staff shared a pre-closeout summary of the results of the audit with Enbridge on 23 August 2019, which identified compliance gaps. At that time, Enbridge was given a week to provide any additional documents or records to help resolve the identified gaps in information or compliance. Subsequent to the pre-closeout meeting, Enbridge provided additional information to assist the CER audit staff in making their final assessment of compliance. CER audit staff conducted a final closeout meeting with Enbridge on 12 September 2019.

2.0 Facility and Process Description

Enbridge Pipelines Incorporated is a subsidiary of Enbridge Incorporated with the head office for its Canadian operations in Calgary. Enbridge operates liquid and natural gas pipeline systems across Canada and the United States. As part of those systems, Enbridge operates separate control systems for the liquid and natural gas pipelines. For the purposes of this audit, the CER focused on the management of the liquid pipeline control room, including the pipeline control system and the leak detection system. The liquid pipelines that are regulated by the CER are shown in Appendix 2.

Enbridge's corporate management structure and Management System Framework describe the minimum requirements each business unit must have in its Integrated Management System (IMS). The LP Integrated Management System Document (IMSD describes the purpose and structure of the LP IMS, and references standards, processes and procedures applicable to its management programs. Under the umbrella of the IMSD, Enbridge not only manages the six programs required by section 55 of the OPR, but also governs a number of business programs, which includes one titled Operate and Maintain Management Program. The Operate and Maintain Management Program provides a framework for operational activities including pipeline control of the LP system.

Enbridge has primary and backup control rooms for the operation and control of the CER-regulated liquid pipelines.

The primary control room consists of 49 consoles operated by the control room staff; 48 are managed by CROs, STAs, and Shift Supervisors, and one allocated to the on-shift Leak Detection Analyst (LDA). Some of the consoles are for the operation and control of pipelines, whereas others are for the operation and control of terminals. There are 15 CER-regulated lines operated by the console operators.

Of the various pipeline control consoles within the control room, some are used to operate and control assets regulated only by the CER; others operate assets regulated only by the American Pipeline and Hazardous Materials Safety Administration (PHMSA) or provincially regulated assets; while the remainder control assets that are regulated by both the CER and PHMSA. Regardless of the control console, they are all operated using identical procedures; the company does not have one set of procedures for CER-regulated assets and another set for PHMSA or provincially regulated assets.

Work shifts are 12 hours in duration and are organized such that employees work two to four nights in a row before having time off and then switching to the day shift. The schedule is arranged so that no employee is allowed to work more than four nights in a row.

To combat fatigue, the company has a number of policies, processes and facilities to keep workers as alert as possible.

The company conducts cross training of its operators so that one operator can be qualified to operate and control the assets of up to three different pipeline consoles. This ensures that the company has greater flexibility within its workforce to account for issues such as illness, vacation, or occasions when a console operator becomes busy and requires another operator to assist. The STAs and the Shift Supervisors are individuals who were once CROs themselves and have been promoted to their positions as a result of their demonstrated skills and knowledge. As such, they are able to step in to assist when necessary.

The company conducts quarterly exercises in switching its operations between the primary and backup control rooms. The exercises are conducted in an organized fashion so that the pipeline control system remains operational and nothing has to be shut down. However, in a real scenario, it is possible that the pipeline would have to be shut down from the primary control room and then restarted once the operators take up their positions in the backup control room. The quarterly exercises are organized to ensure that every Shift Supervisor, STA, LDA and CRO goes through the procedure at least once per year.

Enbridge is currently in the process of switching over to a new supervisory control and data acquisition (SCADA) system. Part of the conversion activities involves the use of a "paired desk" process. In this process, the "new" system is loaded onto two paired consoles. Then, the operators go through a two-month process of training and operating the new system while continuing to operate the old system. At the end of the two month process, the operators are switched over to the new system. The company estimates that it will take a number of years to switch all of its consoles over to the new system.

3.0 Assessment of Compliance

3.1 General

The OPR requires companies to develop and implement a pipeline control system and a leak detection system as part of the companies' management systems. Carefully designed and well-implemented management systems are a reflection of companies' commitments to continual improvement in safety and environmental protection throughout the full life-cycle of facilities. They also support a culture of safety and are fundamental to keeping people safe and protecting the environment. The control systems and leak detection systems must also meet the requirements of CSA Z662 and reflect the level of complexity of the pipeline, the pipeline operation, and the products transported.

For the purposes of this audit, the CER's expectations included, but were not limited to, Enbridge having established and implemented:

- an effective organizational structure, competency and training requirements, and training programs and processes to identify and communicate roles, responsibilities, and authorities, and to verify the competency of workers;
- control room operation and maintenance manuals designed to ensure that the pipeline is operated safely, efficiently, and in a manner that protects people and the environment;

- a process for the internal reporting, analysis, and investigation of hazards, potential hazards, incidents, and near-misses reported through the control centre, and for taking corrective and preventive measures, including measures to manage imminent threats; and
- quality assurance measures, including audits and inspections, to ensure that the pipeline control system is being effectively operated and maintained and that personnel are carrying out their duties in accordance with company requirements in a competent manner.

Each company and their management systems are required to comply with all applicable requirements of the CER Act, its applicable regulations, standards referenced in the regulations, such as the CSA Z662, and any company-specific Orders and Certificates.

Section 6.1 of the OPR requires a company regulated by the CER to establish and implement a management system that:

- is systematic, explicit, comprehensive and proactive;
- integrates the company's operational activities and technical systems with its management of human and financial resources to enable the company to meet its obligations under the OPR section 6;
- applies to all of the company's activities involving the design, construction, operation, or abandonment of a pipeline, and to the programs referred to in the OPR section 55;
- ensures coordination between the programs referred to in the OPR section 55; and
- corresponds to the size of the company, to the scope, nature, and complexity of its activities, and to the hazards and risks associated with those activities.

3.2 Assessment of Enbridge's Regulated Facilities

The CER audit staff's assessment of Enbridge's compliance with the regulatory requirements are summarized in Table 1 of this report and explained in detail in Appendix 1 attached to this report. The CER audit staff identified no issues of concern with twenty (20) of the protocol items and found Enbridge to be non-compliant with one (1) of the regulatory requirements evaluated as part of this audit. The non-compliance is related to the fact that Enbridge was unable to demonstrate that it had conducted a pipeline control system audit with a maximum interval of three years in accordance with section 55 of the OPR. This was a repeat finding from a previous Enbridge audit conducted in fiscal year 2014/2015. For more detailed information on this issue, please refer to the Assessment of **AP-18: Control Room audits** in Appendix 1.

3.3 List of Audit Findings

The CER could assign one of two possible types of findings to each audit protocol item evaluated:

1. No Issues Noted – *No non-compliances were identified during the audit based on the information provided and reviewed within the context of the scope of the audit; or*

2. Non-compliant – *An evaluated regulatory requirement does not meet legal requirements. The company has not demonstrated that it has developed and implemented programs, processes and procedures that meet the legal requirements. A corrective and preventative action plan must be developed and implemented.*

Below is a table that provides a generalized description of the CER's audit findings. They correspond to the Appendix 1 Audit Assessment Tables that provide more information regarding the review and substance of each finding.

Table 1: Summary of Findings

Audit Protocol Item	Regulatory Reference	Protocol Topic	Status	Summary of Finding
AP-01	**OPR s. 6.3(1)**	**Policy and Commitment Statements**	No Issues Noted	Enbridge demonstrated that it has the required policy and commitment statements.
AP-02	**OPR s. 6.5(1)(d)**	**Hazard Identification**	No Issues Noted	Enbridge demonstrated that it is identifying hazards associated with control centre operations.
AP-03	**OPR s. 6.5(1)e**	**Risk Assessment**	No Issues Noted	Enbridge demonstrated that it assesses the risks associated with the identified hazards.
AP-04	**OPR s. 6.5(1)(f)**	**Controls**	No Issues Noted	Enbridge demonstrated that it has developed suitable controls to manage the risks with the identified hazards.
AP-05	**OPR s. 6.5(1)(a)**	**Goals, Targets and Objectives**	No Issues Noted	Enbridge demonstrated that it has objectives and targets for its control centre operations designed to work towards the achievement of the company's goals.
AP-06	**OPR s. 6.4**	**Organizational Structure, Roles and Responsibilities**	No Issues Noted	Enbridge demonstrated that it has an adequate organizational structure to manage the control centre and that it has defined the roles and responsibilities for each position.
AP-07	**OPR s. 6.5(1)(q)**	**Operational Control**	No Issues Noted	Enbridge demonstrated that it has established and implemented a process for coordinating and controlling the operational activities of the control room.

Audit Protocol Item	Regulatory Reference	Protocol Topic	Status	Summary of Finding
AP-08	**OPR s. 27**	**Operating & Maintenance Manuals**	No Issues Noted	Enbridge demonstrated that it has developed, regularly reviews and updates as required, control room operations and maintenance manuals.
AP-09	**OPR s. 37(c)**	**Pipeline Control System and Leak Detection System**	No Issues Noted	Enbridge demonstrated that it has developed and implemented a pipeline control system that includes a leak detection system, although due to the scope of the audit and the protocol used, the audit staff did not assess the control system against all of the requirements of CSA Z662.
AP-10	**OPR s. 37(b)**	**Pipeline Control System Data Recording System**	No Issues Noted	Enbridge demonstrated that it has developed and implemented a pipeline control system that records historical pipeline operation data, messages and alarms for recall.
AP-11	**OPR s. 6.5(1)r**	**Investigation of Incidents, Near Misses and Non-compliances**	No Issues Noted	Enbridge demonstrated that, within the scope and objectives of this audit, it has established and implemented a process for the internal reporting of hazards, potential hazards, incidents, and near-misses related to the operation of the pipeline and for taking corrective and preventative actions.
AP-12	**OPR s. 32(1.1)**	**Emergency Procedures Manual**	No Issues Noted	Enbridge demonstrated that it has developed, regularly reviews and updates as required an emergency procedures manual to respond to control room emergencies.
AP-13	**CSA Z662-15 – Clause E.4.3.2**	**Analysis of Leak Alarms**	No Issues Noted	Enbridge demonstrated that it analyzes all leak alarms to determine the cause.
AP-14	**CSA Z662-15 Clause 10.5.2.1**	**Safe Shut Down of Pipeline in an Emergency**	No Issues Noted	Enbridge demonstrated that it has established emergency procedures for the safe control or shutdown of the

Audit Protocol Item	Regulatory Reference	Protocol Topic	Status	Summary of Finding
				pipeline system in the event of an emergency
AP-15	**OPR s. 6.5(1)(j)**	**Training, Competence and Evaluation**	No Issues Noted	Enbridge demonstrated that it has established competency criteria and training programs for pipeline controllers.
AP-16	**OPR s. 6.5(1)(k)**	**Training, Competence and Evaluation**	No Issues Noted	Enbridge demonstrated that it has established and implemented a process for verifying that control room personnel are trained and competent and for supervising them to ensure they perform their duties in a manner that is safe, ensures the security of the pipeline and protects the environment.
AP-17	**OPR s. 56 (b)**	**Annual Training Report**	No Issues Noted	Enbridge demonstrated that it annually compares the actual training received by control centre staff with the planned training and conveys this information to Senior Management. However, given the scope of the audit the audit staff did not verify that an annual training report is generated at the corporate level.
AP-18	**OPR s. 55(1)(2)**	**Control Room audits**	Non-Compliant	While Enbridge demonstrated that it conducted an audit of its control room, the audit did not meet the regulatory requirements of the OPR paragraph 55(1)(b) in that it did not evaluate control centre processes for compliance with the OPR. Furthermore, Enbridge was unable to demonstrate that control room audits are being conducted with a maximum interval of three years. This is a repeat non-compliant finding from a previous audit of Enbridge conducted by the NEB during the 2014/2015 timeframe

Audit Protocol Item	Regulatory Reference	Protocol Topic	Status	Summary of Finding
AP-19	**CSA Z662-15 Clause E.8.4**	**Leak Detection System – audits of Special Incidents**	No Issues Noted	Enbridge demonstrated that it conducts assessments of the leak detection system to evaluate incidents as required by CSA Z662-15 Clause E.8.4.
AP-20	**OPR s. 6.5(1)(x)**	**Annual Management Review**	No Issues Noted	Enbridge demonstrated that it has a process for conducting an annual management review of its control room operations and for ensuring continual improvement.
AP-21	**OPR s. 37(a)**	**Supervisory Control and Data Acquisition (SCADA) design, maintenance and operational functions**	No Issues Noted	Enbridge demonstrated that it has developed and implemented a pipeline control system that comprises the facilities and procedures used to control and monitor the operation of the pipeline.

4.0 Conclusion

Within the scope of this audit, the CER audit staff found that Enbridge was operating its liquid pipeline control and leak detection systems in a manner that protects the safety of its employees and the public and protects the environment. Enbridge was able to demonstrate that its liquid pipeline control centre's operations are integrated within the company's management system.

Enbridge demonstrated that, within the scope of the audit, it had established and implemented:

- an effective organizational structure, competency and training requirements, and training programs and processes to identify and communicate roles, responsibilities, and authorities, and to verify the competency of workers;
- control room operation and maintenance manuals designed to ensure that the pipeline is operated safely, efficiently, and in a manner that protects people and the environment;
- a process for the internal reporting, analysis, and investigation of hazards, potential hazards, incidents, and near-misses reported through the control centre, and for taking corrective and preventive measures, including measures to manage imminent threats; and

- quality assurance measures, such as inspections and assessments, to ensure that the pipeline control system and leak detection system are being effectively operated and maintained and that personnel are carrying out their duties in accordance with company requirements in a competent manner.

However, the CER audit staff found that Enbridge was not conducting audits as per OPR section 55. This Non-Compliant finding related to the frequency and level of detail required of the pipeline control system audits. This was a repeat finding from a previous Enbridge audit conducted in fiscal year 2014/2015.

The CER requires Enbridge to address the deficiency identified during this audit. Therefore, Enbridge is ordered to develop and submit, to the Secretary of the Commission, a Corrective and Preventative Action (CAPA) Plan to address the CER's finding detailed in Appendix I. The CAPA Plan must describe the company's analysis of its deficiencies and proposed methods and timeframe(s) to resolve it. Enbridge is ordered to submit the CAPA Plan for approval within 30 days of this Final Audit Report being issued by the CER.

The CER will assess the implementation of Enbridge's CAPA Plan to confirm it is fully implemented in a timely manner.

The CER will make its Final Audit Report and the Enbridge approved CAPA Plan public on the CER's website.

Appendix 1.0 - Audit Assessment Tables

AP-01: Policy and Commitment Statements

Regulatory Requirement: **OPR s. 6.3(1)** The company shall establish documented policies and goals for meeting its obligations under section 6, including (b) goals for the prevention of ruptures, liquid and gas releases, fatalities and injuries and for the response to incidents and emergency situations.
Expected Outcome: The company is able to demonstrate that it has established documented policies and goals for the prevention of ruptures, liquid and gas releases, fatalities and injuries and for the response to incidents and emergency situations.
Summary of Information Made Available by Enbridge: To demonstrate compliance with this requirement, Enbridge supplied the CER audit staff with: • Integrated Management System Document • Liquid Pipelines Strategic and Business Planning Process • LP Safety and Reliability Commitment Statement • Policy – Emergency Management • Policy – Environmental • Policy – Health and Safety- • Policy – Integrity Management • Email link to Safety and Reliability Policy
Assessment: The CER audit staff reviewed the documents supplied by Enbridge with its policies and goals as written in section 1.5 of the company's Integrated Management System Document (IMSD), which are*:* • the prevention of ruptures and liquid release; • the prevention of fatalities and injuries; • the response to incidents and emergency situation; and • other goals deemed appropriate for liquid pipelines (LP) by Executive Management. From the high-level Integrated Management System (IMS) goals, each management program area has developed its own policies and goals. The goal of the Operate and Maintain Management Program is to *"receive, store, transport and deliver product safely, reliably and efficiently"*. Specific objectives and targets for the Operate and Maintain Management Program to achieve these goals are reviewed or established each year through the Liquid Pipelines Strategic and Business Planning Process.

The Enbridge Integrity Management Program Policy states that the company is committed to the safe operation of its pipeline system, and to continuously improving pipeline system reliability with the goal of achieving zero failures. This policy establishes commitments for the operation of the pipeline system to ensure the safety of the public, employees, and protection of the environment. It states that Enbridge will:

- Utilize leading industry standards and practices for the design, construction, commissioning, testing and inspection, operation, maintenance, and discontinuance/ retirement of the pipeline system.
- Execute a comprehensive pipeline integrity management program designed to eliminate all significant pipeline releases and continuously reduce low impact leaks by ensuring effective monitoring, evaluation, and mitigation of all hazards to process piping, equipment, and protective devices.
- Implement a comprehensive right-of-way monitoring and stakeholder awareness program to prevent damage to the pipeline system.
- Implement a control system to anticipate, detect, and mitigate pipeline and facility incidents during operation.
- Use pipeline reliability metrics and lessons learned from incident investigation analyses to improve the tools, processes, and methods used to manage pipeline system safety.
- Ensure operation and maintenance procedures are comprehensive, maintained, used, and reviewed to achieve safety, and reliability.
- Ensure accurate and reliable documentation of pipeline assets is maintained and updated to reflect current conditions.

Enbridge has related policies and goals for its other program areas.

As mentioned above, the specific objectives and targets for liquid pipelines to work towards Enbridge's higher level goals are reviewed or established each year through the Liquid Pipelines Strategic and Business Planning Process. Progress towards achieving the objectives and targets are maintained in the LP Scorecard and Executive Management Team (EMT) Dashboard. Scorecard and EMT Dashboard performance is monitored, reviewed and reported at minimum on a quarterly basis.

Through the documents and records made available to the CER audit staff and through interviews, Enbridge was able to demonstrate that it has established documented policies and goals for the prevention of ruptures, liquid and gas releases, fatalities and injuries and for the response to incidents and emergency situations.

Finding: No issues noted.

Based on the information made available by Enbridge and reviewed by the CER audit staff within the scope of this audit, no non-compliances relating to this protocol item were identified during the audit.

AP-02: Hazard Identification

Regulatory Requirement:

OPR s. 6.5(1) A company shall, as part of its management system and the programs referred to in section 55,

OPR s. 6.5(1)(d) establish and maintain an inventory of the identified hazards and potential hazards.

