

Response to Directive 7 of Order 73/15

7. *Manitoba Hydro shall file terms of reference for an Asset Condition Assessment Report for approval by the Board that, at minimum, include the information set out in Appendix “G” of this Order, by no later than October 31, 2015.*

Response:

Manitoba Hydro has initiated a corporate wide undertaking to examine, develop and implement the components of a comprehensive asset management framework including the refinement and documentation of an asset management plan and strategies, asset condition assessments and asset health indices, as well as the enhancement of the Corporation’s capital prioritization framework.

Background

As part of its 2015/16 & 2016/17 General Rate Application, Manitoba Hydro provided evidence on the Corporation’s sustaining capital requirements supported with information about the condition of its infrastructure and capacity constraints and the related impacts on system reliability. In addition, as part of the Planning & Operations Witness Panel, witnesses for Manitoba Hydro made presentations and responded to questions regarding its corporate prioritization framework, issues related to aging infrastructure, and the tools and methodologies used by Manitoba Hydro to prioritize capital investments.

In Order 73/15, the Public Utilities Board (“PUB”) indicated that it requires further information on Manitoba Hydro’s long term pacing and prioritization of its capital investment requirements and directed Manitoba Hydro to provide a timeline for the refurbishment and/or replacement of Manitoba Hydro’s assets up to 2049/50, along with an asset health index for certain asset components for the generation, transmission and distribution systems.

Asset Management Initiatives

As noted above, Manitoba Hydro initiated a corporate wide undertaking to develop and implement the components of a comprehensive asset management framework, including the following initiatives:

a) Asset Management Policy & Strategies

As part of enhancing Manitoba Hydro’s asset management strategy, Manitoba Hydro is reviewing its governance structure associated with asset management. As part of this enhancement, Manitoba Hydro will formally establish an asset management governance

structure, including an executive sponsorship, a corporate steering committee of senior managers and various working groups to undertake the initiatives described below.

Manitoba Hydro intends to engage a consultant to assist in refining and documenting Manitoba Hydro's asset management policy and strategy. This asset management policy would set out the principles by which the Corporation intends to undertake asset management to achieve its organizational objectives. The asset management strategy would establish the scope and objectives of Manitoba Hydro's asset management program. This review is also intended to recommend key asset management processes and systems Manitoba Hydro should improve upon or develop, including a performance management framework, risk management assessments, operations and maintenance asset planning, adherence to industry accepted standards and ongoing audit reviews.

This consultant is expected to be retained in the first quarter of 2016 and will assist the Corporation in developing an Asset Management Strategic Plan.

b) *Asset Condition Assessments and Asset Health Indices*

Generation

Between 2009 and 2011, Manitoba Hydro undertook a systematic assessment of all of its key generation asset components, which included the assessment of more than 1200 significant assets whose failure can generally cause generation outages of more than a month. These assets types include generator stators, generator rotors, exciters, governors, turbines, breakers, transformers and batteries.

Manitoba Hydro is currently developing standards for future condition assessments, including a schedule for completing such assessments, which will vary based on the asset type and health of the asset. For example, turbines will be assessed every 12 years when they undergo major inspections, as these are long lived assets and change in condition slowly. Transformers, on the other hand, are assessed yearly and generator stators re-assessments are in the range of 5 to 10 years.

Transmission

In 2012, Manitoba Hydro engaged Kinectrics Inc. ("Kinectrics") to develop asset condition assessment methodologies and statistical failure models for a subset of its transmission system assets. Kinectrics worked with Manitoba Hydro to customize the condition

assessment methodology framework developed by Kinectrics and to incorporate Manitoba Hydro transmission asset information and data sources into this framework.

Since the conclusion of the 2015/16 & 2016/17 GRA, Manitoba Hydro engaged Kinectrics to conduct an audit of the asset condition assessment methodologies used for Manitoba Hydro's transmission, High Voltage Direct Current ("HVDC") and distribution system assets. For each asset type, Kinectrics examined Manitoba Hydro's asset health formulation, condition parameters & weighting factors, data scoring criteria, and data sources & availability.

Manitoba Hydro is awaiting the report from Kinectrics with respect to this engagement, which will be filed with the PUB at the next GRA. Preliminary results indicate that Manitoba Hydro's asset condition methodologies for transmission assets are consistent with best practices and compare favourably with other utilities with regards to asset condition assessment model quality and accuracy due to the type and quantity of data being incorporated. Manitoba Hydro intends to refine its asset condition methodologies, in particular with respect to protection relays, as well as its HVDC system assets.

Distribution

The preliminary results of the Kinectrics audit, as discussed above, with respect to distribution assets, suggests that Manitoba Hydro should expand the characteristics used in its distribution asset condition assessment methodologies and that Manitoba Hydro should enhance its condition assessment practices and its existing asset registry for its distribution system assets.

Manitoba Hydro has recently engaged Kinectrics to refine the asset condition assessment of the Corporation's distribution assets. This engagement is expected to produce quantitatively proven asset health indices and replacement schedules for Manitoba Hydro's distribution assets and are expected to be available for the next GRA. Please see the attached Terms of Reference for details of this engagement.

c) Capital Asset Prioritization

In Order 73/15, the PUB indicated that it requires additional information on Manitoba Hydro's long term pacing and prioritization of its capital requirements. The following sections outline the work being undertaken with respect to the pacing and prioritization of the Manitoba Hydro's capital investment requirements.

