INTERNATIONAL COLLABORATION THROUGH THE PIPELINE ENGINEERING COMPETENCY SYSTEM

Chris Harvey, Principal, Chris Harvey Consulting
Reena Sahney, President, Jiva Consulting
Ashley McLean, Senior Advisor, Performance, Canadian Energy Pipelines Association
Karen Polglaze, Communications Manager, Australian Pipelines and Gas Association

INTERNATIONAL COLLABORATION THROUGH THE PIPELINE ENGINEERING COMPETENCY SYSTEM

Background to the APGA Pipeline Engineer Competency System

APGA's Pipeline Engineer Competency System arose out of concern about the future of the pipeline industry's pipeline engineering capability and the critical link between that capability and the industry's confidence that petroleum pipelines would continue to be safe and reliable. The first discussions began in 2003 with a paper by Max Kimber and continued until 2008 when the APGA (then APIA) Board made the decision to make an investment in understanding what was required to ensure that the depth and breadth of knowledge, experience and expertise held by the pipeline engineering community would be passed on to the oncoming generations of engineers.

The initial investment led to the first stage of the creation of APGA's Pipeline Engineering Competency Standards in 2010. This was followed by a continuing investment in the Competency Standards to where, in 2016, APGA had developed its fully fledged Pipeline Engineer Competency System (PECS), comprising of competency standards for both onshore and offshore pipelines with a range of tools and resources.

From the time of the initial development of the PECS in 2010, APGA has been in discussion with a number of organisations about their use of the PECS. In 2011/2012, APGA held discussions with the Pipeline Systems Division of ASME (American Society of Mechanical Engineers) about adopting and adapting the partially developed PECS for use by ASME and its members. ASME's membership is not only in North America, but extends worldwide. The discussions came to an abrupt stop when ASME underwent a reorganisation that led to focus on other priorities.

However, in 2016 APGA had discussions with the Canadian Energy Pipeline Association (CEPA), a voluntary, non-profit industry association representing major Canadian transmission pipeline companies, and the Rosen Group (Rosen), a for profit corporation, about potential use of the PECS. Rosen decided to go in a different direction, but following an initial hiatus, CEPA undertook a thorough consideration and assessment of the PECS and other competency frameworks that led it to deciding to enter into a licence agreement with APGA to adopt and adapt the PECS for use by its members and the Canadian industry.

CEPA, competency frameworks and the PECS

CEPA's journey with the competency frameworks, and ultimately with the PECS, had some similarities to APGA's, with the recognition of demographic change and impacts on the workforce. However, in Canada and the US there was also an increased focus on competency management within the pipeline industry. Within this context, CEPA established a project that was driven by three main environmental factors:

- Changes in North American workforce demographics;
- Opportunities identified through its CEPA Integrity First® program; and
- An increased emphasis on competency in industry regulation, standards and best practices.

Similar to many industries in North America and in Australia, the Canadian pipeline industry has been undergoing a significant demographic shift: the retirement of its most experienced technical

personnel[1]. The loss of experience is a particular challenge for organizations as experience is the aspect of competency that is the most difficult to capture and relay to less seasoned personnel. Recent events associated with the COVID 19 pandemic notwithstanding, the Petroleum Human Resources Council of Canada (PHRCC) [1], had indicated that: "Over the next decade, total hiring for direct oil and gas jobs range between 125,000 and 150,000 due to industry activity, age-related attrition, and non-retirement turnover".

In Canada, the CEPA Integrity First program, an industry-led program established by the Canadian Energy Pipeline Association to continuously improve in the areas of safety, environment and socio-economics, has also been a driver. Through CEPA Integrity First, it became clear that member companies have ongoing programs in place for competency management of technical staff. However, it also became clear that there was an opportunity for collaboration and to further mature competency management practices. Specifically, there was an opportunity to develop a framework for managing competency, at an industry level, that would facilitate progression and maturity in this area – both more quickly and effectively.