Expected Outcomes: The company is able to demonstrate that it has identified the hazards and potential hazards associated with the pipeline control room and has included them in the inventory. Specific areas for demonstration related to this protocol question include:

- the company has a compliant inventory that is established and maintained;
- the inventory includes hazards and potential hazards associated within the company scope of operations and activities through the lifecycle of the pipelines;
- hazards and potential hazards are identified for the control room;
- the inventory has been maintained, it is current, and is up-to-date including changes made to company operations and activities; and
- the inventory is being used as part of the risk evaluation and controls processes.

Summary of Information Made Available by Enbridge:

To demonstrate compliance with this requirement, Enbridge supplied the CER audit staff with the following documents:

- Inventory of Hazard and Potential Hazard Categories Version 5.1
- Hazard Identification Process, Version 1.1
- Risk Assessment Tools and Methodologies Version 1.1
- Hazard and Risk Management Process Version 2.0
- Risk Register Process Version 2.1
- Control Room Management Plan.

Assessment:

Hazards for the control room are identified in the Inventory of Hazard and Potential Hazard Categories. Hazards and potential hazards applicable to the control room are identified in the "Owner" column of Inventory of Hazard & Potential Hazard - Control Centre Operations (CCO). The version of the inventory that the company supplied was V5.1, dated 30 May 2019 superseding the version V5.0, dated 11 May 2016.

The CER audit staff also interviewed Enbridge staff regarding its hazard identification process. Through the documents made available for review and the responses provided during interviews, Enbridge was able to demonstrate that it has an established and maintained inventory of the identified hazards and potential hazards.

Regulatory Requirement:

OPR s. 6.5(1) A company shall, as part of its management system and the programs referred to in section 55,

OPR s. 6.5(1)(d) establish and maintain an inventory of the identified hazards and potential hazards.

Finding: No Issues Noted.

Based on the information made available by Enbridge and reviewed by CER audit staff within the scope of this audit, no non-compliances relating to this protocol item were identified during the audit.

AP-03: Risk Assessment

Regulatory Requirement:

OPR s. 6.5(1) A company shall, as part of its management system and the programs referred to in section 55,

OPR s. 6.5(1)(e) establish and implement a process for evaluating and managing the risks associated with the identified hazards, including the risks related to normal and abnormal conditions.

Expected Outcome: The company is able to demonstrate that they have evaluated and are managing the risks of the identified hazards associated with running an effective control room, including the risks related to normal and abnormal conditions. Specific areas for demonstration related to this protocol question include:

- the company has a compliant process for evaluating and managing risks that is established and implemented;
- the method(s) for risk evaluation and managing the risks are based on referenced regulatory standards and are appropriate for the nature, scope, scale, and complexity of the company's operations, activities, and s.55 programs ;
- risk is evaluated for all hazards and potential hazards and includes normal and abnormal conditions;
- risk levels are monitored on a periodic basis as-needed, and re-evaluated for changing circumstances;
- risk is managed using defined method(s) appropriate to the s.55 programs; and
- risk acceptance criteria is determined for all hazards and potential hazards.

Summary of Information Made Available by Enbridge:

Enbridge supplied the CER audit staff with documentation used for the liquid pipelines risk assessment process including its:

- Hazard and Risk Management Process
- Risk Evaluation Process
- Hazard Identification Process
- Risk Analysis Process
- Risk Assessment Tools and Methodologies
- Risk Treatment Process
- Risk Register Process
- LP Risk Matrix
- CCO-HRR_10 July 2019
- Operate and Maintain Management Program
- CCO Quality Management System QMS Procedures Manual
- CCO Management of Change Process
- PHA Worksheet – Rupture Detection
- Change Bulletin – Change Implementation Checklist (CIC) Tool
- MOC Presentation

- [AOP] Thermal Pressure High Warning Alarm Procedure
- [AOP] Sectionalizing Valves – Command Failure – Pipeline Procedure
- [AOP] Unexplained Tank Movement or Imbalance – Terminal Procedure
- [EOP] Reported Emergency Procedure
- [EOP] Overpressure – Suspected or Confirmed – Pipeline Procedure
- [EOP] Leak – Confirmed – Pipeline Procedure
- [EOP] Rupture Detection Alarm – Pipeline Procedure
- Framework Standard – Risk Management
- Contingency Plan Development
- Integrated Contingency Plan Eastern Region
- Hazard and Risk Management Training
- Hazard and Risk Management Training – Menu

Assessment:

Enbridge follows the ISO 31000 Risk Management – Guidelines. The Hazard and Risk Management Process is implemented within the company's IMS. Responsibilities are outlined in Enbridge's hazard and risk management process document. Each IMS Program department is accountable to ensure that all hazards and risks that could impact its program are documented within the individual program's risk register and supporting documents.

Risk is analyzed by determining consequences and their likelihood of occurrence. To complete each risk analysis, each IMS program owner must gather information about each hazard's probability of occurrence and the variety of consequences that can occur to a variety of receptors such as the health and safety of workers and the public and the environment.

Each Enbridge Business Unit's risk evaluation process is governed by the company's IMS Risk Evaluation Process. Enbridge LP has established a Risk Assessment Matrix that identifies the combinations of likelihoods and consequences related to its hazards that translate to Low, Medium, High, and Extreme risk. The approval of executive leadership is required when an extreme or high risk is to be retained by Enbridge LP and the associated hazard cannot be managed through any of the hierarchy of controls typically used by industry.

Reviews are conducted to reassess hazards and risks to evaluate the effectiveness of risk treatment, identify new risks, and delete obsolete risks in the Hazard and Risk Register. A consolidated Enbridge Hazard and Risk Status Report is prepared by the Enbridge LP Risk Management Department. Hazard and risk reporting occurs at least annually.

Enbridge's LP control room Hazard and Risk Register is managed in accordance with section 3 of the Operate and Maintain Management Program. Hazard identification, risk analysis, assessment and evaluation are embedded in the CCO Quality Management System.

The CER audit staff also interviewed company staff regarding Enbridge's risk assessment process. Enbridge was able to demonstrate it has established and implemented a process for evaluating and managing the risk associated with the identified hazards, including the risk related to normal and abnormal conditions.

Finding: No Issues Noted.

Based on the information made available by Enbridge and reviewed by the CER audit staff within the scope of this audit, no non-compliances relating to this protocol item were identified during the audit.

AP-04: Controls

Regulatory Requirement:

OPR s. 6.5(1) A company shall, as part of its management system and the programs referred to in section 55,

OPR s. 6.5(1)(f) establish and implement a process for developing and implementing controls to prevent, manage and mitigate the identified hazards and the risks and for communicating those controls to anyone who is exposed to the risks.

Expected Outcome: The company is able to demonstrate that it has developed and implemented controls for the identified hazards associated with the pipeline control room and that it has communicated the risk controls to anyone exposed to the risks. Specific areas for demonstration related to this protocol question include:

- the company has a compliant process for developing and implementing risk controls;
- the method(s) for developing risk controls are appropriate for the nature, scope, scale, and complexity of the company's operations and activities and s.55 programs;
- risk controls are developed and implemented;
- risk controls are adequate to prevent, manage and mitigate the identified hazards and risks;
- risk controls are monitored on a periodic basis and as-needed and re-evaluated for changing circumstances; and
- risk controls are communicated to those exposed to the risks.

Summary of Information Made Available by Enbridge:

Enbridge supplied the CER audit staff with documentation used for the liquid pipelines risk assessment process including:

- Hazard and Risk Management Process
- Risk Analysis v.1.1 Process
- Risk Treatment v.2.1 Process
- Operate and Maintain Management Program
- CCO Quality Management System (QMS) Procedures Manual
- CCO Incident Investigation Process
- Q1 2019 Hazard-Risk Review Meeting Presentation
- Risk Evaluation Process.

Assessment:

Enbridge's LP control room is managed by the Operate and Maintain Management Program within the LP IMS and uses the IMSD Hazard and Risk Management Process to identify and manage hazards and their associated risks. Control room controls are developed and implemented using the "Treat Risk" section of the Hazard and Risk Management Process.

Enbridge controls are implemented via publishing to the Governance Document Library (GDL). The GDL is the central location and official repository for stakeholder management system documents used in liquid pipelines (LP) and includes management system policies, program documents, processes, standards, specifications, procedures, work instructions, and guides. Publication of documentation to the GDL is governed by the Document Control Management Process described in Section 5.8 of the IMSD and is also discussed in the associated Document Control Standard.

The adequacy of documented administrative controls is determined following the Document Control Management Process (Responsibilities section) and via adherence to the Document Control Standard (Standards and Requirements section). Document control verification responsibilities are described in the Program Owner/Process Owner/Document Owner section of the document.

In addition, the requirement for the verification of the adequacy of the controls is described in the CCO Incident Investigation Process. In this process, operational controls identified as contributing to the root cause of incidents are to be reviewed for adequacy and revised if necessary. For additional discussion on CCO Incident Management Process, please refer to the assessment section of **AP-11 – Investigation of Incidents, Near-Misses and Non-Compliances**.

Specific to the control room, the effectiveness of controls is monitored through a number of methods including quarterly and annual reviews. On a quarterly basis, operational event metrics are evaluated against the risk evaluations contained in the Pipeline Control Hazard Risk Register. Where these evaluations indicate existing controls are not effective, the controls may be revised or additional controls may be developed.

Internal and External Communications of controls are managed as part of the IMSD (Section 11) of the Operate and Maintain Management Program.

The requirement for the review of controls that are handled through the development and implementation of operating procedures for normal, abnormal and emergency situations is discussed in section 9 of the Control Room Management Plan (CRM Plan). The ongoing review and improvement of controls is also managed as part of the Annual Management Review Process.

Enbridge has developed a database of procedures, called its Procedure Accelerator (PA), which it uses to control and manage the pipeline control system during normal, abnormal and emergency situations. The PA procedures describe the detailed procedures to be followed by operators, analysts and supervisors to manage any scenario that might arise, including the communications between the various console operators.

Further details on the issue of managing controls are provided in the assessments of **AP-15** and **AP-16** of this report, which address the issue of **Training, Competency and Evaluation**.

Enbridge's processes require that a Control Room Management Plan Effectiveness Review be completed annually to assess the effectiveness of governing operational procedures referenced in the CRM Plan. Enbridge provided the CER audit staff with a completed effectiveness review as evidence that it is being conducted.

The CER audit staff also interviewed company staff regarding Enbridge's control implementation process and were satisfied that the interview responses aligned with Enbridge's documented processes.

Overall, the CER audit staff were able to verify that, within the scope of the audit, the company demonstrated that it has established and implemented a process for developing and implementing controls to prevent, manage and mitigate the identified hazards and the risks and for communicating those controls to anyone who is exposed to the risks.
Finding: No Issues Noted. Based on the information made available by Enbridge and reviewed by the CER audit staff within the scope of this audit, no non-compliances relating to this protocol item were identified during the audit.

AP-05: Goals, Targets and Objectives

Regulatory Requirement:

OPR s. 6.5(1) A company shall, as part of its management system and the programs referred to in section 55,

OPR s. 6.5(1)(a) establish and implement a process for setting the objectives and specific targets that are required to achieve the goals established under subsection 6.3(1) and for ensuring their annual review.

Expected Outcome: The Company is able to demonstrate that it has established and implemented a process for setting the objectives and specific targets and key performance indicators to achieve the company's goals for the prevention of ruptures, liquid and gas releases, fatalities and injuries and for the response to incidents and emergency situations applicable to the company's control room operations. Specific areas for demonstration related to this protocol question include:

- the company has a compliant process that is established and implemented;
- the company has set objectives and targets and key performance indicators;
- all objectives are relevant to the company's management system when considering the scope of the process and their application to s.55 programs;
- an annual review of the objectives and targets is performed by the company; and
- the annual reviews are being completed and have determined if the objectives were achieved.

Summary of Information Made Available by Enbridge:

Enbridge provided the CER audit staff with the following documents:

- Strategic and Business Planning Management Process
- Department Planning Management Process
- Management Review Management Process
- Liquid Pipelines – 2019 Top Objectives
- LP IMS Performance Monitoring' Scorecard and Dashboard Metrics
- Excerpt from the EMT IMS Performance Dashboard
- Annual Management Review Summary Template
- Annual Management Review Summary Guide
- Liquid Pipelines – Strategy on a Page
- 2019 VP Objectives Pipeline Control Endorsed by LP EVP
- IMS Integrated Planning Session – Capture Book
- Operate and Maintain Management Program
- LP EMT Meeting Agenda dated 18 October 2018
- LP EMT Meeting Agenda dated 15 November 2018
- Email Correspondence to EMT – LP Priorities, STIP Scorecard and EMT Dashboard
- LP EVP LP Wide Communication of 2019 STIP Scorecard
- Integrated Management System Document

Assessment:

Enbridge uses three IMS management processes to establish, monitor and review objectives, performance measures and targets for the IMS Management Programs and Liquid Pipelines (LP) Business Unit, all of which are aligned with the company's IMS goals. The processes are:

- Strategic and Business Planning Management Process
- Department Planning Management Process
- Management Review Management Process

LP uses the annual Strategic and Business Planning Management Process to review and update annual business unit priorities, objectives, performance measures, and targets. It is a process that takes place over a series of LP Executive Management Team (EMT) meetings. Decisions related to priorities and objectives are documented in the Liquids Pipelines – 2019 Top Objectives. IMS priorities and objectives are incorporated into this document.

Enbridge provided the CER audit staff with several documents demonstrating the process for setting, monitoring and updating priorities and objectives. They are documented in:

- IMS Integrated Planning Session: At this planning session, IMS Management Program priorities and objectives are set and then incorporated into relevant department plans. Annual targets are then established by the management programs based on the goals, objectives and performance measures documented in management program documents. This ensures that there is alignment between IMS Goals and LP's priorities and objectives.
- Liquids Pipelines – 2019 Top Objectives: Select IMS priorities and objectives (as identified in the annual Integrated Management Planning session) are incorporated into this document.
- LP IMS Performance Monitoring' Scorecard: Decisions related to performance measures, metrics and targets are documented in this document.
- LP IMS Performance Monitoring Dashboard Metrics Spreadsheet: Dashboard Metrics and select IMS metrics and targets are reported in the dashboard and reviewed on a monthly or quarterly basis.
- Department Planning Management Review Process: LP uses the annual Management Review Process to review and update department level priorities, objectives and targets. The annual Management Review Process is used by program owners to review the adequacy and effectiveness of their program and of the IMS. The management review measures the performance of each IMS program to ensure the various components are on track to deliver their stated goals, objectives, performance measures and targets.

Also provided were the Annual Management Review Summary Template and Guide. The template is used by each program manager to document the results of the annual MR Process including the department's success in working towards the departmental priorities and in achieving the established objectives and targets.

The completed management review summaries for each management program are then used to develop the IMS Annual Report. Inputs into the Management Review Process include: performance results, assurance activities & results/significant findings, program risks, bench-marking and lessons learned activities, and completed continuous improvements.

Outputs of the Management Review Process include commitments to corrective actions to address below target performance results and/or significant assurance findings, resource related risks, and opportunities for improvement planned for next year. The IMS Annual Report is used as an input into the next round of LP Department Planning.

The CER audit staff also interviewed Enbridge staff regarding Enbridge's control implementation process and were satisfied, based on the responses provided, that the company's processes align with those documented.

Overall, Enbridge was able to demonstrate it has established and implemented a process for setting the objectives and specific targets related to Pipeline Control within the Operate and Maintain Management Program to achieve the company's goals established under subsection 6.3(1) of the OPR and for ensuring their regular review.

Finding: No Issues Noted.

Based on the information made available by Enbridge and reviewed by the CER audit staff within the scope of this audit, no non-compliances relating to this protocol item were identified during the audit.

AP-06: Organizational Structure, Roles and Responsibilities

Regulatory Requirement:

OPR s. 6.4 The company must have a documented organizational structure that enables it to (a) meet the requirements of the management system and meet its obligations under section 6; (b) determine and communicate the roles, responsibilities and authority of the officers and employees at all levels of the company; and (c) demonstrate, based on an annual documented evaluation of need, that the human resources allocated to establishing, implementing and maintaining the management system are sufficient to meet the requirements of the management system and to meet the company's obligations under section 6.

Expected Outcome: The company is able to demonstrate that:

- it has a documented organizational structure for its control room, operations staff, SCADA support staff and other support staff;
- it has determined and communicated the roles, responsibilities and authorities for control room management and operation to all control room staff and those who interact with them; and
- it conducts an annual documented evaluation of need of the human resources required to operate and maintain its pipeline control system and leak detection system.

Summary of Information Made Available by Enbridge:

Enbridge supplied the CER audit staff with the following documents:

- Enbridge Control Room and SCADA Services organizational charts
- Control Room Management Plan (CRM Plan)
- Job Profiles
- Alarm Response Team Procedure
- Control Room Training Guidelines
- CCO Quality Management System (QMS) Procedures Manual
- Proposed 2018 Work Force Plan
- CCO Workload Assessment Plan
- Line Specific Leak Detection System Manual L02

Assessment:

Enbridge provided an organizational structure of the control room and Supervisory Control and Data Acquisition (SCADA) services group, including Control Room Management and shift staff (i.e., Shift Supervisors, Senior Technical Advisors (STAs), Control Room Operators (CROs), and Leak Detection Analysts (LDAs)).

Section 3.3 of the Control Room Management Plan (CRM Plan) describes the roles, responsibilities, and authorities (and prohibitions) for control room staff during normal, abnormal and emergency situations, including the CRO, STA, LDA and Shift Supervisor. Enbridge also provided job profiles that align with each role as described in the CRM Plan.

Enbridge uses a database tool which it calls its Procedure Accelerator (PA) that provides operating personnel with a single source for referencing procedures and supporting information. The procedures contained within the tool also describe individual accountabilities amongst CROs, LDAs and Shift Supervisors for each procedure, as applicable. Changes to operating procedures, including changes to roles, responsibilities and authorities, follow defined management of change (MOC) processes and are communicated to personnel and managed as per the CCO Standards and Procedures Quality Management System.

Within the PA tool, control room personnel are required to review the PA procedures associated with their role (and indicate that they have done so by clicking on a link within the tool) whenever there is a change to a procedure or at least annually. Doing so, serves to maintain their knowledge and competency of the PA procedures.

Within the CCO Quality Management System Procedures Manual (QMS) Section 7.2, titled 'Manage the Annual Procedure Verification by Operators' identifies what procedures and standards are to be reviewed, by whom and how often.

New control room personnel are provided with individual training plans that outline the criteria involved to be a competent operator. This is referenced in the Control Room Training Guidelines. New personnel are trained on the company operating procedures as described in the Control Room Training Guidelines. These training guidelines identify the various types of training to be carried out by each role within the control room and the roles and responsibilities for the development, approval, delivery and evaluation of the training that takes place.