I. Development of Corporate Value Framework

Manitoba Hydro has engaged Copperleaf Technologies Inc. (“Copperleaf”) to assist in the development of a Corporate Value Framework (“CVF”) methodology. A CVF is a systematic framework to understand the value of all investments in an organization. The CVF helps identify the optimal set of investments that deliver the greatest value (or mitigates risk) to the organization, while respecting funding, resource and timing constraints. This tool will be used to assess the value of capital investments across all areas of the corporation in support of allocating funds to projects and assets that optimize strategic value or mitigate risk.

There are five broad value categories within the CVF, namely: financial, reliability, environmental, safety & security, and corporate citizenship. The CVF includes various measures within each of the categories to be used in scoring the Corporation’s capital projects when determining the appropriate pacing and prioritization of capital expenditures across the organization.

It is expected that the development of the CVF will be completed early in 2016 and will be incorporated into the existing Copperleaf C55 software used by the Corporation, as discussed below.

II. Standardization of Capital Investment Planning Software

Manitoba Hydro has also engaged Copperleaf to standardize its capital investment planning processes through the implementation of its Copperleaf C55 software application in all capital-intensive business units. Copperleaf C55 is an asset investment planning and management decision analytics software solution, which Manitoba Hydro currently uses for capital investment planning for its generation assets. C55 will be implemented for Manitoba Hydro’s transmission, distribution, and information technology assets with a preliminary scheduled completion in 2017. A second phase for the implementation of C55 in other capital areas (e.g. facilities and fleet) will begin shortly thereafter.

Pending completion of the CVF, it will be incorporated into Manitoba Hydro’s Copperleaf C55 software in early 2016 and the framework will be applied to evaluate the capital projects for generation assets. The CVF will be applied for capital investment planning for other areas of the corporation, once the C55 software has been fully implemented.

III. Implementation of the Transmission System Reliability Risk Model

Manitoba Hydro has developed a sophisticated probabilistic planning tool that enables planners to analyze scenarios and quantify the risk to be mitigated by a particular transmission system capital investment. Risk is quantified in terms of an Expected Un-served Energy (i.e. the combined likelihood and severity of an outage in units of MW.hr). For planning purposes, the benefits of a particular capital improvement are described in terms of the associated change in Expected Un-served Energy. This Expected Un-served Energy measure has been incorporated into the CVF discussed above.

Manitoba Hydro implemented this planning tool in 2015 for CEF15. This new tool has helped facilitate the prioritization and pacing of Manitoba Hydro's transmission assets in CEF15 by minimizing the incremental risk associated with project deferrals.

**TERMS OF REFERENCE FOR
ASSET CONDITION ASSESSMENT OF MANITOBA HYDRO'S DISTRIBUTION
ASSETS**

1. PURPOSE

Develop a more comprehensive Asset Health Index (AHI) methodology for Manitoba Hydro's key distribution asset categories and perform an Asset Condition Assessment (ACA) of these assets.

2. BACKGROUND

The Manitoba Hydro distribution system was initially built in the early 1900s with major expansions in the 1950s and services all customers within the Province of Manitoba. It has an estimated replacement value of over \$15 billion and a significant portion of the distribution system is reaching end-of-life. Infrastructure reinvestment is critical for the safety and reliability of Manitoba Hydro's plant across the entire province and to ensure existing and new customers continue to receive an appropriate level of reliability into the future.

In order to effectively facilitate the replacement of key assets, a consistent method of determining the expected end-of-life is required and is a critical input to the Copperleaf system in order for Manitoba Hydro to prioritize forecasted capital expenditures in a manner that addresses the most high risk areas. Manitoba Hydro is currently looking to improve the current methods of determining the health and condition of all key distribution assets in order to provide more comprehensive and consistent data for these programs.

Kinectrics Inc. (Kinectrics), an independent company that is recognized worldwide for outstanding technical and business excellence in the energy sector, will assist in the development of an Asset Condition Assessment of Manitoba Hydro's key distribution assets. Kinectrics will apply the most up-to-date methodologies that utilize existing available condition information and data, information from interviews with technical experts, and Kinectrics expertise in the Asset Management field to identify assets that should be "flagged for action".

3. SCOPE

Developing Manitoba Hydro-specific Health Index formulations and Condition Criteria for distribution assets, including but not limited to the following asset categories:

1. Poles

2. Underground cables
3. Pad mounted transformers
4. Pad mounted switch gear
5. Street lights
6. Manholes
7. Reclosers (station & line)
8. Switchgear

For each asset category:

1. Determining Health Index distribution based on available information, such as test and inspection results, corrective maintenance records, age, manufacturer, geographical location and input from Manitoba Hydro's technical staff;
2. Performing Risk Assessment to link Health Index with the corresponding Probability of Failure (POF) based on asset-specific failure curves;
3. Developing a risk-based "flagged for action" 10-year strategy for each of the asset categories; and,
4. Identifying data gaps and providing prioritized strategy for closing them.

4. TIMING & DELIVERABLES

A report from Kinectrics is expected to be completed in 2016 and will be filed with the Public Utilities Board at the next General Rate Application. The deliverables are as follows:

1. Develop a more comprehensive Asset Health Indexing process for key distribution assets based on parameters, including test and inspection results, corrective maintenance records, age, manufacturer, geographical location and input from Manitoba Hydro's technical staff.
2. Producing an asset health condition report of Manitoba Hydro's key distribution assets; the report will be used in supporting investment requirements to sustaining existing distribution assets and to support rate applications in a manner consistent with that for transmission assets.
3. Performing Risk Assessment to link Health Index with the corresponding Probability of Failure (POF) based on asset-specific failure curves.
4. Developing a risk-based "flagged for action" 10-year strategy for each of the key asset categories.
5. Identifying data gaps to support a more comprehensive Asset Health Indexing process and providing a prioritized strategy for closing them.