IEAC INDEPENDENT EXPERT COMMITTEE

RECOMMENDATIONS:
MONITORING

Submitted to the IEAC Oversight Committee

March 5, 2018

Table of Contents

1. Background

The mission of the Independent Experts Advisory Committee (IEAC) is as follows:

To oversee and provide independent assessment of the adequacy of mitigation, monitoring and management measures, and provide recommendations to the Responsible Ministers with respect to those and addition of any further such measures for the protection of the health of the Indigenous and local population impacted by the Lower Churchill Project, and in particular increases of methylmercury in country foods in the Churchill River near Muskrat Falls and downstream, all along the river and including Lake Melville.

The IEAC is comprised of an Oversight Committee (OC) and an Independent Experts Advisory (IEC) Committee. The IEC is made up of six scientific experts and three indigenous knowledge experts.

The IEAC focuses on three key areas: mitigation, monitoring and management. This report focuses on the activities of the IEC with respect to monitoring.

The goal of monitoring is to understand the current amounts of mercury and methylmercury particularly in the water and biota – especially those organisms that people use for food. No environment is free from these compounds, so baseline data provide critical insight as to the concentrations of mercury/methylmercury that occur naturally. Such information is necessary to be able to identify changes that may be due to the construction/operation of the hydroelectric facility. Similarly, a robust monitoring program will be able to detect changes as they occur and, hopefully, serve as an early warning prior to increases in the amounts of methylmercury in the food that people consume. It is necessary to use laboratory analytical methods that can 'see' mercury/methylmercury at levels that are meaningful – i.e. the detection limit, DL, (in simplest terms this is the lowest amount that can be reliably measured). The DL has to be low enough to detect changes. For example, there could be changes in the methylmercury concentrations but if these are occurring below the detection limit they cannot be 'seen'.

The purpose of this document is to summarize the work that the IEC has undertaken since its inception in August 2017. Also attached are the documents that were provided to, or developed by the committee, during its deliberations.

2. Activities

One of the first activities of the IEC was to undertake a review of then current Aquatic Environmental Effects Monitoring Program (AEEMP) for Muskrat Falls. These findings were summarized in a report entitled 'IEC Review of Aquatic Environmental Effects Monitoring Program: Recommendations on changes to the scope and quality of the Muskrat Falls AEEMP' dated 18 September 2017 which is attached. A key finding of the IEC was that –

"The scope and extent of the current regulator mandated Aquatic Environmental Effects Monitoring Program (AEEMP) for Muskrat Falls must be considered exceptional compared to other similar monitoring programs in Canada. Nevertheless, there exist a number of issues mainly related to detection limits, sampling frequency, and the scope of sampled components that could be addressed to enhance the overall quality of the AEMP. In addition, data analysis and reporting could be improved at least for some components to allow for unbiased comparisons and better interpretation of the results, particularly when being used in relation to methylmercury exposure of humans and potential health risks. Finally, other aquatic monitoring programs exist that collect relevant data for the Muskrat Falls Project. Sampling coordination and data integration or at least sharing of information between those programs could result in substantial synergies, avoiding sampling duplication while strengthening the data base."

This information was presented to the OC on 20 September 2017 and resulted in the following recommendation to the Minister which was submitted on 22 September 2017 –

Recommendation #2: The IEAC recommends that Nalcor implement the changes described in the independent expert's report titled "Recommendations on changes to the scope and quality of the Muskrat Falls Aquatic Monitoring Program".

The recommendation was accepted by the Minister of Municipal Affairs and Environment on 29 September 2017.

A parallel activity of the IEC was to evaluate the results of the water monitoring program that had been acquired by Nalcor since October 2016 when it was first announced that water levels would be increased behind Muskrat Falls. An independent consultant, Dr. Iris Koch, was contracted to review these data but prior to the initiation of her activities Nalcor released a report from its consultant Azimuth entitled 'Relationship between Muskrat Falls Reservoir Elevation and Mercury Concentrations, Lower Churchill River October 2016 – September 2017'. Key findings in this report included:

Seasonal increases in total and dissolved MeHg at all locations sampled;

That the temporary impoundment in November 2016 and re-flooding in mid-February did not produce a clear increased MeHg water column signal until May 2017 and that this persisted through September, 2017;

While slight increases in MeHg concentrations were observed in the impounded area (as noted above), even smaller changes were noted downstream;

It was also noted that 'In the absence of a detectable increase in MeHg delivered by the LCR to Goose Bay as a result of the impoundment, it is reasonable to assume that no detectable or meaningful change in downstream biota mercury concentrations should be expected – either within the river, or extending into Goose Bay and beyond'.

Dr. Koch took this report, as well as other laboratory data, into consideration during her deliberations and presented her results both in a report (Koch, 12 Dec 17) and a presentation to IEC members (Koch, 9 Dec 17). Her reports focused on measurement uncertainty which is inherent in analyses of this type. She noted:

'The measurement uncertainty, which is the spread of values around a measured value that is attributed to the measurand (or the "true value" that is being sought through the measurement process). The measurement uncertainty is a parameter that is often overlooked when interpreting data produced by analytical laboratories, when users typically interpret a reported concentration as a single stand-alone value. However, the concept of measurement uncertainty is especially important when attempting to discern differences over time or spatially, as is the case in the present monitoring study'.

Using standard approaches endorsed by the Canadian Association of Analytical Laboratories she calculated the expanded uncertainty to be approx. 40%; a value that was not surprising considering that the measured concentrations were near the detection limit. (Note: the uncertainty will be expected to be less at higher concentrations such as those that might be found in biota samples).