Lastly, there has been an increased emphasis on 'competency' and 'competent personnel' in regulation both in Canada and the US as evidenced by the National Energy Board Onshore Pipeline Regulations [2], explicit clauses within CSA Z662 Oil and gas pipeline systems [3] and Minimum Federal Safety Standards for the Transportation of Natural and Other Gas by Pipeline (49 C.F.R. Part 192 [4]). This augments a number of initiatives already in place such as the Pipeline Operator Qualification Program (OQ) already established by the Pipeline Hazardous Materials Safety Administration (PHMSA) in the US [5]. The increased emphasis on competency is part of a broader trend towards a performance-based approach to ensuring individuals are equipped for their roles and functions within an organization. The trend can be seen through similar initiatives led by organizations such as the Institution of Civil Engineers in the UK [6] and a number of engineering professional bodies including the Association of Professional Engineers and Geoscientists of Alberta [7].

While there were a number of less informal efforts prior, CEPA formally identified the opportunity for industry collaboration in this area in 2017 through CEPA Integrity First. This led to the execution of a project to formally assess the state of the industry as it relates to competency management. Specifically, the Pipeline Integrity Community of Practice (CoP) within CEPA formed a task group to identify and better understand potential solutions to address this need. A systematic review of both industry operators and service-providers to understand the specific nature of the industry gap, the challenges associated with it, as well as identification of options for addressing the gap, was undertaken in 2018.

As a result of undertaking the work, there was recognition that the opportunity for the industry lay in three main areas:

- An opportunity to bring a greater degree of standardization to the definition of competency as no standardized definition existed (both within and outside the pipeline industry);
- An opportunity to apply a management system-based approach to managing competency; and
- An opportunity to streamline the resources and timeline needed for implementing a cohesive system within the Canadian industry.

[1]In North America, the term "baby boomer" refers to those individuals born between 1946 and 1965.

However, the CoP also identified that there were two challenges, in particular, with maturing competency management within the Canadian pipeline industry:

- First, the competency system needs to be flexible to address a broad range of technical topics, operation types as well as a progression of proficiencies (e.g., engineers in training through to senior level subject matter experts).
- Second, there was a need for a system that was practical and could be developed / adopted in a relatively short time frame.

It was through this formalized effort that CEPA established that the optimal solution for closing the gap for managing the competency of (primarily office-based) technical staff in the Canadian industry was a two-part solution:

- First, the development of a guidance document for industry on competency management that would allow members to define / use a set of competency standards of their choosing; and
- Second, exploration with APGA regarding the adoption of the APGA PECS such that this body of work could be used in conjunction with the approach detailed in the CEPA guidance document.

With this approach in mind, a guidance document for industry was released in early 2019 that provided guidance in a number of key areas including:

- Key terminology and establishing the importance of clarity of language;
- Discussion of a practical model for competency based on four components (theoretical knowledge, skills, experience; and behaviour). [8]; and
- A framework, with detailed guidance, on establishing a competency management system with illustrative examples that remained flexible for the range of needs across CEPA member companies.

Further, discussions between CEPA and APGA were also initiated in this time period to establish an agreement for collaboration.

THE APGA / CEPA Agreement

The agreement for the use of the APGA competencies in Canada was finalized, on the basis of a license / sub-license agreement in 2019. Specifically, the agreement allows for companies to access the APGA PECS through a license agreement; since the over-arching agreement is with CEPA, organisations must be a CEPA member in order to be eligible to sign a sub-license agreement. Access to the content, and associated updates, are subject to an annual fee. The agreement is unique in nature and provides a strong foundation for this international collaboration allowing the adaption of the APGA PECS for Canadian industry.