Enbridge provided a Leak Detection Analyst Workload Assessment Report dated 30 July 2018 and a Workload Assessment Plan for the control room dated 16 August 2018. These assessments are used to review, assess and manage console workload at the Control Centre. The company also supplied a 2018 CCO Workload Assessment Summary from December of 2018. The company uses the results of the assessment to identify the requirement to reallocate staff workload, or move functions from one terminal to another, or as an impetus to hire additional staff. The results of the workload assessments are reviewed during the annual Management Review Process.

Enbridge Control Room accounts for controller time spent on activities through its CCO Workload Assessment Plan and delineation of operator roles and responsibilities under normal operation in the Control Room Management Plan section 3.3.1. The CRM plan lists the operator's critical and discretionary tasks that are required to be completed. Critical tasks are measured in the CCO Workload. While non-critical tasks are not measured in the CCO Workload Assessment Plan, they are taken into consideration to ensure sufficient personnel are available to manage all Control Room functions. The CCO Workforce Plan is reviewed by CCO Management on a quarterly basis to ensure appropriate staffing levels are maintained.

As further evidence that Enbridge conducts evaluations of need of its workforce, Enbridge provided:

- A 2018 CCO Workload Assessment Summary - Sarnia Asset Balancing – to assess workload between the pipeline and terminal console. The decision was made to move the Sarnia injections to the Terminal console to balance the workload;

- CIC ID 00207 - This was the Management of Change (MOC) document used to assess and document the plan to move the assets; and
- Notification to Staff of Sarnia Asset Balancing - This was the Portal Bulletin that was issued to communicate the MOC to the affected CCO staff.

In summary, Enbridge was able to provide sufficient evidence to the CER audit staff that it has established and implemented an organizational structure with roles, responsibilities and authorities and that it conducts an annual evaluation of need of its control centre staff.

Finding: No Issues Noted.

Based on the information made available by Enbridge and reviewed by the CER audit staff within the scope of this audit, no non-compliances relating to this protocol item were identified during the audit.

AP-07: Operational Control

Regulatory Requirement:

OPR s. 6.5(1) A company shall, as part of its management system and the programs referred to in section 55,

OPR s. 6.5(1)(q) establish and implement a process for coordinating and controlling the operational activities of employees and other people working with or on behalf of the company so that each person is aware of the activities of others and has the information that will enable them to perform their duties in a manner that is safe, ensures the security of the pipeline and protects the environment.

Expected Outcome: The company is able to demonstrate that it has established and implemented a process for coordinating and controlling the operational activities of control room staff and other people working with or on behalf of the company so that each person is aware of the activities of others and has the information that will enable them to perform their duties in a manner that is safe, ensures the security of the pipeline and protects the environment. It is expected that:

- the company has a compliant process that is established and implemented to supervise and ensure the operations of the control room are correct;
- the methods for coordinating and controlling operational activities are defined;
- employees and other people working with or on behalf of the company are aware of the activities of others;
- employee's operational activities are planned, coordinated, controlled, and managed; and
- people working for or on behalf of the company:
  - are pre-qualified for their assigned duties to ensure safety, the security of the pipeline and to protect the environment;
  - are assigned work plans that have been reviewed by the company and are assessed for the interoperation with the work to be performed by other people working on behalf of the company; and
  - have adequate oversight performed by company representatives for their assigned tasks to ensure safety, security of the pipeline and the protection of the environment.

Summary of Information Made Available by Enbridge:

Enbridge supplied the CER audit staff with access to:

- Operational Activity – Control and Coordination Process
- Control Room Management (CRM) Plan
- CCO Training Guidelines
- Capacity Outage Planning and Safe Work Approval
- Capacity Outage Planning Safe Work Approval Standard
- Construction and Maintenance Coordination Committee Charter
- CCO Service Level Expectation Guide
- Batch Swing – Injection or Receipt – Pipeline
- Pipeline Start Up
- COPAS Work Request Procedure

- Maximo Reporting Procedure
- Operate and Maintain Management Program Manual
- COPAS Request

Assessment:

Enbridge has a number of documented processes that it uses to coordinate and control operational activities as described below.

The Operational Activity - Control & Coordination Process describes the activities and decisions to be taken to ensure Enbridge staff have a documented understanding of their responsibilities to manage and control work activities within the operating regions. This also applies directly to Regional Operations staff.

The Control Room Management Plan (CRM Plan) defines how the CCO manages activities associated with the control room to ensure duties are performed in a safe manner. The Plan includes roles and responsibilities of control room personnel during normal, abnormal and abnormal operations. It also describes the prohibitions that staff must adhere to ensure that no-one in the CCO oversteps their authority in any given situation.

To ensure all new control room personnel know how to carry out their functions and are qualified to do so, they are subjected to an onboarding and training process. This process is designed to ensure that new staff acquire the necessary knowledge and skills to carry out their roles and responsibilities as outlined in the CCO Training Guidelines. In addition, the CCO has an ongoing retraining process to ensure staff remain competent.

Enbridge conducts cross training of its operators so that one operator can be qualified to operate up to three different consoles. In this manner, Enbridge has greater flexibility with its workforce to account for issues such as illness, vacation or occasions when a console operator becomes busy and requires another operator to assist.

Of the various pipeline control consoles within the control room, some are used to operate and control assets regulated strictly by the CER; others operate assets regulated by the American Pipeline and Hazardous Materials Safety Administration (PHMSA); while others control assets that are regulated by provincial entities or both the CER and PHMSA. It was noted by the audit staff that many of Enbridge's documents and procedures dealing with console operation do not make reference to the OPR, but rather make reference to PHMSA and align with US Regulations (the CRM Plan is an example). However, regardless of the control console, it was noted by the audit staff that all consoles are operated using identical procedures; Enbridge does not have one set of procedures for CER assets and another set for PHMSA assets or provincially regulated assets.

The Enbridge CCO uses its PA database tool to control and manage the pipeline control system during normal, abnormal and emergency situations. The PA procedures describe the detailed procedures to be followed by operators, analysts and supervisors to manage any scenario that might arise, including the communications between the various console operators. Enbridge provided the audit staff with an illustration of how the PA tool works. Control Room Staff are required to review the PA procedures annually or whenever they are changed to ensure they are current with the most up-to-date procedures.

Within the PA, Enbridge explained how the Capacity Outage Planning and Approval System (COPAS) work request procedure is used by field staff to submit work requests to the CCO for approval and coordination of maintenance outages. The Capacity Outage Planning and Safe Work Approval Process referenced in Section 7.1.7 of the CRM Plan is also used by the CCO to communicate upcoming outages to field staff that may impact Operations, and to identify field maintenance work that may impact the operating capacity of the pipeline. In support of this process is the Capacity Outage Planning and Safe Work Approval Standard is used by field staff to ensure coordination and safe completion of assigned tasks.

Enbridge field operations uses Maximo (database and scheduler for maintenance activities). The Maximo Reporting Procedure provides the guidelines on creating a work order and ensures coordination between field personnel control room personnel when pipeline monitoring and control equipment requires maintenance. The CCO Work Order Criticality Supporting Information section within the CCO Service Level Expectation Guide outlines the response when equipment issues occur. This guides communication between control room and regional maintenance staff utilizing the Maximo tool.

The CER audit staff also interviewed Enbridge staff regarding Enbridge's control implementation process. The company was able to demonstrate that it has established and implemented a process for coordinating and controlling the operational activities of employees and other people working with or on behalf of the company so that each person is aware of the activities of others and has the information that will enable them to perform their duties in a manner that is safe, ensures the security of the pipeline and protects the environment.

In summary, Enbridge was able to demonstrate that it has established and implemented a process for coordinating and controlling the operational activities of control room staff and other people working with or on behalf of the company.

Finding: No Issues Noted.

Based on the information made available by Enbridge and reviewed by the CER audit staff within the scope of the audit, no non compliances relating to this protocol item were identified during the audit.

AP-08: Operating and Maintenance Manuals

Regulatory Requirement:

OPR s. 27: A company shall develop, regularly review and update as required, operation and maintenance manuals that provide information and procedures to promote safety, environmental protection and efficiency in the operation of the pipeline and shall submit them to the Board when required to do so.

Expected Outcome: The company is able to demonstrate that it has developed, regularly reviews and updates as required, control room operations and maintenance manuals that provide information and procedures to promote safety, environmental protection and efficiency in the operation of the pipeline, including but not limited to guidance on issues such as:

- shift handover communications;
- fatigue management;
- alarm management; and
- handling of over-pressurization and leak alarms.

Summary of Information Made Available by Enbridge:

Enbridge provided the CER audit staff with its:

- Control Room Management Plan
- CCO Quality Management System
- Procedure Accelerator Index
- Electronic Shift Change Procedure
- P012 - Overpressure Evaluation Procedure
- LD – APD – Leak Alarm
- CCO Fatigue Risk Management Handbook
- Alarm and Event Philosophy, Alarm Management Plan; and Governance Document Library Sample

Assessment:

As discussed throughout the assessment of protocol items AP-01 to AP-20, Enbridge has developed a number of operating and maintenance manuals and procedures related to the operation and maintenance of its Control Room: These include, but are not limited to:

- IMSD Hazard and Risk Management Process
- Control Room Management Plan (CRM Plan)
- Control Room Management Plan Effectiveness Review
- CCO Incident Investigation Process
- CCO Quality Management System (QMS)

- Control Room Training Guidelines
- Procedure Accelerator Tool
- Electronic Shift Change Procedure;
- Overpressure Evaluation Procedure
- CCO Fatigue Risk Management Handbook
- Alarm Management Plan
- Leak Detection System General Manual
- Emergency Shutdown – Pipeline Procedure
- Determining Operating Limits Procedure
- Implementing Operating Limits Procedure
- Pipeline Operating Limit Verification Procedure
- Monthly SCADA Alarm Review Procedure
- SCADA Point to Point Verification Procedure
- Transfer CCO Operations Site Procedure

The IMSD Hazard and Risk Management Process is used to identify and manage hazards and their associated risks and develop controls such as operating procedures;

The Control Room Management Plan defines how the CCO manages activities associated with the control room to ensure duties are performed in a safe manner. The Plan includes roles and responsibilities of control room personnel including supervisors, control room operators and support staff during normal, abnormal and abnormal operations.

The Control Room Management Plan Effectiveness Review is a process completed annually to assess the effectiveness of governing operational procedures referenced in the CRM Plan.

The CCO Incident Investigation Process is used to investigate the adequacy of controls (such as operating procedures) and taking appropriate corrective actions if they are found to be inadequate;

The CCO Quality Management System (QMS) ensures operating standards and procedures are accurate and current to provide safety, customer service, and efficiency goals of the organization.

The Control Room Training Guidelines identify the various types of training to be carried out by each role within the control room and the roles and responsibilities for the development, approval, delivery and evaluation of the training that takes place.

The Procedure Accelerator tool contains all of the control room procedures for dealing with normal, abnormal and emergency situations.

The CCO Fatigue Risk Management Handbook provides shift staff with access to fatigue risk management strategies and guidelines that support fatigue mitigation and provide barriers to ensure safe operations of our systems.

The Alarm Management Plan (AMP) establishes alarm effectiveness and evaluation criteria. The document addresses how the Alarm and Event Philosophy (AEP) is operationalized by the company. The AEP document provides an optimum basis for alarm selection, priority setting, event selection, and configuration to promote safe and reliable pipeline operations.

The Leak Detection System (LDS) General Manual provides a detailed explanation of the LDS aspects that are common to the pipeline system. It is supported by individual line specific manuals that provide detailed routing, operational, and modelling information for each pipeline.

The Emergency Shutdown – Pipeline Procedure lists the response steps when an emergency shutdown request is required. The procedure describes the responsibilities for the CRO, Senior Technical Advisor (STA) and Supervisor. Control Room Operator responsibilities include initiating commands through the Supervisory Control and Data Acquisition (SCADA) system to field equipment to stop the line and sectionalize the pipeline.

The Determining Operating Limits Procedure describes how the Control Centre defines and implements alarm set-points and control limit.

The Implementing Operating Limits Procedure describes how the Senior Technical Advisor (STA) implements limit changes through a pressure limits web interface.

The Pipeline Operating Limit Verification Procedure defines how pressure control limits are verified and checked.

The Monthly SCADA Alarm Review Procedure describes the steps to be taken to review the performance of the SCADA alarm system and identify opportunities for improvement.

The SCADA Point to Point Verification Procedure describes the steps required to verify SCADA displays with the associate field equipment.

The Transfer CCO Operations Site Procedure and the Emergency Evacuation Procedure describe the steps to transfer control between the primary and backup control systems as well as the associated responsibilities.

In summary, Enbridge was able to demonstrate that it has developed, reviews and updates control room operations and maintenance manuals that provide information and procedures to promote safety, environmental protection and efficiency in the operation of the pipeline.

Finding: No Issues Noted.

Based on the information made available by Enbridge and reviewed by the CER audit staff within the scope of the audit, no non-compliances relating to this protocol item were identified during the audit.

AP-09: Pipeline Control System and Leak Detection System

Regulatory Requirement:

OPR s. 37 A company shall develop and implement a pipeline control system that **(c)** includes a leak detection system that, for oil pipelines, meets the requirements of CSA Z662-15 and reflects the level of complexity of the pipeline, the pipeline operation and the products transported.

Expected Outcome: The company is able to demonstrate that it has developed and implemented a pipeline control system that includes a leak detection system that, for oil pipelines, meets the requirements of CSA Z662-15.

Summary of Information Made Available by Enbridge:

Information provided by Enbridge to the CER audit staff included:

- Leak General Detection (LDS) General Manual
- Liquid Hydrocarbon Pipeline Leak Detection Strategy
- Mainline Leak Detection Equipment Engineering Design Standard
- Material Balance System (MBS) Standard
- Examples of line specific leak detection system manuals
- Samples of leak detection preventative maintenance tasks
- Aa record of an L09 MBS API 1130 test report
- Other documents and records supporting the CER's information request

Assessment:

This Leak Detection System (LDS) General Manual provides a detailed explanation of the LDS aspects that are common to the pipeline system. It is supported by individual line specific manuals that provide detailed routing, operational, and modelling information for each pipeline. The Preface section of the LDS Manual states *"these manuals are designed to meet CSA Z662 Annex E (Recommended practice for liquid hydrocarbon pipeline system leak detection) and API Recommend Practice 1130 (Computational Pipeline Monitoring for Liquids)"*.

In section 1.5 of the LDS Manual, the company states commitments that include:

- the Enbridge pipeline system will not be operated without a functioning leak detection system, for all modes of pipeline operation;
- all leak alarms will be acknowledged, analyzed and evaluated; and
- qualified personnel will be trained in accordance with industry standards and applicable regulations

Enbridge stated it has a comprehensive approach and committed to continuous improvement. Below are summarized leak detection methods used by Enbridge:

- Controller Monitoring – Control Room Operator monitors pipeline conditions through the SCADA system and identifies unexpected operational changes that may identify potential leaks.
- Computational Pipeline Monitory (CPM) – Monitoring systems utilize measurements and pipeline data to detect anomalies that may indicate potential leaks.
- Scheduled Line Balance Calculations – Volume balance calculations within Enbridge's commodity movement tracking and volume balance CPM systems. This practice is aligned to CSA Z662-15 Annex E and refers to *"over/short reports"* that identify unexpected losses of pipeline inventory that may indicate a leak.
- Visual Surveillance and Reporting – Resources and infrastructure have been established to facilitate reporting of oil or oil odors from third parties and aerial and ground patrol. Third party reports are managed through an emergency telephone line that is monitored 24/7 by the Control Centre.
- Rupture Detection – Computer based pipeline monitoring system to identify potential pipeline rupture events.
- Automated Pressure Deviation – Computer based pipeline monitoring that utilizes pressure measurements during a pipeline shut-in and generates an alarm if a pressure drop occurs.
- Acoustic inline inspection - geo-referenced measurement tools that confirm the integrity of the pipe, and detect and locate small leaks.

Enbridge provided the CER audit staff with a Leak Detection Overview Presentation and a demonstration of a Fluid Withdrawal Simulation Test. This test is conducted on a quarterly basis by Enbridge. Its purpose is to demonstrate that leak detection systems are functioning within prescribed parameters. It also serves to test the ability of CROs and LDAs to detect, analyze and properly respond to perceived leaks.

The CER audit staff were provided with an overview of the Leak Detection Alarm Manager (LDAM) functions during the Fluid Withdrawal Simulation. LDAM is utilized by the Alarm Response Team (ART) to respond to and independently assess every leak alarm. The ART consists of the Control Centre Operator, Senior Technical Advisor and Leak Detection Analyst. When a leak alarm occurs, the three members of the ART independently review the information and determine if the leak is valid. If a leak is confirmed by one of the three ART members, then the pipeline is shut down immediately. If a leak cannot be conclusively ruled out within 10 minutes, the pipeline is shut down and the investigation continues to determine the cause for the alarm. An example of monthly LDAM alarm events was provided to the audit staff, and event details were discussed. LDAM and Leak Detection procedures reside in the Procedure Accelerator Tool.

Additionally, a site visit of the primary and backup control rooms including observation of the Leak Detection Consoles was provided by Enbridge, as well as the opportunity to interview control centre staff.

Alignment to CSA Z662-15 applicable requirements were described in the Leak Detection Overview Presentation. Supporting documents, records, and observations are listed below.

- Leak detection capability, design, operational and equipment requirements are described in the Liquid Hydrocarbon Pipeline Leak Detection Strategy, Leak Detection System (LDS) General Manual, line specific LDS manuals, & Mainline Leak Detection Equipment Standard, & MBS Display Standard.
- Liquid Hydrocarbon Pipeline Leak Detection Strategy section 3.1.3 and the Leak Detection System General Manual section 1.3.2 describe how calculation of oil inventory is performed at fixed intervals, typically 2 to 24 hours. Losses of pipeline inventory may indicate a possible

leak. The Commodity Movement Tracking Procedure is referenced, and a commodity over-short summary report was provided for the period 1 May to 1 June 2019.

