Q. [D01-Dams] - Please identify and fully support any claim that any of Hydro's earthen dams have characteristics that would allow for a 100-year average service life, but not a 110- or 120-year average service life due to:

a. Foundation bearing capacity, compressibility, and permeability,
b. Reliability of construction materials,
c. Durability of construction materials,
d. Construction conditions at the site,
e. Structural stability,
f. Pore pressure issues,
g. Level of water,
h. Monitoring equipment,
i. Design safety factors,
j. Erosion issues,
k. Seepage and uplift issues, or
l. Other considerations or issues.

A. Hydro-owned embankment dams are similar in nature and construction to thousands of dams in the US and Canada. These similarities include types of materials, foundation conditions, design criteria, and construction techniques to name a few. Further, based on Mr. Kennedy's experience, dams throughout North America are not commonly depreciated over a period of greater than 100 years. (Also refer to the response to IC-NLH-83.) This assumes that the dams are well designed, well constructed and well maintained and monitored.

Embankment dams are engineered structures comprised mostly of natural materials. Please refer to CA-NLH-249 for the fill composition of Hydro's earthen

dams. Problems with erosion of materials, environmental impacts and changes in seepage have to be monitored and addressed as the need arises. Properly designed and constructed embankment dams can remain structurally stable and safe for 100 years as long as they are not subjected to erosion processes. Aging also affects the foundation of a dam. Water flow through the foundation can result in strength changes over time. A good solid foundation is as essential for the life span of the dam structure as the dam itself. Maintenance of the foundation is also critical.

Embankment dams are most vulnerable to floods, internal erosion and seismic loading, but in order to realize a dam's useful life, it cannot be neglected. Periodic safety assessments are indispensable as they will show what measures have to be taken to maintain the dam's useful life. The long life of a dam can only be assured as long as proper maintenance can be guaranteed. Neglecting civil maintenance will most assuredly lead to a shortened life.

The main factors which have an impact on service life and which may call for an upgrade to a dam include:

- changes in the design criteria;
- changes in methods of analysis;
- results of risk assessments; and
- aging of construction and foundation materials and components.

All of Hydro's dams are maintained, operated and monitored to ensure their continued safe performance. Periodic assessments are carried out and changed or updated design criteria are checked. All of these processes are in place to ensure a long life.