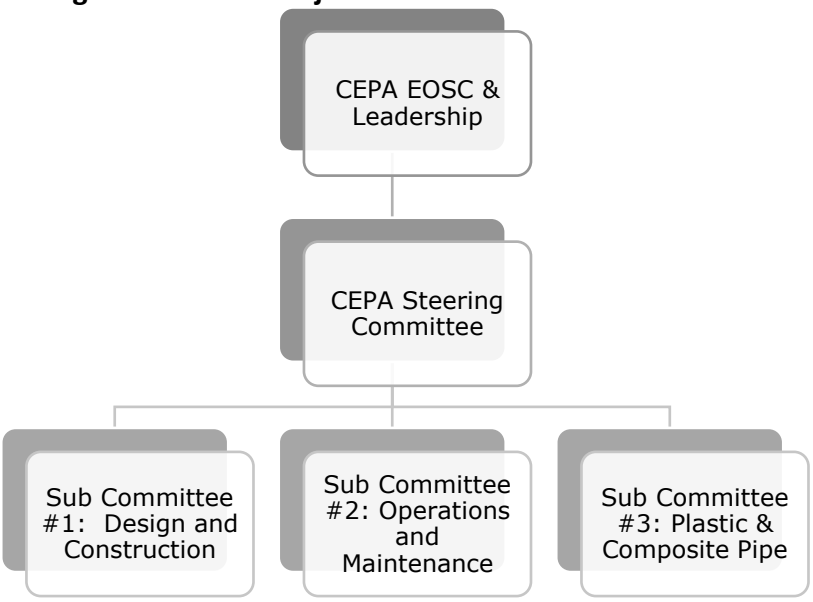
Once the IP agreement had been executed APGA and CEPA commenced the process of implementing it. The most significant implementation step was the creation of the Canadian version of the PECS (PECS-Can). This required a process of adaptation of the PECS for Canadian use, which was no small task, involving reviewing and adapting approximately 230 competency standards and the supporting tools.

As part of managing project risk, the CEPA team elected to use two main techniques:

- Adaptation of the process used by APGA for development and management of the system as a mechanism to benefit from the APGA experience; and
- A staged approach with clearly defined milestones.

In respect of adaptation of the process used by APGA, the CEPA team elected to adopt a committee structure that was similar to that used by APGA for the development / maintenance of PECS. The committee structure is shown in Figure 2 and focuses on the use of a steering committee, along with three sub-committees.

Figure 2: CEPA's Project Committee structure



More specifically, the steering committee was established to ensure that a central group could:

- Bridge the gap between senior leadership and execution of the project by setting direction for adaptation effort using a number of mechanisms such as establishing guiding principles for the effort;
- Champion and communicate effort to senior management and member companies; and
- Provide continuity in effort in the context of the overall initiative that has spanned multiple years.

Further, the steering committee is primarily composed of individuals involved with past work, but with a view of a broader effort going forward (i.e., beyond pipeline integrity). In addition, there is representation from both CEPA member companies, CEPA staff with facilitation and support provided by Jiva to ensure a wholistic perspective in completing the work.
To supplement the effort of the steering committee, the three sub committees had been established to:

- Review individual competencies for technical robustness, within the Canadian context, as part of adaptation effort; and
- Contribute to modification / writing of new competencies, if required.

The composition of the subcommittees includes technical experts from member companies for each of the three topic areas:

- Design and Construction;

- Operations and Maintenance; and
- Plastic and Composite Pipe.

Individuals having technical depth from a range of domains were also selected with a view to establishing a balance between differing product types, differing scales of operations as well as pipelines and facilities assets.

The second technique used to manage risk on the project was to implement a staged approach. In particular, it was unclear when the project commenced, the exact nature of modifications that would be required to adapt the PECS to the Canadian context. As such, an extensive scoping and planning stage was undertaken prior to beginning detailed modification of the PECS. The details of each stage follow.