- The Liquid Hydrocarbon Pipeline Leak Detection Strategy section 11, and Leak Detection System General Manual section 9 describe the steps to monitor, review and evaluate the leak detection performance. The Leak Detection Metrics Monthly Report for June 2019 was an example of a periodic LDS review. The report summarizes the LDS performance, issues, and reliability and robustness metrics.
- The Mainline Leak Detection Equipment Standard and the Leak Detection System General Manual describes the equipment and its function within the Leak Detection System. As mentioned previously, the audit staff were provided a simulated demonstration of a Fluid Withdrawal Test, which evaluated the CPM sensitivity. The leak detection capability of leak detection system was observed and discussed. The Company performs simulated leak tests on a pipeline simulator to train Control Centre Operators and Leak Detection Analysts. A L09 MBS API 1130 Report (2019 Q2) record provided a sample of a CPM system that performed correctly.
- The Leak Detection System General Manual section 13 and the Operating and Maintenance Manual Books 5 & 6 (Pressure, Temperature, Viscometer, Densitometer, and Flowmeter) describe the preventative maintenance tasks required for the Leak Detection System. The Company provided a list of work orders specific to calibrating LDS equipment calibrations.

For a detailed description of the pipeline control Supervisory Control and Data Acquisition (SCADA) system, please refer to the assessment section of **AP-21: Supervisory Control and Data Acquisition (SCADA) design, maintenance and operational functions**.

In summary, through document and record reviews, site visits and staff interviews, Enbridge demonstrated that it has a developed and implemented a control system and leak detection system that has data and alarming integrated with the SCADA system. The pipeline systems are monitored 24/7 for leaks by trained Leak Detections Analysts, Control Centre Operators, and Senior Technical Advisors.

Finding: No Issues Noted.

Based on the information made available by Enbridge and reviewed by the CER audit staff within the scope of the audit, no non-compliances relating to this protocol item were identified during the audit.

AP-10: Pipeline Control System Data Recording System

Regulatory Requirement:

OPR s. 37: A company shall develop and implement a pipeline control system that **(b)** records historical pipeline operation data, messages and alarms for recall.

Expected Outcome: The company is able to demonstrate that it has developed and implemented a pipeline control system that records historical pipeline operation data, messages and alarms for recall.

Summary of Information Made Available by Enbridge:

To demonstrate compliance with this requirement, Enbridge provided the CER audit staff with:

- An overview presentation
- A tour of the Control Centre
- An observation of a shift change
- Leak Detection System (LDS) General Manual
- Records Retention Schedule
- Records of historical operations and alarms

Assessment:

Enbridge provided the CER audit staff with an overview presentation which explained the Leak Detection System and the Supervisory Control and Data Acquisition (SCADA) systems. In addition, Enbridge provided the CER audit staff with a tour of the primary and backup control systems. During the tour of the primary control system, auditors observed console operators dealing with and managing incoming alarms. The CER audit staff also observed a shift change for the Control Centre Operator, Senior Technical Advisor and Shift Supervisor on the evening of 14 August 2019 during which, shift change reports of operational status, outages, alarms and upcoming activities were discussed with incoming staff.

The CER audit staff reviewed the Leak Detection Systems General Manual (LDS Manual) which describes Leak Detection System. Section 14 of the LDS Manual describes the record keeping process and lists the retention requirements. Section 14.1, Retention of Records, states *"records should be historically documented to meet the requirement of API-1130."* The retention periods for records are listed in section 14.2 of the LDS Manual.

The Company provided the CER audit staff with a list of historical record of alarms for console 28, dated 15 May 2019 and demonstrated the capability of SCADA alarm information retention. Operation beyond design limits (OBDL) incidents from the past 6 months and historical alarm messages and commands, and a table showing time and corresponding pressures were also provided. Enbridge also provided the CER audit staff with a record of the LDS and SCADA data that was recorded from a Fluid Withdrawal Test conducted on 13 July 2019.

In summary, Enbridge demonstrated that its pipeline control system records historical pipeline operational data, messages and alarms, and that operators have the ability to recall and print whatever data they require from any previous time period.

Finding: No Issues Noted.

Based on the information made available by Enbridge and reviewed by the CER audit staff within the scope of the audit, no non-compliances relating to this protocol item were identified during the audit.

AP-11: Investigation of Incidents, Near Misses and Non-Compliances

Regulatory Requirement:

OPR s. 6.5(1) A company shall, as part of its management system and the programs referred to in section 55,

OPR s. 6.5(1)(r) establish and implement a process for the internal reporting of hazards, potential hazards, incidents and near-misses and for taking corrective and preventative actions, including the steps to manage imminent hazards;

Expected Outcome: The company can demonstrate that it has established and implemented a process for the internal reporting of hazards, potential hazards, incidents and near-misses related to the operation of the pipeline and for taking corrective and preventative actions, including the steps to manage imminent hazards. It is expected that:

- the company has a compliant process that is established and implemented;
- the company has defined its methods for internal reporting of hazards, potential hazards, incidents and near-misses;
- hazards and potential hazards are being reported as required by the company's process;
- incidents and near-misses are being reported as required by the company's process;
- the company has defined how it will manage imminent hazards;
- the company is performing incident and near-miss investigations; and
- the company's investigation methodologies are consistent and appropriate for the scope and scale of the actual and potential consequences of the incidents or near misses to be investigated.

Summary of Information Made Available by Enbridge:

Information provided by Enbridge to the CER audit staff to demonstrate compliance with this regulatory requirement included:

- Integrated Management System Document
- Corrective and Preventive Action Management Process
- Control Room Management Plan
- CCO Incident investigation Process
- Safety Observation Standard
- Hazard Assessment and Control Standard
- Procedure Accelerator Tool Index
- An incident investigation report for Sarnia Terminal

Assessment:

The LP Integrated Management System Document (IMSD) references LP standards and processes related to incident reporting and investigation. Documents specifically applicable to LP incident reporting and investigation, include:

- Enbridge Incident Reporting Standard

- Enbridge Incident Investigation Standard
- Enbridge Incident Investigation Process
- Enbridge Hazard Assessment and Control Standard
- Enbridge Corrective and Preventive Action Management Process
- Control Room Management (CRM) Plan
- CCO Incident investigation Process
- Procedure Accelerator (PA)

The Enbridge Incident Reporting Standard (IRS) provides *"guidance on regulatory and company reporting and notification requirements to internal stakeholders"*. Figure 1 of the IRS defines the various types of incidents to be reported and the 'Responsibilities' section describes the responsibilities of the Control Centre personnel. The Enbridge Incident Investigation Standard is used to *"determine the causal factors associated with incidents based on facts, and to implement controls to prevent similar events from occurring"*.

The Enbridge Incident Investigation Process is intended to *"ensure Enbridge workforce and contractors use accepted methods to report, investigate and learn from incidents"*. Section 5.10 of the Enbridge IMSD states that the Incident Investigation Process is a continuous improvement effort to provide a Liquids Pipelines-wide standardized approach to conducting incident investigations.

Section 8 of the CRM Plan describes how CCO personnel investigate events and how incident investigation and reporting is conducted. Enbridge's CCO Incident Investigation Process describes the detailed Control Room process for investigating near misses, incidents and potential incidents, determining root causes, and implementing corrective and preventative actions (CAPAs). The company's CAPA management process defines the minimum standard for creating, administering, and tracking, reporting and managing corrective and preventative actions.

For addressing incidents as they are occurring, Enbridge's PA database lists all of the procedures and steps that employees are to follow to manage any normal, abnormal and emergency incidents that show up on the control room consoles. The PA tool and the procedures contained therein are Control Room-level controls that have been implemented to ensure a consistent, repeatable process is followed to report and manage hazards, potential hazards, incidents and near misses. For example, there is a PA procedure for dealing with Overpressure – Suspected or Confirmed. Each PA procedure explains the operator steps involved in identification of the hazard or potential hazard and guides the operating staff through to the CCO Incident investigation Process where it would be reported to the correct authority. All operators are required to review and sign off on all PAs each year to ensure they are familiar with any changes to the procedures. Interviews with CROs, STAs, LDAs and Shift Supervisors confirmed their familiarity with the PA tool, the procedures and how to use them.

The Enbridge Encompass system is used to record and report incidents internally. The Company provided a sample of an event record for an event at the Sarnia Terminal including an incident investigation report describing the root cause of the event cause and the CAPA plan stemming from the incident.

Overall, Enbridge demonstrated that it has an incident reporting and investigation process that is specific to its Control Room and is governed by, and integrated within, the IMSD. The process includes the procedures for developing and implementing CAPAs and tracking them through to completion. All incidents are entered into the Encompass system which is an enterprise-wide system. For addressing incidents as they are occurring,

the company has developed a list of PAs which an operator can quickly access and follow to ensure every type of incident is managed appropriately and consistently.
Finding: No Issues Noted. Based on the information made available by Enbridge and reviewed by the CER audit staff within the scope of the audit, no non-compliances relating to this protocol item were identified during the audit.

AP-12: Emergency Procedures Manual

Regulatory Requirement:

OPR s. 32(1.1): The company shall develop an emergency procedures manual, review it regularly and update it as required.

Expected Outcome: The company is able to demonstrate that it has developed, regularly reviews and updates as required an emergency procedures manual to respond to control room specific emergencies (e.g., bomb threat).

Summary of Information Made Available by Enbridge:

Information provided by Enbridge to the CER audit staff to demonstrate compliance to this regulatory requirement included:

- Control Room Management Plan
- Quality Management System (QMS) Procedures Manual
- Procedure Accelerator Index
- Governance Document Library Sample
- CCO Training Guidelines
- Terminal Emergency Response Certification Requirements
- Pipeline Emergency Response Certification Requirements
- Emergency Response Certification Requirements
- 2018 Winter Training Course Map
- Various samples, reports and records

Assessment:

The CRM Plan Section 3 describes the roles and responsibilities of Control Room staff during normal, abnormal and emergency operations.

For each type of incident (normal, abnormal and emergency) that occurs in the Control Centre, Enbridge uses its Procedure Accelerator (PA) database to guide its CCO Staff through the steps to take to quickly and efficiently address any issue that might arise, including incidents such as bomb threat. The PA application gives Control Centre Staff quick access to response steps, links to other procedures, and logs the decisions made by staff.

Operators are to review the procedures at least annually, but must also review them if they have been found to use them incorrectly, or if there has been a change in procedures. Once the operator has reviewed the procedure, they are to indicate that they have done so by clicking a link within the application. In this way, the management team can verify that the CCO Staff have all reviewed and signed off on all of the procedures. The audit staff reviewed the Enbridge's Procedure Acknowledge Example document which displayed how an employee would confirm that they have reviewed a procedure. The audit staff also reviewed revision and change history management in PA.

The QMS Procedures Manual section 4.2.2 identified the Control Centre Operator's key activities associated with using the procedures during emergency operations. Section 7.1 of the QMS Procedures Manual (Manage Procedures) describes in detail the processes for the annual procedure verification by Operators, annual procedure review process, temporary procedures, procedure archive, procedure management, and training.

A demonstration of the Procedures Accelerator (PA) application, showing the functionality specific to emergency procedures, was observed by the CER audit staff. In addition, interviews were conducted with Control Centre Operators, a Leak Detection Analyst, a Senior Technical Advisor and a Supervisor to verify that they were familiar with the procedures and their responsibilities.

The PA application is available to each operator online and is backed up in SharePoint and each Operator's computer hard drive, should online access not be available. This ensures that each operator has access to the procedures at all times.

Sample training records for Emergency Response Certification, Terminal Emergency Certification, and Emergency Response Recertification were provided to the CER audit staff. These records demonstrated testing of employees on emergency procedures.

Enbridge also provided evidence to the CER audit staff that the PA procedures are reviewed on a regular basis and updated and amended as required.

In summary, Enbridge demonstrated that is has developed emergency procedures to be used by Control Room staff and that these procedures are reviewed by all staff on at least an annual basis. Enbridge also demonstrated that its emergency procedures are regularly reviewed and updated.

Finding: No Issues Noted.

Based on the information made available by Enbridge and reviewed by the CER audit staff within the scope of this audit, no non-compliances relating to this protocol item were identified during the audit.

AP-13: Analysis of Leak Alarms

Regulatory Requirement:

CSA Z662-15 - E.4.3.2: Analysis of leak alarms shall determine the cause of the alarm. The leak alarm shall not be discounted and declared invalid without such analysis; all alarms shall be assumed to have a cause. Methods to determine the cause of the leak alarm shall be developed. The leak detection system analysis procedure shall state a maximum analysis period. If the cause of the leak alarm has not been declared within the period, the pipeline shall be brought to a safe state until the leak alarm cause has been determined.

Expected Outcome: The company is able to demonstrate that it analyzes all leak alarms to determine the cause and has developed methods to determine the cause.

Summary of Information Made Available by Enbridge:

Information provided by Enbridge to the CER audit staff to demonstrate compliance to this regulatory requirement included:

- Liquid Hydrocarbon Pipeline Leak Detection Strategy
- Leak Detection Alarm Manager (LDAM)
- LDAM Procedures
- LDAM Combined Export May 1 – 31 2019

Assessment:

Enbridge provided the CER audit staff with descriptions of the four leak detection systems (LDS) that its uses to detect leak conditions, which include:

- Material Balance System (MBS)
- Automated Volume Balance System
- ESI (a software based system that uses real time transient models to simulate operating conditions and provide the operator with a hydraulic simulation of the pipeline)
- ATMOS Pipe (a mass balance leak detection software)

MBS is the primary leak detection algorithm used on Enbridge's CER-Regulated lines. ATMOS Pipe is only used on one CER-Regulated line. It uses advanced statistical and pressure correcting algorithms, and is capable of sensitive leak detection while maintaining a very low false alarm rate during both transient and steady-state pipeline operations.

The company provided the CER audit staff with an overview and demonstration of the Leak Detection Alarm Manager (LDAM) tool and associated procedures that it uses to respond to, and analyze, leak detection alarms. When a leak condition is identified through one of the above-mentioned leak detection systems, an alarm is generated in the Supervisory Control and Data Acquisition (SCADA) system. This allows the Alarm Response

Team (ART) to respond to, and independently assess, every leak alarm that occurs. The ART consists of a Control Room Operator (CRO), Senior Technical Advisor (STA), and Leak Detection Analyst (LDA).

The outcome of every ART assessment and root cause of every leak alarm is tracked in LDAM. The LDAM allows grouping one or more leak alarms into an alarming event when those alarms are due to the same root cause. Each of the LDS listed above have their own leak detection procedures for the ART to follow. The ART utilizes the appropriate leak detection system procedure and independently reviews the information to determine if the suspected leak is valid. If a leak is confirmed by one of the three ART members, the pipeline is shutdown. If a leak cannot be conclusively ruled out within 10 minutes, the pipeline will be shutdown. Methods and steps to determine root cause are included in each of the LDS leak alarm procedures.

In the event that the pipeline is shut down because an assessment was still in progress after 10 minutes, the assessment will continue until it is finalized. There is no time limit for completing an assessment.

The CER audit staff requested Enbridge provide evidence that all alarms are analyzed and root causes are being determined. In response, the company provided a sample of LDAM leak alarm events that occurred on NEB regulated lines for the period from 01 May to 31 May 2019. The sample provided a list of all leak alarms, identified by the time the alarm was received and grouped by alarming event and root cause for each leak alarm.

The CER audit staff reviewed the details of the investigation and root cause for one event (Event 24069, dated 4 May 2019).

Enbridge advised the CER audit staff that the only time that an LDA will declare a leak alarm invalid and not investigate it, is during a scheduled fluid withdrawal test in which case select personnel within the control room will have prior knowledge of the test and will prevent the pipeline from being unnecessarily shut down.

In summary, Enbridge was able to demonstrate to the CER audit staff that it has technology and procedures to analyze all leak alarms to determine the root cause. Based on the evidence provided it appears that company does not discount and declared invalid such alarms without analysis, unless it is during a known test. Enbridge has developed methods to determine the cause of the leak alarms. The Enbridge leak detection system analysis process has a maximum analysis period of ten minutes. If the cause of the leak alarm has not been declared within the 10-minute period, the pipeline is brought to a safe state until the cause of the leak alarm has been determined.

Finding: No Issues Noted.

Based on the information made available by Enbridge and reviewed by the CER audit staff within the scope of the audit, no non-compliances relating to this protocol item were identified during the audit.

AP-14: Safe Shutdown of Pipeline in an Emergency

Regulatory Requirement: **CSA Z662-15 Clause 10.5.2.1** Operating companies shall establish emergency procedures that include: (a) procedures for the safe control or shutdown of the pipeline system, or parts thereof, in the event of a pipeline emergency; and (b) safety procedures for personnel at emergency sites.
Expected Outcome: The company is able to demonstrate that it has established emergency procedures for the safe control or shutdown of the pipeline system in the event of an emergency; and safety procedures for personnel at emergency sites.
Summary of Information Made Available by Enbridge: Information provided by Enbridge to the CER audit staff to demonstrate compliance to this regulatory requirement included: • Emergency Shutdown – Pipeline Procedure; • CCO Training Guidelines • Control Room Management Plan • Pipeline Emergency Response Certification • Terminal Emergency Response Certification • Emergency Response Recertification • Call-out Equipment Issues Procedure • Loss of Contact Procedure • Working Alone – Field Personnel Notification • Medical Emergency Procedure – CCO Personnel
Assessment: The Control Room Management Plan (CRM Plan) section 3.3.13 states that the *Control Room Operator (CRO) has the authority to shutdown the pipeline.* In addition, if the Operator becomes ill, the document states, *"In the event that one console qualified Operator becomes ill, all CCO pipeline and terminal Operators and Senior Technical Advisors are qualified in tasks that would allow them to shutdown a pipeline or terminal in an emergency."* In other words, if a CRO becomes ill and cannot perform their duties, there are other operators within the control room who are qualified and authorized to step in and perform this function, if necessary. The Emergency Shutdown – Pipeline Procedure lists the response steps when an emergency shutdown request is required. The procedure describes the responsibilities for the CRO, Senior Technical Advisor (STA) and Supervisor. Control Room Operator responsibilities include initiating commands through the Supervisory Control and Data Acquisition (SCADA) system to field equipment to stop the line and sectionalize the pipeline. The Senior Technical Advisor verifies the changes made by the Control Room Operator, and the Supervisor performs emergency

notifications and initiates an incident report. Interviews with Control Centre staff confirmed that the Control Room Operator has authority to shutdown the pipeline.

Section 1 of the CCO Training Guidelines Procedure describes the requirement for newly hired personnel to complete "*Simulator training including applicable Terminal or Pipeline Emergency Response Certification*". The audit staff requested and was provided with training records to demonstrate that Pipeline Emergency Response Certification, Terminal Emergency Response and Emergency Certification training was being provided by the company. The records were found to be adequate.

With respect to on-going training or re-certification training in emergency operations, please refer to **AP-15** and **AP-16** dealing with **Training, Competency and Evaluation**.