To quote: 'the expanded uncertainty is the standard way of expressing measurement uncertainty and it provides a high confidence (95%) that the actual or true value is within the interval defined by it around the measured value'.

She concluded that 'The differences seen over time appear to be obscured by the uncertainty of around 40%.'

Fundamentally, her conclusions were that measurement uncertainty made it difficult to discern changes in the methylmercury concentrations in the samples collected between October 2016 and September 2017.

Azimuth responded (Azimuth, 20 Dec 17) to the Koch Technical Memorandum through a clarification of their initial memorandum and stated that 'our re-iteration and categorical conclusion that current data quality and sample replication within and among time periods is sufficient to provide strong and valuable inferences with respect to observed changes in mercury levels'. In her reply (Koch, 8 Feb 18), Koch cited a 'common sense' approach to monitoring recommended by both the Canada-Ontario Framework (for the Great Lakes) and the U.S. Environmental Protection program. She concluded that 'generally it seems prudent

that if a statistical difference is identified on the basis of values (or means) that are within the expanded measurement uncertainty (40%), and certainly within 20% of each other, the conclusions should be carefully considered'. Koch also noted that 'the IAEC will likely wish to examine exactly how the monitoring program is set up and the details of the power analysis (if any) that was used to produce the design.'

The Chair of the IEAC contacted Jason Stow, Indigenous and Northern Affairs Canada, to inquire about the basis for the Northern Contaminants Program (NCP) long-term monitoring program. NCP has been tracking the levels of contaminants in wildlife species that are important to the diets of northern Aboriginal peoples since 2005. Stow made the following observations (Stow, 8 Feb 18), amongst others – 'A monitoring program is usually (ought to be) designed to test a certain hypothesis, which in the case of the NCP is that contaminant trends in the Arctic will follow global emissions patterns. This needs to be considered in the design of the monitoring program to ensure that you are not only measuring the trends, but that you can also evaluate what is driving the trend, i.e. test the hypothesis. In the case of Lake Melville this will obviously have to do with impacts from hydro development'. He also provided a document (Macdonald, Mar 2014), commissioned by NCP, that described a statistical analysis to ascertain if the NCP program was achieving its monitoring goal.

3. Summary

Monitoring is an integral activity of a project of the magnitude of the Muskrat Falls project. It is essential that the monitoring not only fulfill the obligations of the proponent but also the concerns of those who might be impacted by the project. The documents assembled as part of the current IEAC process will provide a foundation for a continued discussion of this important issue.

4. Recommendations

It is therefore recommended by the Independent Expert Committee that the next 'phase' of the IEAC, or another independent body yet to be established:

1. Provide recommendations on the design of the monitoring program, ensuring that it has sufficient statistical power and can answer the questions that people have about key indicators (ie. key fish species, seal).
2. Provide ongoing oversight to the implementation of the monitoring program.
3. Establish a working relationship with the affected communities to develop a community-based program that provides ongoing monitoring results, interpretation of those results in the context of agreed upon benchmarks, and a community-appropriate response to those results.

The above recommendations were made by full consensus of the IEC.

5. List of Relevant Documents

(All documents are provided in attached zip file.)

Azimuth Consulting Group Partnership, 6 November 2017. Technical Memorandum Re: Relationship Between Muskrat Falls Reservoir Elevation and Mercury Concentrations, Lower Churchill River October 2016 – September 2017. Prepared for Peter Madden, Nalcor Energy. Azimuth Consulting Group Partnership, Vancouver, BC. 50 pages (including appendices).

Azimuth Consulting Group Partnership, 20 December 2017. Technical Memorandum Re: Clarification of the Effect of Measurement Error on Analyses of Methylmercury Concentrations in the Lower Churchill River. Prepared for Peter Madden, Nalcor Energy. Azimuth Consulting Group Partnership, Vancouver, BC. Four pages.

IEAC Independent Expert Committee, September 18, 2017. Recommendations on changes to the scope and quality of the Muskrat Falls Aquatic Monitoring Program. Report to the IEAC Oversight Committee.

Koch, I., 9 Dec 2017. Measurement Uncertainty Presentation to the Independent Experts Advisory Committee.

Koch, I., 12 Dec 2017. Technical Memorandum Re: Measurement uncertainty associated with methylmercury concentrations in the Lower Churchill River and Lake Melville from October 2016 to November 2017. Prepared for Dr. Ken Reimer, Chair, Independent Expert Advisory Committee, 19 pages (including appendices).

Koch, I., 8 Feb 2018. Technical Memorandum Re: Comments on Memo Re "Clarification of the Effect of Measurement Error on Analyses of Methylmercury Concentrations in the Lower Churchill River." Prepared for Dr. Ken Reimer, Chair, Independent Expert Advisory Committee. Four pages.

Macdonald, C., March 2014. Re: Performance Assessment of the Temporal Trend Monitoring Data for the Northern Contaminants Program. Prepared for Jason Stow, Environmental Scientist, Northern Contaminants Program, Aboriginal Affairs and Northern Development Canada (now Indigenous and Northern Affairs Canada). Northern Environmental Consulting, Pinawa, Manitoba. 36 pages (including appendices).

Stow, J. 8 Feb 2018. E-mail to Dr. K.J. Reimer, Chair, IEAC Re: Northern Contaminants Program (NCP) Monitoring Program.