Stage 0: Scoping and Planning: The focus of this stage was to conduct a high-level review of the Australian content as a basis for establishing a more detailed project plan for the adaptation effort. It was through this stage that discussions between CEPA and APGA were also undertaken and key project parameters were established such as timeline, committee structure and a detailed understanding of the modifications anticipated (i.e., categorization of competencies requiring varying levels of modification such as minor, intermediate, major etc.,). In particular, there were a number of mechanisms put in place for ensuring that the competencies remained relevant to the Canadian industry while minimizing change to maintain alignment to PECS.

Stage 1: Establish Committees & Kick Off: The focus of this stage was in establishing the committees and developing a detailed meeting structure and format. In addition, it was established that one of the keys to the success of the project, in the timeline required, was to ensure a robust onboarding effort for new committee members.

Stage 2: Confirm Categorization & Complete Initial Revision of Competencies: Upon completion of the scoping and planning, the key focus of the project was a review of each competency standard to ensure that the level of modification (e.g., “minor”, “intermediate”, etc.,) anticipated in the Scoping and Planning stage of the project was confirmed (or modified if required). This stage also involved undertaking an initial revision of each individual competency.

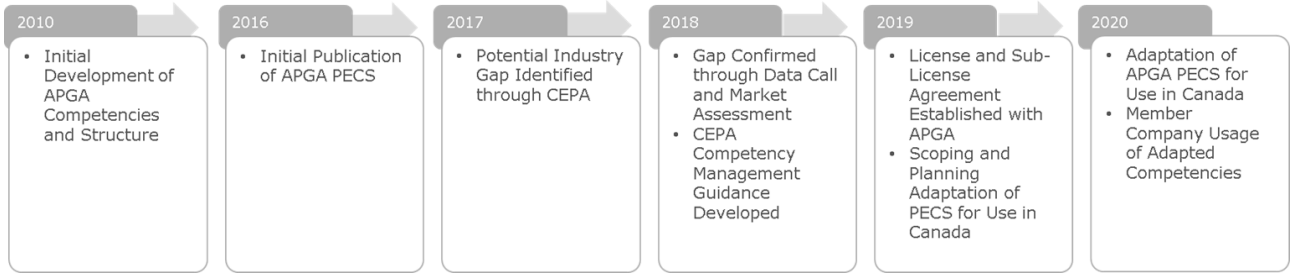
Stage 3: Sub-Committee Review of Competencies: This stage was dedicated to completing a detailed review of Draft #1 of each competency with the Sub-Committees. Working sessions were held with each Sub-Committee to review the changes to each competency and to develop Draft #2 of each competency. The goal of this stage was to obtain technical content approval by the Sub-Committees for each competency.

Stage 4: Finalize Competencies & Summarize Findings: The purpose of Stage 4 was to complete final quality checks (e.g., adherence to APGA PECS style and format) of the competencies, as well as to obtain final Steering Committee approval based on the finalized documentation. A summary of the results of the initiative and recommended next steps for member companies was also developed at this stage.

Once CEPA had completed the task of adapting the PECS, APGA established its own working group, mainly from its PECS (Pipeline Engineer Competency System) Committee. The working group reviewed CEPA’s proposed adaptations to ensure that resulting PECS-Can remained aligned to the PECS, keeping the intellectual property in the PECS and the PECS–Can essentially the same.

The adaptation of the PECS was finalised in the fourth quarter of 2020 with CEPA holding a formal launch to its members in 2021. CEPA's members are in the process of acquainting themselves with the PECS-Can and entering into sub-licences to use the PECS-Can. A timeline of the history leading from the PECS to the PECS-Can are shown in Figure 2.

Figure 2 – Timeline leading to the development of the PECS-Can



As a result of the agreement between APGA and CEPA, the Australian and Canadian pipeline industries have identified an opportunity to advance both of their efforts in the area of competency management for their personnel in a rapid and effective way through collaboration. This project will allow the Canadian industry to benefit from a standardized and robust competency library that remains flexible, yet relevant for ongoing use. Allowing both individuals and organizations to establish a common understanding of competency for technical staff in the industry as well as manage it more effectively.