Enbridge provides annual team training which is described in section 8 of the CCO Training Guidelines Procedure. This section indicates: "*Simulator exercises for Emergency Response Simulation will incorporate scenarios based on review of actual operating data for the occurrence of simultaneous or in-sequence abnormal operating conditions, including a combination of the follow scenarios based on actual Enbridge Control Centre incidents in all sessions:*

- *Leak while running*
- *Leak during or prior to pipeline startup*
- *Leak during full or partial (e.g., upstream of full stream injection) pipeline shutdown*
- *Obstruction while running*
- *Obstruction during or prior to pipeline startup*
- *Emergency alarm (Fire, Gas, MBS)"*

Enbridge provided the CER audit staff with an assessment of an Emergency Recertification – Simulation Evaluation. Control Centre safety procedures for field staff include three specific procedures. The Call-Out Equipment Issue Procedure describes the communication requirements between the Control Room Operator and field personnel when an equipment issue or condition requires immediate field notification. The Loss of Contact Procedure provide appropriate response when contact is lost with field personnel. The Working Alone – Personnel Notification Procedure describes the response steps when the Control Centre receives a notification that field personnel have not checked in through the third-party monitoring company.

Enbridge also provided the CER audit staff with a presentation and demonstration of a Fluid Withdrawal Test simulation, which is designed to test its systems and personnel to determine if they can identify a leak and take the appropriate measures including the steps to shut down the pipeline.

On a quarterly basis, Enbridge tests its process to transfer control operations from the primary to the backup control room and then back again. The process is designed to ensure that every operator in the control room has to go through the process at least once a year. During a controlled transfer the pipeline systems would not be shut down, but in the event of a real emergency, the company would shut down all pipelines before abandoning the primary control room and would then restart them once the operators had transferred to the backup control room.

In summary, Enbridge demonstrated that it has established emergency procedures for the safe control or shutdown of the pipeline system in the event of an emergency; and safety procedures for personnel at emergency sites.

Finding: No Issues Noted.

Based on the information made available by Enbridge and reviewed by the CER audit staff within the scope of this audit, no non-compliances relating to this protocol item were identified during the audit.

AP-15: Training, Competence and Evaluation

Regulatory Requirement:

OPR s. 6.5(1) A company shall, as part of its management system and the programs referred to in section 55,

OPR s. 6.5(1)(j) establish and implement a process for developing competency requirements and training programs that provide employees and other persons working with or on behalf of the company with the training that will enable them to perform their duties in a manner that is safe, ensures the security of the pipeline and protects the environment.

OPR s. 46(1) A company shall develop and implement a training program for any employee of the company who is directly involved in the operation of the pipeline.

OPR s. 46(2) The training program shall instruct the employee on

(a) The safety regulations and procedures applicable to the day-to-day operation of the pipeline;

(a.1) The security processes, procedures and measures applicable to the day-to-day operation of the pipeline;

(b) responsible environmental practices and procedures in the day-to-day operation of the pipeline;

(c) the procedures for the proper operation of the equipment that the employee could reasonably be expected to use; and

(d) the emergency procedures set out in the manual developed under section 32 and the procedures for the operation of all emergency equipment that the employee could reasonably be expected to use.

(3) The company shall use reasonable efforts to ensure that any employee who attends a training program has a working knowledge of the subject-matter of the program at the end of the program.

Non-Mandatory Requirement - CSA Z662-15 - E.9.1: Pipeline controllers shall receive appropriate initial training and retraining. The operating company shall develop a policy for pipeline controller training, testing and retraining. Testing shall be performed to determine pipeline controller competency before the pipeline controller operates the pipeline. The operating company shall establish competency criteria for pipeline controllers. The leak detection system developers, support staff, and pipeline controllers shall be competent in understanding the leak detection methodology, critical equipment and processes, the software application, and the influence of each on the performance of the leak detection system.

Expected Outcome: The company can demonstrate that it has established competency criteria and training programs for pipeline controllers. It is expected that:

- the company has a compliant process for developing competency requirements and training programs;
- the company has defined what competency requirements are required;
- training programs are traceable and trackable to the defined competency requirements and effective at achieving the desired competencies;
- employees and those working on behalf of the company are competent to carry out their assigned work; and
- persons working with or on behalf of the company are provided with adequate training applicable to s.55 programs and the management system.

Summary of Information Made Available by Enbridge:

The information provided by Enbridge to the CER audit staff to demonstrate compliance to this regulatory requirement included:

- Workforce Competency and Qualification Management Process
- Integrated Management System Document
- Operate and Maintain Management Program
- Liquid Pipelines Technical Capability Process
- CCO Training Guidelines
- Control Room Management Plan
- Competency Standard Leak Detection Analysis
- Competency Standard Leak Detection Event Management
- Individual Training Plan
- Enbridge Learning Management System Competency Requirements Phases 1 to 5
- Pipeline Emergency Response Certification
- Terminal Emergency Response Certification
- LP Technical Training Department Plan

Assessment:

The Integrated Management System Document (IMSD), Section 5.6, describes the enterprise-wide Workforce Competency and Qualification Management process, which is designed and intended to establish a consistent approach to ensure a competent and qualified workforce.

The Enbridge Workforce Competency and Qualification Management Process describes the roles and responsibilities, standards and requirements, and a process description/map, which describes interactions with other IMSD processes. These are designed for a consistent approach across the Enbridge Management Program areas to ensure a competent and qualified workforce. The process applies to all Enbridge employees and contractors and the scope includes enterprise wide functions as they pertain to liquid pipelines and Major Projects.

The Section 8, Capability Management section of the Operate and Maintain Management Program document aligns with the IMSD Workforce Competency and Qualification Process and identifies the processes to be followed to create the required training programs and validation tools.

Section 9 of the Control Room Management Plan (CRM Plan), describes the various types of individual operator training and CCO team training that must be carried out.

Competency requirements for Leak Detection Analysts were provided in the competency standards for Leak Detection Analysis and Leak Detection Event Management.

The LP Technical Capability Process describes how training and competency staff in the LP Technical Training Department work with subject matter experts to identify technical competencies, develop and implement outcome-based learning solutions, and administer technical competency assurance and assessment programs that attract, retain and develop its workforce.

The CER audit staff was provided with the CCO Training Guidelines and the five phases of competency evaluation and corresponding training records to demonstrate that the required training and competency evaluations are being completed for CCO Personnel. The objectives of the control room training program are to:

- Train and qualify new staff
- Cross-train and qualify existing staff on different consoles
- Develop and deliver annual lessons learned / team training.

The CCO Training Guidelines describes the 5-phased approach followed for the Entry Level Training Program, including:

- Estimated Training Duration (based on historical data);
- The identification of the trainee's mentor
- Console Specifics (Pipeline, Terminal, Hybrid)
- Timelines for completion of each of the 5 Entry Level Training Phases

For example, the CCO Training Guidelines stipulate that Control Centre Operators are required to complete:

- One or both of the training programs for either Liquids Pipeline Operations or Liquids Terminal Operations Proficiency checklists and written quizzes for the specific facilities they will control
- Simulator training including applicable Terminal or Pipeline Emergency Response Certification
- Operator Qualifications in associated covered tasks (as per 49 CFR Part 195 Subpart G and the Enbridge OQ Plan)
- Each position specific training program seeks to develop specifically applicable competencies.

In order for new operators to operate Enbridge Facilities without direct supervision, each trainee must be evaluated to be in a competent state relative to each of the assigned competencies. In the company's eLMS, an evaluation of "Acquired" indicates that a training operator is in a

Competent state, while any evaluation that does not read "Acquired" indicates that the training operator is considered "Not-yet-Competent" for the specified role and requires further training and mentoring. To achieve the status of acquired, new operators must demonstrate to their mentor that they are able to operate their assigned console for a specified period of time without requiring assistance.

New LDAs follow a training plan similar to CROs, although focused specifically on leak detection systems and their use in liquids pipelines operations. The training plan is a 3-phase approach aimed at achieving competency. Competencies assigned to LDAs are described in the Leak Detection Analysis and Competency Standard - Leak Detection Event Management. Upon demonstrating the required capabilities under the guidance of a mentor, new LDAs undergo a competency assessment to ensure they are at the fundamental level of the mentioned competencies. Similar to CROs, eLMS tracks the state of competency for LDAs.

Enbridge provided the CER audit staff with screen shot examples of completion of training for CROs and LDAs. Screen shots include the following:

- Individual Training Plan
- Phase Completion Records
- ELMS Competency Phase 1
- ELMS Competency Phase 2
- ELMS Competency Phase 3
- ELMS Competency Phase 4
- ELMS Competency Phase 5
- Pipeline Emergency Reponses Certification
- Terminal Emergency Response Certification
- Operator Qualification Record titled, Startup of a Liquid Pipeline.

Enbridge also provided:

- The Shift Supervisor Training Plan
- A Shift Supervisor eLMS Completion Record for Shift Supervisor Training

In summary, Enbridge was able to demonstrate that it has established and implemented competency criteria and training programs for control room staff and that the training programs are being delivered.

Finding: No Issues Noted.

Based on the information made available by Enbridge and reviewed by the CER audit staff within the scope of the audit, no non-compliances relating to this protocol item were identified during the audit.

AP-16: Training, Competence and Evaluation

Regulatory Requirement:

OPR s. 6.5(1) A company shall, as part of its management system and the programs referred to in section 55,

OPR s. 6.5(1)(k) establish and implement a process for verifying that employees and other persons working with or on behalf of the company are trained and competent and for supervising them to ensure that they perform their duties in a manner that is safe, ensures the security of the pipeline and protects the environment;

OPR s. 46(2) The training program shall instruct the employee on

(a) The safety regulations and procedures applicable to the day-to-day operation of the pipeline;

(a.1) The security processes, procedures and measures applicable to the day-to-day operation of the pipeline;

(b) responsible environmental practices and procedures in the day-to-day operation of the pipeline;

(c) the procedures for the proper operation of the equipment that the employee could reasonably be expected to use; and

(d) the emergency procedures set out in the manual developed under section 32 and the procedures for the operation of all emergency equipment that the employee could reasonably be expected to use.

(3) The company shall use reasonable efforts to ensure that any employee who attends a training program has a working knowledge of the subject-matter of the program at the end of the program.

Expected Outcome: The company is able to demonstrate that it has established and implemented a process for verifying that control room personnel are trained and competent and for supervising them to ensure they perform their duties in a manner that is safe, ensures the security of the pipeline and protects the environment. It is expected that:

- the company has a compliant process for verifying employees and other persons are trained and competent;
- records are maintained demonstrating employees and other persons working on behalf of the company are trained and competent as applicable to the Integrity Management Program and specifically, the control room;
- the company has a compliant process for supervising employees and other persons working on behalf of the company; and
- supervision of employees and other persons is adequate to ensure they perform their duties in a manner that is safe, ensures the security of the pipeline and protects the environment.

Summary of Information Made Available by Enbridge:

The information provided by Enbridge to the CER audit staff to demonstrate compliance to this regulatory requirement included:

- Operate and Maintain Management Program
- Liquid Pipelines Technical Capability Process
- CCO Training Guidelines
- Control Room Management Plan
- Edmonton Crude – Batch Swing Receipt
- Densitometer Failure – Terminal
- Gas Alarm - 40 Percent LEL – Terminal
- Leak Detection – SPS – System Outage
- Leak Detection – MBS – Leak Alarm
- CCO Competency Program Phase 5
- Pipeline Emergency Response Certification
- Emergency Response Re-certification
- ELMS Operator OQ Completion – Startup of a Liquid Pipeline
- Procedure Accelerator - Procedure Acknowledge Example
- OQ Evaluation: CC6 - Startup of a Liquid Pipeline
- Competency Requirement - Control Pipeline and Terminal
- Competency Requirements - Transport Hazardous Liquids (Control Centre)
- Competency Requirements - Manage Risk (Control Centre)
- Competency Requirement - Communicate with Operational Stakeholders (Control Centre)
- Competency Requirement - Recognize and Respond to Abnormal Operations (Control Centre)
- Competency Requirement - Recognize and Respond to Emergency Operations (Control Centre)
- Competency Requirement - Operate Console Generic (Control Centre)
- Performance Checklist Operate Edmonton Terminal Console
- Competency Standard Leak Detection Analysis
- Competency Standard Leak Detection Event Management
- Performance Checklists – Formative
- Competency Checklists – Summative
- Leak Detection Analyst Competency Assessment
- Shift Supervisor Training Plan
- Shift Supervisor eLMS Completion Record for Shift Supervisor Training
- LP Technical Training Departmental Plan

Assessment:

As mentioned in the discussion section of **AP-15** (above), section 5.6 of the Integrated Management System Document (IMSD), references the Workforce Competency and Qualification Management Process. This section describes the roles, responsibilities as well as the standards and requirements and a process map which ensures that each program area follows a consistent approach to ensure a competent and qualified workforce. The process map shows its interaction with other IMSD processes.

Enbridge also provided Section 8 of the Operate and Maintain Management Program which addresses capability management. The CER audit staff was provided with the LP Technical Capability Process and the spinoff CCO Training Guidelines. Competency requirements of Leak Detection Analysts was provided in the Competency Standard for Leak Detection Analysis and Competency Standard for Leak Detection Event Management and the five phases of competency evaluation and corresponding records. The company provided the CER audit staff with:

- Competency standards;
- Performance and competency checklists;
- Procedure accelerators; and
- Records of how Enbridge verifies training for workers.

The LP Technical Capability Process describes how training and competency staff in the LP Technical Training Department work together with the Operate and Maintain Management Program's subject matter experts to identify technical competencies, develop and implement outcome-based learning solutions, and administer technical competency assurance and assessment programs that attract, retain and develop staff.

The Enbridge Control Room uses the Enbridge Learning Management System (eLMS) to track the completion of training activities, evaluation events, emergency response certifications, and operator qualifications. Supporting records for completed activities are tracked in the eLMS and stored in a structured SharePoint record repository.

Operators and Leak Detection Analysts are required to review and acknowledge each procedure in the Procedure Accelerator (PA) tool that is mapped to their role by clicking the company's link in the PA tool. They are required to do this during the final phase of their training program and whenever there is a change to a PA procedure and on an ongoing annual basis.

Enbridge LP employs an outcome-based training model that is specifically designed to ensure that employees are competent to perform the required work before they are allowed to operate their console on their own. Required training program outcomes for the Control Centre are defined in a series of competency standards, which the CER audit staff reviewed. All learning and evaluation activities are designed to support the development and verification of the knowledge, skills, abilities, and behaviors listed in the competency standards.

Each new employee is assigned a qualified mentor, who is an experienced member of the CCO, to oversee their training and to sign off when they have demonstrated the required competencies. The Operator's Mentor is required to complete the Operator's competency Performance

Checklists during each phase of their training to guide their formative learning and demonstrate their capability to follow the requirements listed in the Competency Standards.

Operators and Leak Detection Analysts are also required to complete competency checklists for each assigned competency standard and be evaluated against operator qualification requirements at the conclusion of their training program to verify and document that all competency and qualification requirements have been met.

Enbridge provided the CER audit staff with a number of records used by the company to identify competency requirements, design and implement training programs and to certify and recertify their employees. Examples included:

- eLMS Record for Core Training Phase 5 Competency Completion
- Emergency Response Certification for new control room Operators
- Emergency Response Re-Certification for existing qualified control room Operators
- eLMS Record for Operator Qualification Completion
- Procedure Accelerator example with acknowledgement statement
- Supporting Record for Operator Qualification, titled, Startup of a Liquid Pipeline
- Control Pipeline and Terminal
- Transport Hazardous Liquids
- Manage Risk
- Communicate with Operational Stakeholders
- Recognize and Respond to Abnormal Operations
- Recognize and Respond to Emergency Operations
- Operate Console Generic, titled Operate Console Generic – Terminal (Additionally, an Edmonton Console specific example was provided, titled, Performance Checklist Operate Edmonton Terminal Console)
- Competency Standard Leak Detection Analysis
- Competency Standard Leak Detection Event Management

The CCO Training Guidelines and the Control Room Management Plan describe the tactical requirements for managing training and competency in the Control Room, both of which have been established and implemented for over three months. The LP Technical Capability Process (published in July 2019), replaces the LP Technical Training Department Plan document, first published in February 2017. The change was made to align with IMSD requirements, but the governing requirements were not materially changed.

In summary, Enbridge was able to demonstrate that it has established and implemented competency criteria and training programs for control room staff and that competencies are checked on an ongoing basis after initial training programs are delivered.

Finding: No Issues Noted.

Based on the information made available by Enbridge and reviewed by the CER audit staff within the scope of the audit, no non-compliances relating to this protocol item were identified during the audit.

AP-17: Annual Training Program Report

Regulatory Requirement:

OPR s. 56 A company shall, in addition to complying with the record retention requirements set out in the CSA standards referred to in section 4, retain

(b) An annual report on the training program developed under section 46 that compares the actual training received by employees to the planned training.

Expected Outcome: The company is able to demonstrate that it prepares an annual report that compares the actual training received by employees and other staff working on behalf of the company in the control room to the planned training.

Summary of Information Made Available by Enbridge:

The information provided by Enbridge to the CER audit staff to demonstrate compliance with this regulatory requirement included:

- Control Room Management Plan
- CCO Training Guidelines
- 2018 Fall Training Course Map
- 2018 Winter Training Course Map
- Fall Training Completion
- Winter (Spring) Training Completion

Assessment:

Enbridge creates and retains individualized training reports for each employee assigned to operate pipeline assets. Individualized programs are utilized to directly align the competencies developed through associated learning activities with the specific assets the employee is assigned to operate. The individualized training reports are titled the 'Phase 5 Wrap Up Checklist' and they are reviewed and signed by the employee, the employee's mentor, the employee's supervisor, and the training facilitator assigned to oversee an employee's progression through their individualized training program.

Enbridge creates and implements an individualized training program for each control room employee tasked with operating pipeline assets. The training is structured around the standardized competency based training activities described in **AP-15** and **AP-16**. Upon conclusion of all required training and assessment activities, the 'Phase 5 Wrap Up Checklist' is created to serve as a record that the actual training received by the employee matches the planned training that was assigned. Since the training program required to meet the requirements of the OPR s. 46 is specific to each employee, the reporting system Enbridge has established to validate that all assigned training activities have been completed is also specific to each employee.

All employees that are currently operating Enbridge assets also participate in regular refresher training and requalification activities that are stipulated in the CCO Training Guidelines document. Individual reports are generated at the conclusion of each semi-annual training session to

validate that all required individuals attended each session. Operator qualification Reports are generated quarterly and reviewed by CCO leadership.

Enbridge also implements a secondary control by reviewing training records for all employees directly involved in the operation of pipeline assets as part of its annual CRM Effectiveness Review activity. This review provides additional assurance that training requirements have been met as stipulated in the CCO Training Guidelines document. The results of the secondary control are summarized, documented in a CRM Report and presented to the CCO Management Team, as part of the annual CRM Review process.

The Control Room Management (CRM) Plan section 9.1.2 - Program Curricula, describes the learning objectives for Pipeline and Terminal Operators. It indicates that, in addition to the overall training program, specific training for each console is to be conducted annually to ensure a working knowledge of each facility. This document indicates that the Operator training program review is to be conducted annually and on an ongoing basis. CRM Plan Section 9.1.5 - Program Reviews, states that ongoing training program review is based on findings and recommendations from other processes outlined in the CRM Plan, such as CCO Incident Investigation.

Section 8 of the CCO Training Guidelines annual team training states that all control room Operators are evaluated at least once each calendar year in the completion of a simulator exercise, which includes recognition, analysis and response to an emergency condition. In addition, Enbridge conducts exercises in which the entire Control Room staff transition from the primary control room to the backup control room. The company keeps track of participants in these exercises to ensure that all Control Room personnel go through at least one these exercises annually.

Mandatory annual team training topics are described in Section 8.1 of the CCO Training Guidelines. All control room Operators must participate in semi-annual training sessions that include human factors, table top exercises and technical training topics.

- All training records are maintained using the Enbridge Learning Management System (eLMS) tool. This tool is used to track the annual team training provided along with the completion dates of attendees. Controls to ensure training requirements align with the CRM Plan and associated processes are assessed during the CRMP Effectiveness Review. Enbridge provided sample supporting documentation that reflected program planned training and the completion of the annual training requirements.
- Enbridge provided Planning Records: Semi-Annual Training Agendas titled, 2018 Fall Training Course Map and 2018 Winter Training Course Map.

Enbridge provided the CER audit staff with Completion Records: eLMS checkoff for employee's successful completion of Fall and Spring Sessions titled, Fall Training Completion and Winter (Spring) Training Completion.

The status of all training is reviewed quarterly and annually as part of the company's management review process, which is the process through which senior management is made aware of the status of training, and any deficiencies.

In summary, the CER audit staff was able to verify that the Enbridge Control Centre Management Team has established and implemented adequate processes to provide Enbridge Senior Management with the status of its training program in order for the company to prepare an

Annual Training Report as required by the OPR s. 56(b). The CER audit staff did not verify that Enbridge actually prepares an Annual Training Report at the corporate level to advise the Accountable Officer that the company's training program complies with the requirements of the OPR s. 46.

Finding: No Issues Noted.

Based on the information made available by Enbridge and reviewed by the CER audit staff, no non-compliances relating to this protocol item were identified within the scope of the audit. The control centre was able to demonstrate that it is providing Enbridge Senior Management with adequate information from which an Annual Training Report could be prepared. However, given that the audit only assessed management practices at the level of the control centre and not at the corporate level, the CER audit staff did not assess whether the company was using the CCO training information as one subset of the information it uses to generate an Annual Training Report. The CER may request further information on this issue outside of the audit.

AP-18: Control Room Audits

Regulatory Requirement:

OPR s. 55(1) A company shall conduct audits with a maximum interval of three years of the following programs: (b) the integrity management program referred to in section 40, including the pipeline control system referred to in section 37;

OPR s. 55(2) The documents prepared following the audit shall include (a) any deficiencies noted; and (b) any corrective action taken or planned to be taken.

Expected Outcome: The company is able to demonstrate that it conducts audits of the pipeline control system and leak detection system with a maximum interval of three years. The audit reports note any deficiencies and any corrective actions taken or planned to be taken.

Summary of Information Made Available by Enbridge:

To demonstrate compliance to this regulatory requirement, Enbridge provided the CER audit staff with its:

- Integrated Management System Document
- 2016 Internal NEB OPR audit Report – BEC-BR-03
- Operate and Maintain Management Program
- Control Room Management Plan Effectiveness Review Process
- Control Room Management Plan Effectiveness Review – Final Summary Report 2017
- Control Room Management Plan Effectiveness Review – Summary Report 2018
- Control Room Management Plan Effectiveness Action Items titled CRM Plan Effectiveness – Action Items JIRA snapshot
- 2016 Internal NEB OPR audit Report – CAPA Tracking
- D2-101 – Control Pump Station – Revised per BEC-CAP-3.4

Assessment:

In an attempt to demonstrate that it meets this regulatory requirement, Enbridge provided the CER audit staff with a copy of an audit report titled: Briefing Report #: BER-BR-03, 2016 OPR 53/55 Statutory audit, dated 12 December 2016. It also provided its Tracking Sheet which identified the corrective action plans (CAPs) stemming from the audit. To demonstrate that it was following up on the CAPs, Enbridge provided documented evidence of the status of CAP D12-101 Control, Pump Station engineering standard.

The CER audit staff reviewed the Briefing Report #: BER-BR-03, 2016 OPR 53/55 Statutory audit, dated 12 December 2016 and noted that the regulatory requirements that were assessed in the audit were seven (7) clauses from CSA Z662-15 (clauses 4.14.1.6; 4.14.3.3; 10.3.2.6; 10.3.3.1; 10.3.3.2; 10.3.3.5; and 10.3.3.6). The audit did not evaluate any of the processes that the company has in place to assure it is meeting the requirements of the OPR or that those requirements are adequately linked with the LP IMSD and other program areas, where appropriate. When

the CER audit staff inquired as to why Enbridge had not included any OPR requirements, it was advised that the reason was because the NEB had conducted an audit in 2014/2015 in which the management system and some of the company's program areas had been audited.

The Board did in fact conduct an audit in 2014/15 of Enbridge's LP management system and the following management or protection programs:

- Safety Management Program;
- Integrity Management Program;
- Emergency Management Program;
- Environmental Protection Program;
- Third Party Crossings Program; and
- Public Awareness Program.

The CER audit staff reviewed the 2014/15 audit Report, dated 31 March 2015. In its report the Board noted that Enbridge was undertaking many of the activities that are normally associated with a Quality Assurance Program. However, the Board found that:

- Enbridge had not organized the quality assurance activities within a Program as required by the OPR;
- Enbridge was not able to demonstrate that it had undertaken audits consistent with the OPR requirements; and
- Enbridge's process for conducting audits did not meet the Board's expectations.

In response to the audit report, Enbridge developed and submitted to the Board a Corrective Action Plan dated 20 May 2016. In the CAP, the Company stated:

"Enbridge will develop and implement an Assurance Program in IMS-01 that aligns with the NEB audit report expectations. As part of this overall Program, Enbridge has developed inspection, internal audit and corrective and preventative action processes in its IMS. Enbridge is currently reviewing and modifying these processes to align with the NEB auditor's expectations of an Assurance Program and will implement the Program and supporting processes."

Enbridge's milestones to complete its CAP were:

- To document and approve its Assurance Program by Q3 of 2015;
- Document and approve the Implementation Plan for the Assurance Program by Q3 of 2015; and
- Complete execution of the Implementation Plan for the Assurance Program by Q4 of 2015.

Based on the information provided to the CER audit staff by Enbridge, no evidence was provided to indicate that the Assurance Program described in the 20 May 2016 CAP has been implemented. However, section 5.9 of the LP IMSD states that the company is currently designing and establishing an Integrated Assurance audit Program. Enbridge advised the CER audit staff during interviews that beginning in 2020, the program will consolidate a number of existing assurance activities to improve overall quality, and deliver an integrated and coordinated assurance program enterprise-wide. The CER audit staff were further advised that an audit of the pipeline control system is currently scheduled for Q1-Q2 in the year 2020 under the Integrated Assurance audit Program. Even if the Enbridge 2016 Internal audit was assessed as being adequate, given that the audit was dated 22 December 2016, and the next audit of the pipeline control system is planned to be conducted in the first two quarters

of 2020, it can be concluded that the company is not meeting the requirements of the OPR s. 55 that Program audits of the pipeline control system be conducted at a maximum interval of three (3) years.

In spite of being unable to demonstrate that the company has conducted a program audit of its pipeline control system in accordance with the requirements of the OPR, Enbridge did demonstrate to the CER audit staff that it is conducting some assurance assessment activities applicable to the pipeline control system. The Control Room Management Plan (CRM Plan) Effectiveness Review Process was developed to facilitate a methodical and consistent review of each component in the CRM Plan. The Effectiveness Review Process is *"an annual assessment of practices and processes within the CRM Plan to ensure consistency and quality in operations while maintaining best practices, standards and regulations"*. It is an internal practice that reviews and assesses each component in the CRM Plan and ensures alignment to regulations, standards and industry best practices. Regulatory commitments and updates are reviewed annually to ensure compliance to regulations. Updates to the CRM Plan Effectiveness Review protocols are made accordingly. This review is performed annually to ensure that control room processes are compliant, effectively implemented and are consistently executed. It is designed to review the current state of CRM Plan elements and provide insight into the performance and provide recommendations for improvement. A report is issued annually to document the Review, providing a summary of the effectiveness findings against the CRM Plan, related processes and supporting activities.

Enbridge provided the CER audit staff with the CRM Plan Effectiveness Review Summaries for 2017 and 2018. Outcomes from the reviews are documented using an internal tracking spreadsheet which lists the section of the CRM Plan, the Operating Effectiveness Test, the Desired Outcome and other related information. Findings and opportunities for improvements found during the reviews are presented during an annual Pipeline Control and Effectiveness Review and Quality Assurance presentation to stakeholders and management. Corrective actions are assigned during the meeting or are followed up using an internal tracking tool called JIRA. Current year and previous year action items are reviewed during the presentation meeting.

In summary, although Enbridge was found to be conducting effectiveness reviews of its CRM Plan processes and audits of the LP IMS Protection Programs, the Company did not demonstrate that it conducted a Program audit of its pipeline control system in accordance with the requirements of the maximum 3-year interval requirements of the OPR s. 55.

Finding: Non-Compliant

Based on the information made available by Enbridge and reviewed by the CER audit staff, Enbridge has been found Non-Compliant relating to items described in this protocol item. While Enbridge did demonstrate that it conducted an audit of its pipeline control system, the audit did not meet the regulatory requirement of the OPR s. 55(1). The regulatory requirements that were assessed in the audit were seven (7) clauses from CSA Z662-15 (clauses 4.14.1.6; 4.14.3.3; 10.3.2.6; 10.3.3.1; 10.3.3.2; 10.3.3.5; and 10.3.3.6). The audit did not evaluate any of the processes that the company has in place to assure it is meeting the requirements of the OPR or that those requirements are adequately linked with the Liquid Pipelines Integrated Management System or other program areas, where appropriate. This is a repeat finding from an audit conducted of Enbridge by the Board in 2014/15. Furthermore, Enbridge was unable to demonstrate that OPR s. 55(1) audits of its pipeline control system are being conducted with a maximum interval of three years. A CAPA Plan must be developed to analyze, address and manage both of these deficiencies.

AP-19: Leak Detection System – Audits of Special Incidents

Regulatory Requirement:

CSA Z662-15 clause E.8.4: audits shall also include and evaluate, where applicable, details of the following categories of incidents, the action taken, and the results achieved:

a) Pipeline leaks that were not detected by the leak detection system or that were not acted upon by personnel responsible for interpreting and responding to the leak detection system;

b) Occasions when the leak detection system was inoperative because of equipment or system failures exceeding 1 h in duration;

c) Alarms caused by maintenance;

d) Alarms that have an indeterminate cause; and

e) Invalid alarms of the same cause that occur frequently.

Note: Although Annex E of CSA Z662-15 is non-mandatory, Clause 4.20.2 states that r*egardless of the method of leak detection used, operating companies should comply as* ***thoroughly as practical*** *with Annex E regarding record retention, maintenance, auditing, testing and training.*

Expected Outcome: The company is able to demonstrate that it conducts audits of the leak detection system which evaluates incidents where:

- the leak detection system did not detect the leak;
- the personnel responsible for interpreting and responding to the leak detection system did not act upon leak alarms;
- the leak detection system was inoperative because of equipment or system failures exceeding 1 hours in duration;
- alarms were caused by maintenance;
- alarms have an indeterminate cause; and
- alarms of the same cause occur frequently.

Summary of Information Made Available by Enbridge:

To demonstrate compliance to this regulatory requirement, Enbridge provided the CER audit staff with:

- Pipeline Control Systems and Leak Detection (PCSLD) Internal Incident Review Process
- Leak Detection Alarm Manager (LDAM) – Remote Notification
- Lead Detection (LD) SPS Coverage Alarm
- Service Level Agreement (SLA) which it has in place to address leak detection equipment issues
- Event report for Event 24064 L4-ME-4-M-1 FrozenFM (as a sample of a reported event due to instrument error)
- A description of its Alarm Response Team (ART) and the process that the team follows
- Leak Detection System General Manual

- 2018 Q4 LD Performance – Snapshot by Line (as a sample LD Performance Report snapshot detailing the result of API 1130 test for each pipeline for Q4 2018 period)
- Fluid withdrawal testing process to test the Control Centre Personnel and the LDS
- LDS - 2019 M09 Model Routine Maintenance Tracking
- LDAS Monthly Report 2019-06 which reports on LDS performance metrics

Assessment:

Within its documentation, Enbridge has indicated that it has chosen to meet the requirements of CSA Z662 Annex E. In the Preface to the Enbridge Leak Detection System General Manual, it is stated: "*This manual is the first in a series of manuals that describe Enbridge's Leak Detection Systems (LDS). It provides a detailed explanation of LDS aspects that are common to the entire system. All LDS information applicable to individual pipelines can be accessed in their corresponding manual: Line Specific LDS Manual. These supplemental manuals make up the rest of the series, providing detailed routing, operational, and modelling information for each pipeline. Together, this series of manuals is designed to meet the requirements of CSA Z662 Annex E (Recommended practice for liquid hydrocarbon pipeline system leak detection) and API RP-1130 (Computational Pipeline Monitoring for Liquids).*"

Enbridge has a Pipeline Control System and Leak Detection (PCSLD) Internal Incident Review Process to review and investigate incidents related to the pipeline control and leak detection systems. The purpose of the PCSLD Internal Incident Review Process is *"to understand and document incidents or close calls and the process to capture initial actions, corrective actions and other opportunities for improvement resulting from the review. Information resulting from this process is also used for reporting and general communication purposes"*.

The process map in section 4.1 of the PCSLD Internal Incident Review Process shows the roles and responsibilities of the various staff during an incident from notification, through review and to resolution and monitoring and finally, communication and closure. Section 4.2 describes each step of the process in greater detail.

Enbridge utilizes its Leak Detection Alarm Manager (LDAM) which includes remote notification functionality to ensure that no leak alarm is missed. As described in the assessment section of **AP-13: Analysis of Leak Alarms** (above), all leak alarms are analyzed. In situations where a leak within the performance thresholds of the Leak Detection System is not identified, an incident review is conducted as defined in the PCSLD Internal Incident Investigation Process.

All leak alarms are assessed individually by the Alarm Response Team (ART). If the cause of the leak alarm has not been determined within 10 minutes, the pipeline is shut down. Even when the pipeline is shutdown, the assessment continues until the root cause of the alarm is identified. The pipeline remains shutdown until the assessment is concluded. Additionally, if the LDS becomes inoperative for longer than 10 minutes, the associated pipeline is shut down until system operations are restored.

System health alarms such as leak detection system coverage, data issue, degradation, and system outage, are in place to monitor and address LDS issues and root cause. All system failure events are recorded, tracked and reviewed to ensure they are addressed. System performance

metrics are reported and assessed monthly. This assures operational reliability of the LDS and all outage events, including those exceeding one hour are assessed and corrected. Corresponding procedures are in place and executed to handle LDS health alarms.

Enbridge has a Service Level Agreement (SLA) in place to address leak detection equipment issues affecting (or that might affect) the operability or performance of the LDS. The SLA is triggered whenever an equipment issue is reported to be the root cause. Service level performance is reviewed on a monthly basis to ensure all targets are met and any exceptions are investigated and corrected. Enbridge provided a snapshot of the SLA describing the service description and service levels. It also provided the audit staff with a copy of an event on Line 4 (Event 24064 L4-ME-4-M-1 FrozenFM) as an example of an event reported due to instrument error.

Section 9 of the company's LDS General Manual discusses the Evaluation of LDS Performance. Testing to validate and verify LDS performance using industry practices API 1130 and to CSA Z662-15 Annex E is conducted on initial implementation, semi-annually and when changes are implemented. This testing is carried out to verify that Enbridge's LDS is performing as expected. If deficiencies are found, they are promptly addressed. Improvement opportunities of the LDS are reviewed, prioritized, and addressed through the model improvement plan and/or long-range capital program. Enbridge provided the audit staff with its Leak Detection Performance Snapshot detailing the result of API 1130 test for each pipeline for the Q4 2018 period.

As a component of its leak detection strategy, Enbridge regularly conducts fluid withdrawal testing. Fluid withdrawal tests can be announced in advance to CCO Staff, or conducted as unannounced events to prove both the effectiveness of the systems and the processes followed by personnel when systems go into alarm. The intent of unannounced testing is to provide an opportunity for Enbridge to evaluate operating and/or leak detection response procedures; personnel response and adherence to procedures; and the performance of the Leak Detection System. When unannounced fluid withdrawal tests are conducted, it is arranged that a few key people in the control room are aware of the test. In addition, sensors that might give the operator a clue that a test is being carried out, are blinded. As a result, when the test occurs, the on-shift Control Room Operator and the Leak Detection Analyst and the Senior Technical Advisor all believe that a real leak is occurring and must act accordingly.

Enbridge performs weekly maintenance checks on all pipelines it operates. This check verifies overall health of the LDS at a detailed level (i.e., within the LD model). All LDS alarms, including reoccurring and alarms generated by maintenance activities are reviewed to determine if corrective actions are required. Any issues found in these checks are investigated and resolved accordingly. As evidence the company provided the audit staff with its 2019 M09 Model Routine Maintenance Tracking Sheet.

The Enbridge Leak Detection team generates monthly reports on leak detection metrics such as scorecard performance, and SLA performance, as well as LD operational highlights (e.g., system availability and reliability). These reports provide an overview of the LDS operations over the month and include items such as number of alarms related to maintenance and description of issues resulting in reoccurring alarms. As evidence, the company provided the audit staff with its LDAS Monthly Report 2019-06.

Enbridge indicated that there have not been any incidents in the past six months that triggered an incident review due to CSA Z662-15 Clause E.8.4 (a) (i.e., Pipeline leaks that were not detected by the leak detection system or that were not acted upon by personnel responsible for interpreting and responding to the leak detection system).