Two significant opportunities from the CEPA/APGA Agreement

Two significant potential opportunities have been identified by CEPA and APGA from their experience with the licence agreement between CEPA and APGA and the creation of the PECS-Can.

1. **Scope for broader internationalisation of the PECS.** The Canadianisation of the PECS, which was originally developed specifically for the Australian and New Zealand pipelines industries, to form the PECS-Can has provided a greater understanding of the nature of the changes needed to make competency standards useful and fully applicable in an international context. The vast majority of changes to the PECS competency standards where related to terminology with a significant number of changes relating to applicable standards and legislation. While there were several instances where engineering practice is different in the Standards (e.g., the Safety Management Study does not have a direct parallel in the Canadian Standard for pipelines CSA Z662 or practice). The work necessary to take the PECS-Can and develop an international version of the PECS, while not insignificant, may be a worthwhile development given the size of the international pipeline industry and the opportunity to leverage and mature practices at a global level.
2. **Opportunity for significant collaboration between APGA and CEPA on pipeline engineering and pipelines operation and management.** One of the features of the licence agreement with CEPA is that it is provides for CEPA's collaboration with APGA in respect of the ongoing maintenance and development of the PECS and the PECS-Can, which is the role of the APGA's PECS Committee. Preliminary discussions about what a collaborative approach to ongoing maintenance and development of the PECS and the PECS-Can so that they stay in synch with each other have taken place and are expected to recommence when CEPA's members have entered into sub-licences to use the PECS-Can.

An unexpected benefit of the CEPA's Canadianisation process to form the PECS-Can has been a continuous improvement log containing aspects of the PECS that CEPA's committees identified for improvement. This is the benefit of a new set of eyes looking at the PECS and with the advantage of coming from a different legislative and cultural setting. It is expected that as part of the collaboration between CEPA and APGA they will review the continuous improvement log with a view to implementing the recommended improvements.

An additional recent development in the relationship is the creation of competencies for Damage Prevention professionals by CEPA. The licence agreement has been extended to allow for the development of these competencies using the APGA format and make them available on the APGA database alongside the PECS-Can and made available to APGA and its members.

Whether, and to what extent these opportunities will be realised will become clear as the PECS-Can's role in the Canadian pipelines industry and the relationship between APGA and CEPA mature. Given that Canadian practice can often contribute to the development of US practices because several pipeline owner/operators operate in both countries and the cooperative and collaborative beginnings of the APGA/CEPA relationship, it will be worth seeing what has evolved in a couple of years' time.

REFERENCES

[1] Petroleum Human Resources Council of Canada, 2013, "The Decade Ahead: Labour Market Outlook to 2022 for Canada's Oil and Gas Industry," Petroleum Labour Market Information, http://www.iecbc.ca/sites/default/files/Enform%20Petroleum%20Labour%20Market%20Information%20canada_labour_market_outlook_to_2022_report_may_2013.pdf

[2] National Energy Board, 2012, "Regulations Amending the Onshore Pipeline Regulations, 1999," Canada Gazette, from http://canadagazette.gc.ca/rp-pr/p1/2012/2012-10-27/html/reg3-eng.html

[3] Anon, CSA Z662-19 Oil and gas pipeline systems, Canadian Standards Association, June 2019.

[4] Transportation of Natural and Other Gas by Pipeline: Minimum Federal Safety Standards, 49 C.F.R. § 192 (2006).

[5] Pipeline and Hazardous Materials Safety Administration, 2017, "About Operator Qualification," from https://www.phmsa.dot.gov/pipeline/operator-qualifications/about-operator-qualification

[6] Creasey, R., 2013, "Improving Students' Employability," Engineering Education, 8(1), pp. 16-30

[7] Association of Professional Engineers and Geoscientists of Alberta, n.d., "Work Experience Required for Engineering Applicants," from https://www.apega.ca/apply/work-experience/engineers/