Based on the information provided by Enbridge, the CER audit staff are satisfied that the company has a number of processes in place for responding to the types of incidents listed in CSA Z662 clause E.8.4. These include conducting assessments to identify root causes, making recommendations and taking corrective actions.
Finding: No Issues Noted. Based on the information made available by Enbridge and reviewed by the CER audit staff within the scope of this audit, no non-compliances relating to this protocol item were identified during the audit.

AP-20: Annual Management Review

Regulatory Requirement:

OPR s. 6.5(1) A company shall, as part of its management system and the programs referred to in section 55,

OPR s. 6.5(1)(x): establish and implement a process for conducting an annual management review of the management system and each program referred to in section 55 and for ensuring continual improvement in meeting the company's obligations under section 6.

Expected Outcome: The company is able to demonstrate that it has a process for conducting an annual management review of its control room operations and for ensuring continual improvement in meeting the company's operations under section 6. It is expected that:

- the company has a compliant process that is established and implemented;
- the company's methods for conducting the management review are defined;
- the company has defined methods for reviewing the management system and each s. 55 program;
- the company has maintained records to demonstrate the achievement of OPR s. 6 obligations is continually improved; and
- the company has identified, developed, and implemented corrective actions as part of its continual improvement.

Summary of Information Made Available by Enbridge:

To demonstrate compliance to this regulatory requirement, Enbridge provided the CER audit staff with:

- Management Review (MR) Process
- Annual Management Review Summary Template
- Annual Management Review Summary Guide
- Integrated Management System Document
- Operate and Maintain Management Program Document
- Communication – Kick off Annual Management Review
- Management Review Template Overview Presentation

Assessment:

Enbridge provided the CER audit staff with the company's Integrated Management System Document (IMSD) in which the Management Review (MR) Process is explained. Also provided was the MR Template and Guide which is used to generate a summary document for each program area, including the Operate and Maintain Management Program, which includes the Control Centre. Integration of the MR Process with each OPR s.55 program and Enbridge's Operate and Maintain Management Program is demonstrated in the following areas of the IMSD:

- Section 2.0 shows the Management Programs and Business Programs and the various management system processes that make up the management system including the MR Process.

- Section 3.4, describes the MR Process and how it fits into the role of continual improvement.
- Section 3.4 also describes the role of the Integrated Management System Executive Committee in the MR Process
- Section 5.13 describes the roles of Program and Management Process Owners in the MR Process.

Included within the MR process is specific direction to the various program areas regarding the requirements to conduct an annual MR. The company also provided the MR Template and Guide used in LP for each program area to prepare and report on their annual management review. Enbridge also provided the MR Process used by its Liquid Pipelines (LP) unit and explained the roles and responsibilities of its executive committee charged with reviewing the MR submissions of each program area and business unit. Finally, the company explained how the MR process gets moved up through the company executive committee to the Accountable Officer and ultimately leads to the creation of the company's annual report to the NEB in accordance with the OPR s. 6.6(1) and (2).

The requirement to conduct an annual MR is also discussed in Section 5 of the Operate and Maintain Management Program document, which states: *"The Operate and Maintain Management Program Owners carries out an annual management review that feeds into the LP IMS Annual Report reviewed by the Integrated Management System Executive Committee (IMSEC) and signed-off by the EVP, Liquids Pipelines (Accountable Officer)."*

The Operate and Maintain Management Program document, Section 12 – Management Review, Program Owners are advised on their inputs to the MR process.

Annually the Integrated Management Department sends a kick-off communication to IMS Management Program and Process owners, and management review coordinators. Enbridge provided the CER audit staff with a copy of the communication process, which included:

- A copy of the Management Review Process
- The Annual Management Review Summary Templates
- The Annual Management Review Summary Guide (instructions)

Annually a meeting is held with the management review coordinators to discuss the annual management review process and answer any questions or concerns related to the process requirements in:

- Benchmarking and Lessons Learned
- Additional Continuous Improvement Initiatives- Current and Planned Continual improvement information gets incorporated into the Annual Report as appropriate

The Liquid Pipelines (LP) Management Review Process describes how LP is to conduct the annual MR under the umbrella of the Integrated Management System Management Programs (includes s. 55 programs). The process is administered by the LP Integrated Management (IM) Department.

Once all program areas and business units have prepared and submitted their annual MR, they are reviewed by an executive committee.

Section 3.4 of the IMSD states that the Integrated Management System Executive Committee (IMSEC) is responsible to conduct the overall review of IMS performance. The IMSEC reviews the annual MR Summaries prepared by each Management Program and Management Process Owner. These summaries are used as input to the IMS Annual Report, from which the Accountable Officer is made aware of the performance of the company in meeting its goals, objectives and targets. From this the AO's annual report is prepared and reported to the CER. The report is reviewed by IMSEC, endorsed by the IMS Owner, and approved by the Accountable Officer. The Annual Report provides the basis upon which the Accountable Officer submits a signed statement to the CER that LP has completed the review and report, and is continually improving the safety and security of our assets, the general public as well as property and environment through the IMS.

In summary, Enbridge demonstrated to the CER audit staff that it has established and implemented a process for conducting an annual management review of its control room operations and for ensuring continual improvement.

Finding: No Issues Noted.

Based on the information made available by Enbridge and reviewed by the CER audit staff within the scope of this audit, no non-compliances relating to this protocol item were identified during the audit.

AP-21: Pipeline Control System and Leak Detection System

Regulatory Requirement:

OPR s. 37 A company shall develop and implement a pipeline control system that (a) **comprises the facilities and procedures used to control and monitor the operation of the pipeline;**

Expected Outcome: The company is able to demonstrate that it has developed and implemented a pipeline control system that includes a leak detection system that, for oil pipelines, meets the requirements of CSA Z662-15.

Summary of Information Made Available by Enbridge:

Information provided by Enbridge to the CER audit staff to demonstrate compliance to this requirement included:

- Pipeline Control System Design, Maintenance and Operations
- P003 – Determining Operating Limits Procedure
- P004 – Implementing Operating Limits Procedure
- CCO Alarm Management Plan
- CCO Normal Operating Procedure – Revising Pressure Operating Limit – Pipeline
- CCO Pipeline Operating Limit Verification Procedure
- P030 – Pipeline Operating Limit Verification Procedure
- SCADA Point to Point Verification Procedure
- Monthly SCADA Alarm Review Procedure
- May 2019 Edmonton SCADA Alarm Report
- Control Room Management Plan
- SCADA Commissioning Checklist
- SCADA Monthly Alarm Reports
- SCADA Transfer Procedures
- Pipeline Operational Limits Verification for 2018

Assessment:

Enbridge provided standards and procedures related to the Supervisory Control and Data Acquisition (SCADA) design, operation, maintenance, and operation. Specific topics included alarm management, backup systems, and commissioning. Enbridge provided tours of the Primary and Backup Control Centres during which time the audit staff observed the SCADA system operation. The CER audit staff also witnessed Control Centre Operator interactions with SCADA during a Control Centre shift change.

Enbridge provided the CER audit staff with its Determining Operating Limits Procedure that describes how the Control Centre defines and implements alarm set-points and control limit. The limits and shutdowns are imposed by the Control Centre Engineering team. The procedure states that the goals of the operating limits are to:

- *"Allow the safe steady state operation within the Maximum Allowable Operating Pressure (MAOP) of the pipeline.*
- *Provide automated protection of the pipeline and facilities.*
- *By exception and with proper change management, operating limits can be used as control to manage transient hydraulic requirements."*

The Implementing Operating Limits Procedure describes how the Senior Technical Advisor (STA) implements limit changes through a pressure limits interface. Enbridge provided the CER audit staff with a detailed record titled MOC: 2018-1449, dated 7 December 2018 as an example of an operating limit change on Line 21.

The Alarm Management Plan (AMP) section 5.3 describes the requirement to verify safety-related limits on an annual basis not exceeding 15 months. Enbridge provided the CER audit staff with the Pipeline Operational Limits Verification for 2018 as an example of the annual verification.

The Pipeline Operating Limit Verification Procedure defines how pressure control limits are verified and checked. The Background section of this document states *"SCADA* continuously *checks to ensure downloadable limits are consistent between the Operating Limit Database, SCADA and the PLC."*

The AMP describes how the Company establishes alarm effectiveness criteria and evaluates them monthly. In addition, the AMP describes:

- The roles and responsibilities of Control Centre staff (Section 4);
- The alarm performance targets (Section 5.7.1); and
- The alarm review tasks (Section 5.7.2).

The Monthly SCADA Alarm Review Procedure describes the steps to be taken to review the performance of the SCADA alarm system and identify opportunities for improvement. Enbridge provided the CER audit staff with the May and June 2019 Edmonton SCADA Alarm Reports to verify that this procedure is being carried out. These monthly reports along with the minutes from the 31 July 2019 Alarm Program Steering Committee Meeting (also provided by Enbridge) provided examples of performance monitoring and continuous improvement.

Enbridge provided the CER audit staff with a comprehensive list of procedures related to SCADA abnormal operations and transferring to/from the Primary and Backup Control Centres. Section 4.4.1 of the Control Room Management Plan (Backup SCADA Systems) describes how backup systems are monitored, maintained and responded to by the SCADA support group, which is available 24/7. The description of backup redundancy states:

- "*The backup control centre (or backup SCADA systems) duplicates the functions of the primary control centre (or primary SCADA systems) in order to provide continuity of operations in the event of an emergency at the primary control centre.*

- *Every SCADA server at the primary control centre has a redundant counterpart at the backup control centre which can operate the same facilities.*
- *Additionally, each server within both the primary and backup control centres has a redundant backup. SCADA server redundancy is applied within each respective control centre, as well as across the control centres themselves".*

The Transfer CCO Operations Site Procedure and the Emergency Evacuation Procedure describe the steps to transfer control between the primary and backup systems as well as the associated responsibilities. Transfer of control between the SCADA environments is also described in the SCADA Request for Maintenance or Install document. Backup SCADA systems are tested, at a minimum, annually. The backup systems are also utilized during maintenance of the primary systems, which also serves as a method to assess their functionality.

The Backup Control Centre consoles mimic the Primary Control Centre consoles requirements. This was observed by the CER audit staff when the Company provided tours of both facilities. The Company plans and institutes a planned test every quarter to transfer operations from the primary to the backup. Control Centre Operators perform checks to ensure systems are operating properly. Enbridge provided the CER audit staff with the following records to demonstrate executing these checks:

- Backup Control Centre Checklist;
- Backup Server and Console Checklist; and
- SCADA Mode Switch Checklist.

Enbridge provided the CER audit staff with its SCADA Point to Point Verification Procedure which describes the steps required to verify SCADA displays with the associate field equipment. This procedure is required when there is:

- An installation of a new SCADA solution;
- Addition of new field equipment;
- Change in existing SCADA display; or
- Change in SCADA database with or without corresponding PLC changes.

Various methods are used for the Point to Point Verification based on the consideration of safety and practicality. To verify that the Company carries out the Point to Point Verification Procedure, Enbridge provided the CER audit staff with SCADA Commissioning Checklist records for:

- Project# PEI-26174 dated 18 March 2019;
- Project# 20004466 dated 16 November 2017; and
- Project# 1241195A80 dated 3 March 2014.

SCADA display changes apply the API 1165 Recommended Practice for Pipeline SCADA Standard when SCADA displays are added, expanded or replaced as described in the API 1165 Display Review Procedure section 2.0 – Scope. Enbridge also provided SCADA philosophy and style guides that describe standardized practices, operational requirements, and displays.

Enbridge advised the CER audit staff that the company is currently in the process of switching over to a new, modern SCADA system. Part of the conversion activities involves the use of a "paired desk" process. In this process the "new" system is loaded onto two paired consoles. Then, the operators go through a two-month process of training and operating the new system while continuing to operate the old system. At the end of the two month process, the operators are switched over to the new system. The company estimates that it will take a number of years to switch all of its consoles over to the new system.

In summary, within the scope of this audit, Enbridge demonstrated that it has a developed, implemented and operates and maintains a pipeline control system, which is a Supervisory Control and Data Acquisition (SCADA) system. However, given the scope of the audit and the protocol used, the CER audit staff did not assess all pipeline control system and leak detection system requirements of CSA Z662.

Finding: No Issues Noted.

Based on the information made available by Enbridge and reviewed by the CER audit staff within the scope of this audit, no non-compliances relating to this protocol item were identified during the audit.

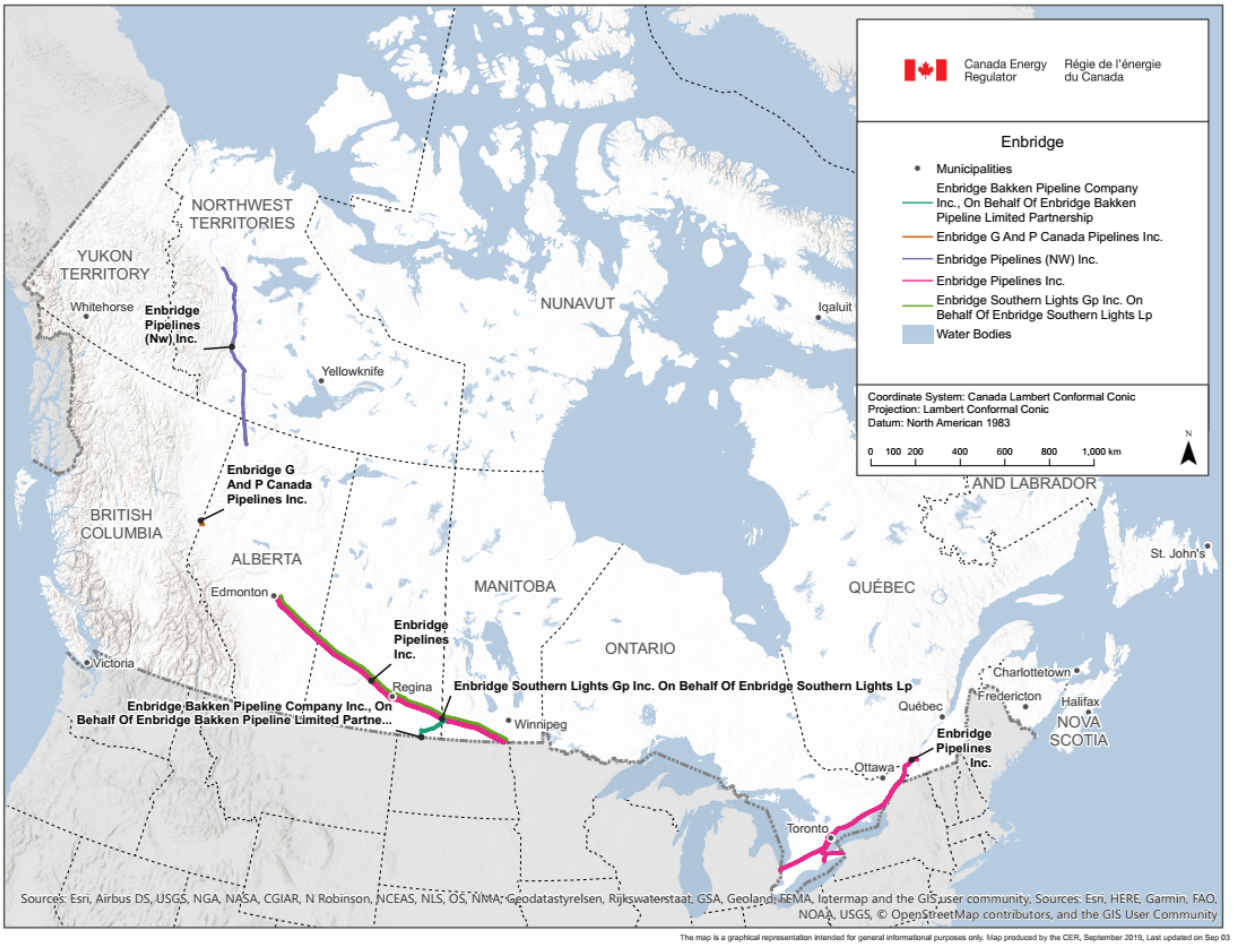
Appendix 2.0 - Maps and System Descriptions

Enbridge Pipelines Inc. and its subsidiaries included in the scope of this audit are shown in Figure 1 and specifically include:

- Enbridge Pipelines Inc.;
- Enbridge Bakken Pipeline Company Inc., on behalf of Enbridge Bakken Pipeline Limited Partnership;
- Enbridge Southern Lights GP Inc. on behalf of Enbridge Southern Lights LP; and
- Enbridge Pipelines (NW) Inc.

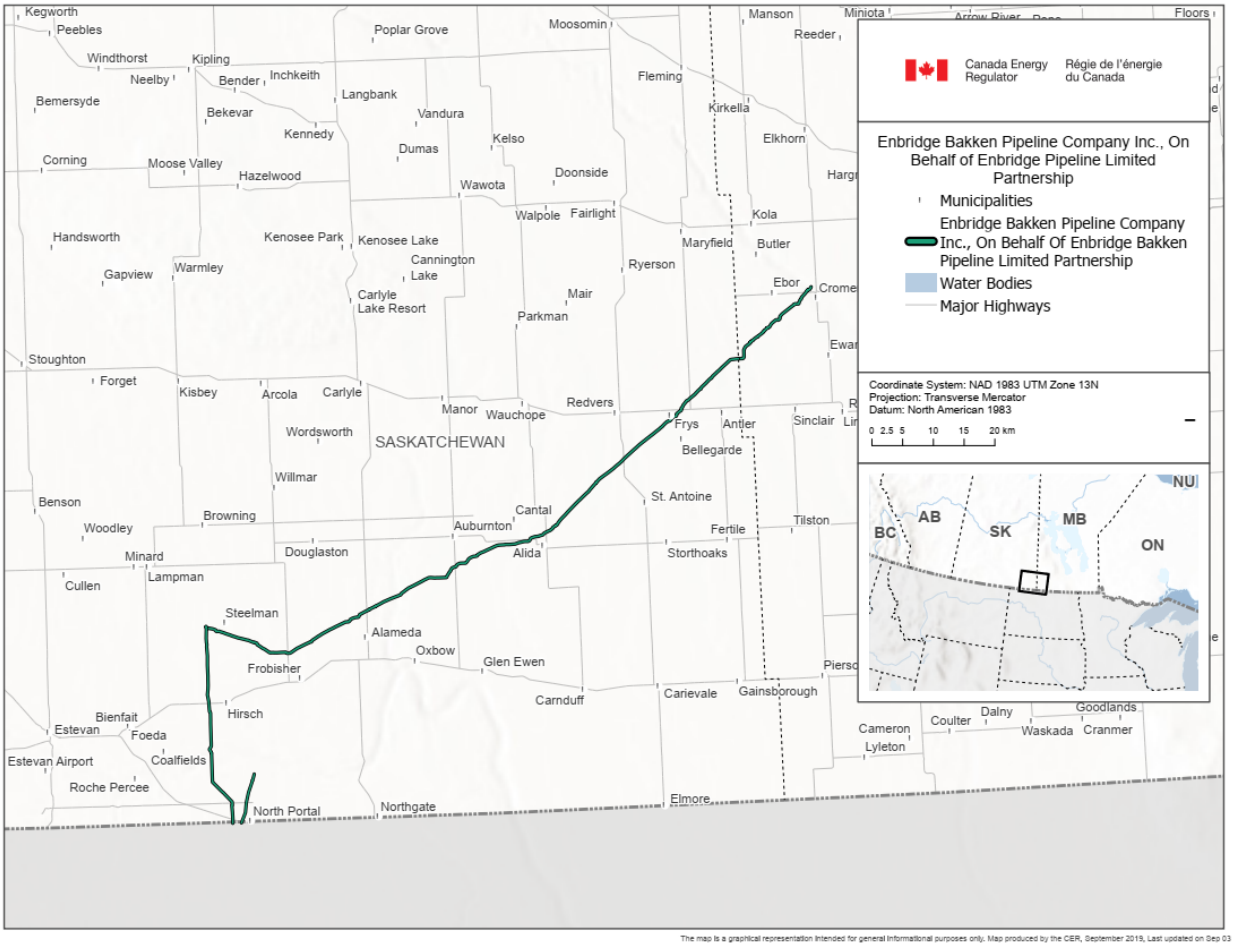
These subsidiaries hold the certificates for Enbridge's liquid pipeline, CER-regulated facilities.

Figure 1: Enbridge



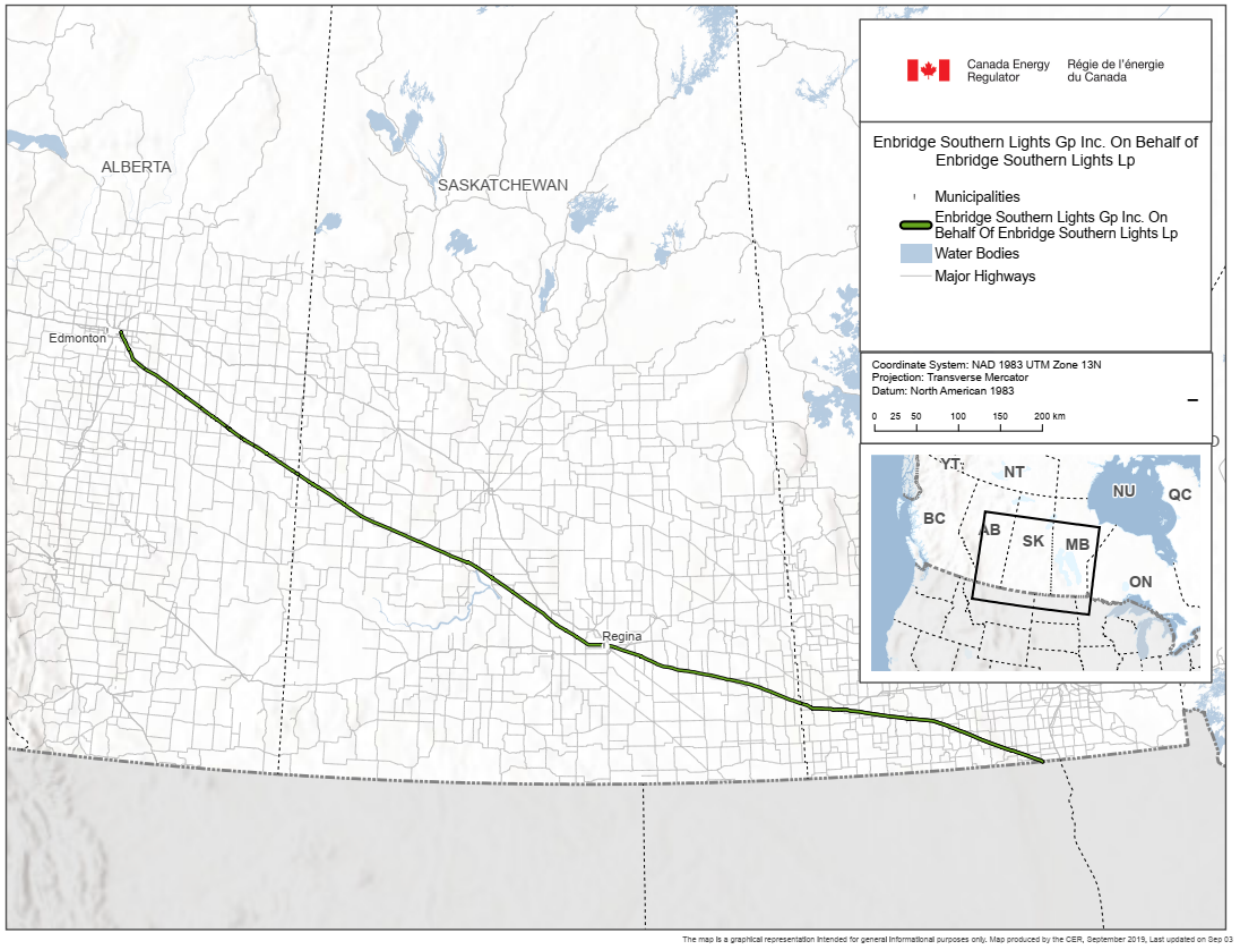
The Enbridge CER-regulated liquid pipeline system, shown in Figure 1, is 7,747.04 km of oil pipelines that extend from Edmonton, Alberta, to Montréal, Québec, connecting with other oil pipelines in the United States at the Manitoba/North Dakota and Michigan/Sarnia Ontario borders.

Figure 2: Enbridge Bakken Pipeline Company Inc.



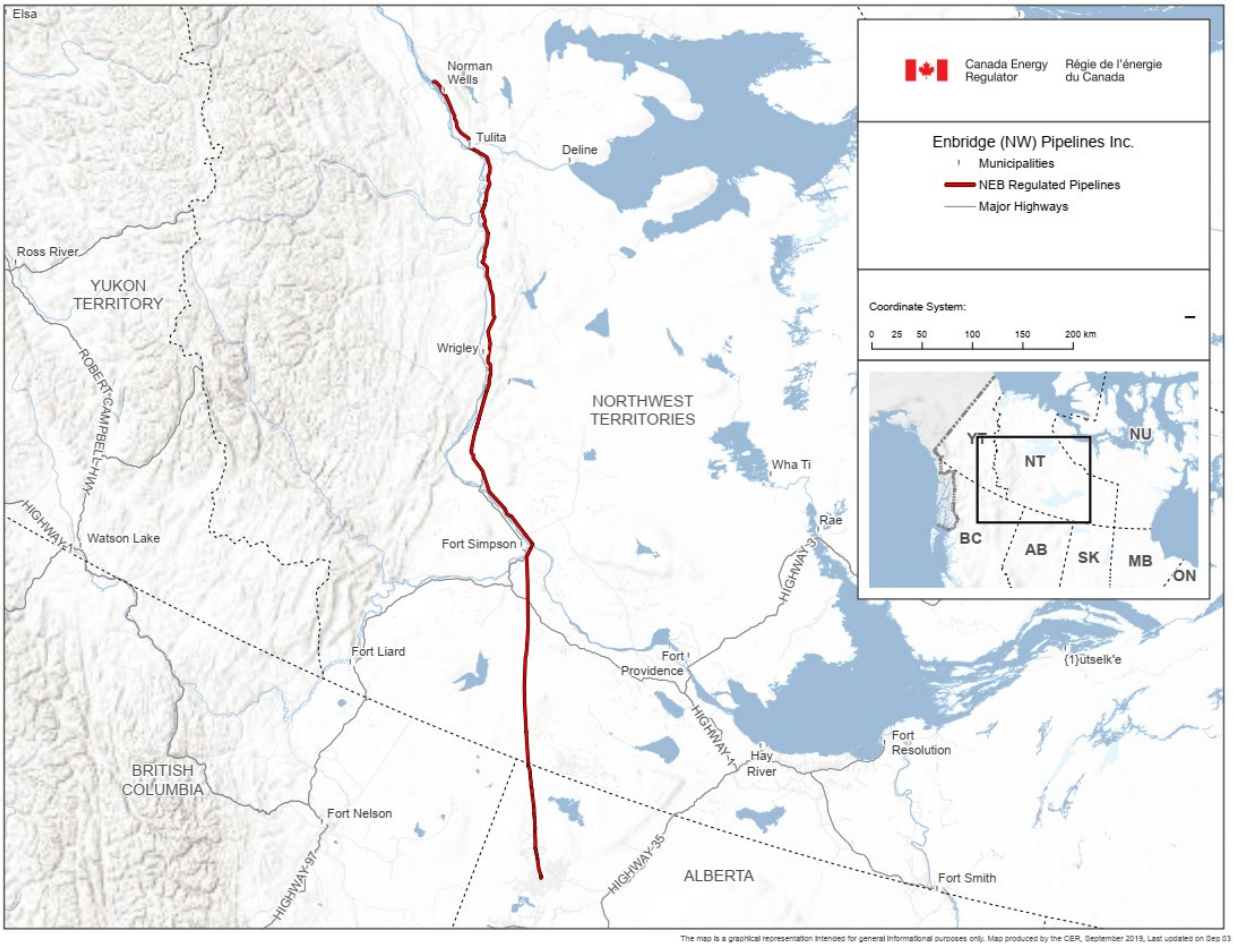
The Enbridge Bakken pipeline, shown in Figure 2, is a 157.28 km pipeline that transports oil from North Dakota to Cromer, Manitoba.

Figure 3: Enbridge Southern Lights GP Inc.



The Enbridge Southern Lights pipeline, shown in Figure 3, is a 1529.75 km pipeline that transports oil from Manhattan, Illinois to Edmonton Alberta, crossing the Manitoba/North Dakota border.

Figure 4: Enbridge Pipelines (NW) Inc.



The Enbridge (NW) pipeline, shown in Figure 4, is an 854.65 km pipeline that transports oil from Norman Wells, Northwest Territories into Northern Alberta.

Appendix 3.1 - Abbreviations

The following abbreviations were used in this report:

AO: Accountable officer

AOP: Abnormal Operating Procedure

AP: audit Protocol

API: American Petroleum Institute

CAPA: Corrective and Preventative Action

CCO: Control Centre Operations

CER: Canada Energy Regulator

CER Act: *Canadian Energy Regulator Act*

CRM: Control Room Management

CRO: Control Room Operator

CSA: Canadian Standards Association

EHS: Environment, Health and Safety

EMT: Executive Management Team

EOP: Emergency Operating Procedure

IMS: Integrated Management System

IMSD: Integrated Management System Document

IMSEC: Integrated Management System Executive Committee.

IR: CER audit Information Request

LDA: Leak Detection Analyst

LDAM: Leak Detection Alarm Manager

LDS: Leak Detection System

LP: Liquid Pipelines

MBS: Material Balance System

MOC: Management of change

MR: Management Review

MS: Management System

NEB: National Energy Board, replaced by CER on 28 August 2019

OPR: *National Energy Board Onshore Pipeline Regulations*

PA: Procedure Accelerator

RTS: Rupture Detection System

SCADA: Supervisory Control and Data Acquisition

STA: Senior Technical Advisor

Appendix 3.2 - Glossary of Terminology and Definitions

(The Board has applied the following definitions and explanations in measuring the various requirements included in this audit. They follow or incorporate legislated definitions or guidance and practices established by the Board, where available, and this will continue under the CER.)

Adequate: The management system, programs or processes complies with the scope, documentation requirements and, where applicable, the stated goals and outcomes of the CER Act, its associated regulations and referenced standards. Within the Board's regulatory requirements, this is demonstrated through documentation.

Audit: A systematic, documented verification process of objectively obtaining and evaluating evidence to determine whether specified activities, events, conditions management systems or information about these matters conform to audit criteria and legal requirements and communicating the results of the process to the company.

Compliant: The CER uses this term to indicate that, based on the information made available and reviewed, no non-compliances relating to the protocol item referenced were identified during the audit. A Corrective and Preventive Corrective Action (CAPA) plan is not required to be developed.

Corrective Action Plan: A plan that addresses the non-compliances identified in the audit report and explains the methods and actions that will be used to correct them.

Developed: A process or other requirement has been created in the format required and meets the described regulatory requirements.

Effective: A process or other requirement meets its stated goals, objectives, targets and regulated outcomes. Continual improvement is being demonstrated. Within the CER's regulatory requirements, this is primarily demonstrated by records of inspection, measurement, monitoring, investigation, quality assurance, audit and management review processes as outlined in the OPR

Established: A process or other requirement has been developed in the format required. It has been approved and endorsed for use by the appropriate management authority and communicated throughout the organization. All staff and persons working on behalf of the company or others that may require knowledge of the requirement are aware of the process requirements and its application. Staff has been trained on how to use the process or other requirement. The company has demonstrated that the process or other requirement has been implemented on a permanent basis. As a measure of "permanent basis", the CER requires the requirement to be implemented, meeting all of the prescribed requirements, for three months.

Finding: The evaluation or determination of the compliance of programs or elements in meeting the requirements of the *Canadian Energy Regulator Act* and its associated regulations.

Implemented: A process or other requirement has been approved and endorsed for use by the appropriate management authority. It has been communicated throughout the organization. All staff and persons working on behalf of the company or others that may require knowledge of the requirement are aware of the process requirements and its application. Staff has been trained on how to use the process or other requirement. Staff and others working on behalf of the company have demonstrated use of the process or other requirement. Records and interviews have provided evidence of full implementation of the requirement, as prescribed (i.e., the process or procedures are not partially utilized).

Inventory: A documented compilation of required items. It must be kept in a manner that allows it to be integrated into the management system and management system processes without further definition or analysis.

List: A documented compilation of required items. It must be kept in a manner that allows it to be integrated into the management system and management system processes without further definition or analysis.

Maintained: A process or other requirement has been kept current in the format required and continues to meet regulatory requirements. With documents, the company must demonstrate that it meets the document management requirements in OPR, paragraph 6.5(1)(o). With records, the company must demonstrate that it meets the records management requirements in OPR, paragraph 6.5 (1)(p).

Management System: The system set out in OPR sections 6.1 to 6.6. It is a systematic approach designed to effectively manage and reduce risk, and promote continual improvement. The system includes the organizational structures, resources, accountabilities, policies, processes and procedures required for the organization to meet its obligations related to safety, security and environmental protection.

(The Board has applied the following interpretation of the OPR for evaluating compliance of management systems applicable to its regulated facilities, and this will continue under the CER.)

As noted above, the CER management system requirements are set out in OPR sections 6.1 to 6.6. Therefore, in evaluating a company's management system, the CER considers more than the specific requirements of section 6.1. It considers how well the company has developed, incorporated and implemented the policies and goals on which it must base its management system as described in section 6.3; its organizational structure as described in section 6. 4; and considers the establishment, implementation, development and/or maintenance of the processes, inventory and list described in subsection 6.5(1). As stated in subsections 6.1(c) and (d), the company's management system and processes must apply and be applied to the programs described in section 55.

Manual: A document that contains a set of instructions on methods which are employed to accomplish a result. These instructions will be detailed and comprehensive. The document will be organized for ease of use.

Non-Compliant: The audited company has not demonstrated that it has developed and implemented programs, processes and procedures that meet the legal requirements relating to the protocol item referenced. A Corrective and Preventive Corrective Action (CAPA) plan must be developed for approval and implemented.

Plan: A detailed, documented formulation for action to achieve an end.

Practice: A repeated or customary action that is well understood by the persons authorized to carry it out.

Procedure: A procedure indicates how a process will be implemented. It provides a documented series of steps followed in a regular and defined order thereby allowing individual activities to be completed in an effective and safe manner. A procedure also outlines the roles, responsibilities and authorities required for completing each step.

Process: A documented series of actions taking place in an established order, with identified roles and responsibilities, and directed towards a result. A process includes the roles, responsibilities and authorities for the actions. A process may contain a set of procedures, if required.

(The CER has applied the following interpretation of the OPR for evaluating compliance of management system processes applicable to its regulated facilities.)

OPR subsection 6.5(1) describes the CER's required management system processes. In evaluating a company's management system processes, the CER considers whether each process or

requirement: has been established, implemented, developed or maintained as described within each section; whether the process is documented; and whether the process is designed to address the requirements of the process, for example a process for identifying and analyzing all hazards and potential hazards. Processes must contain explicit required actions including roles, responsibilities and authorities for staff establishing, managing and implementing the processes. The CER considers this to constitute a common 5 w's and h approach (who, what, where, when, why and how). The CER recognizes that the OPR processes have multiple requirements; companies may therefore establish and implement multiple processes, as long as they are designed to meet the legal requirements and integrate any processes linkages contemplated by the OPR section. Processes must incorporate or contain linkage to procedures, where required to meet the process requirements.

As the processes constitute part of the management system, the required processes must be developed in a manner that allows them to function as part of the system. The required management system is described in OPR section 6.1. The processes must be designed in a manner that contributes to the company following its policies and goals established and required by section 6.3.

Further, OPR subsection 6.5(1) indicates that each process must be part of the management system ***and*** *the programs referred to in OPR section 55. Therefore, to be compliant, the process must also be designed in a manner which considers the specific technical requirements associated with each program and is applied to and meets the process requirements within each program. The CER recognizes that single process may not meet all of the programs; in these cases it is acceptable to establish governance processes as long as they meet the process requirements (as described above) and direct the program processes to be established and implemented in a consistent manner that allows for the management system to function as described in 6.1.*

Program: A documented set of processes and procedures designed to regularly accomplish a result. A program outlines how plans, processes and procedures are linked, and how each one contributes toward the result. Program planning and evaluation are conducted regularly to check that the program is achieving intended results.

(The CER has applied the following interpretation of the OPR for evaluating compliance of programs required by the CER regulations.)

The program must include details on the activities to be completed including what, by whom, when, and how. The program must also include the resources required to complete the activities.

Appendix 4.0 – List of Company Staff Interviewed and Documents Reviewed

The lists of company staff interviewed and documents reviewed are maintained on file at the offices of the Canada Energy Regulator.