Disclaimer

The information made available in these files is provided as a service to the public and our customers. We have taken great care to ensure and maintain the accuracy and authenticity of information contained in this file; however, some information may inadvertently be inaccurate or dated. Accordingly, all figures, dimensions, statements and language are offered on an "as is" basis and without warranties of any kind, either express or implied. Anyone intending to rely on any of the information in this file should first confirm the accuracy and authenticity of such information with Newfoundland and Labrador Hydro at (709) 737-1370. We encourage users to contact us if you have any questions about the information presented or to identify any errors in these files.

Newfoundland and Labrador Hydro does not warranty that the functions contained in these files are free from viruses or other harmful components.

Newfoundland and Labrador Hydro nor any of its subsidiaries or affiliates, their employees, officers and directors shall be liable for any loss or damage, direct or indirect, which may arise or occur as a result of the use of or reliance upon any of the information provided in these files.

All trademarks and trade names referred to or reproduced in these files are proprietary to their respective owners.

Q. Further to page 1 of Mr. Henderson supplementary evidence, provide details of the responses (including copies of actual responses) to the survey conducted on the use of hydrology data of other utilities. Include a listing of the questions and the responses for each utility, the name of each utility contacted, a name and telephone number for each utility representative contacted.

A. The organizations contacted in the survey referenced in the supplementary evidence were Hydro-Quebec, Ontario Power Generation, Manitoba Hydro, SaskPower, Alcan (Quebec), Alcan (British Columbia), and BC Hydro. The following individuals, all members of the CEA Technologies Inc. Hydraulic Integrated Resource Management Interest Group, were contacted:

Name	Phone Number	Contact Information
Dave Dhaliwal	250-639-8611	Superintendent, Power Operations, Alcan Primary Metal - British Columbia
Brian Fast	604-528-2242	Manager, Hydrology & Technical Services, Power Supply, B.C.Hydro
Mark Peters	306-566-2993	Engineer II, Generation Modeling Dispatch, SaskPower
Harold Surminski	204-474-3170	Section Head, Generation System Studies Resource Planning and Market Analysis Dept., Power Planning and Operations Division, Manitoba Hydro
Don Ferko	416-592-4621	Engineer Water Resource Forecasting & Scheduling Dept, Ontario Power Generation

Luis Carballada	514-289-2211	Gestion de Systemes Hydriques Forecasting &Water Ressources Vice presidence Production Hydro Quebec
Roger Lambert	514-289-5846	Chef Planification et Commercialisation Direction Optimisation et Opérations D.P. Marchés de gros et Projets de developpement Groupe Production, Hydro Quebec
Louise Remillard	418-699-3860	Engineer/Analyst Hydraulic Resources Group Quebec Power Operations, Alcan Smelters and Chemical Ltd.

Organizations have expressed concern in releasing details specific to their organization due to issues of confidentiality. Accordingly, details on individual responses cannot be released. However, the following is a synopsis of the questions posed, as well as a summary of the responses with references to individual organizations removed.

Questions

The primary questions posed to the representatives were:

- Does your organization develop average energy estimates for hydroelectric facilities?
- How are these estimates developed?
- Is your organization considering reducing its historical record to reflect the most recent 30-year period?
- For what purposes are average energy estimates developed? What corporate functions use this information?

Depending upon the answers to these questions, follow-up questions were asked. Follow-up questions that were asked to most, if not all respondents were as follows:

- Why does your organization use the full historic record in developing average (or median) energy estimates?
- Is the whole historic record used, or is a subset of the information used?

Responses

No organization curtailed its hydrologic record to 30 years for the purposes of rates, regulatory issues, forecasting, or budgeting. Furthermore, individual years were not excluded from the methodology for determining average energy, but rather the whole record was used. Of the seven organizations contacted, five indicated that the basis for estimating average energy capability for hydroelectric facilities was the maximum reliable hydrologic record. A sixth respondent indicated that multiple average energy estimates were developed, depending upon the purpose for the estimate. That organization also relied upon the maximum reliable hydrologic record for developing annual average energy estimates for the purposes of rates, regulatory issues, forecasting, and budgeting. The final organization contacted indicated that currently they develop their estimates based upon snowpack conditions and the application of linear regression factors. This last organization is in the process of studying the issues associated with moving to a more comprehensive energy estimation approach.

Uses for the average or median energy estimate extended to a wide range of activities, including planning, operations, budgeting, arranging purchase and sale contracts, and forecasting. Respondents indicated that there were a large number of functions that relied upon the information, ranging from technical assessments to financial and business planning functions.

When asked why their individual organizations chose to use the full historic record, respondents indicated that they wished to reflect the full range of hydrologic experience to date in developing their estimates. When asked about climate change and climactic trends, respondents indicated that there was insufficient information at this time to warrant moving from their established methodologies.

Q. Explain why Hydro did not include 2000 production, which happens to be one of the highest hydraulic production years on record, in the data used in determining the forecast Hydraulic production for 2002 (filed with the Board in May 2001).

A. The data used for the May 2001 filing was initially developed in, and based upon, information available late in 2000. Year-end data for 2000 was not available at that time. Submission of the revised cost of service study will include the information available up to that point, and would therefore reflect the impacts of 2000 inflows and water-to-energy conversion factors on Hydro's average energy estimates.

Q. Mr. Henderson states at page 1 of his Supplemental Evidence that if Hydro used a 30 year average for test year hydraulic production, “we would not be planning operation of our system storage levels to ensure our firm loads could not be met with a repeat of a known historical occurrence."

(a) Does the witness believe it is necessary to link planning for the operation of the hydraulic system (the goal of which is ensuring adequate energy supply), with the forecast production of the hydraulic system in a test year (the goal of which is establishing reasonable electricity rates)?

(b) Does the availability of the RSP to deal with financial implications of a dry year provide increased flexibility in forecasting test year hydraulic production?

(c) Isn’t it prudent to use a more conservative approach to planning (i.e., the use of a firm energy criteria) than the approach that would be employed to project hydraulic production for setting rates for a test year?

A. (a) Yes, it is necessary to link the planning of the operation of the power system and the forecast used for setting rates to ensure consistency. The operation of the power system recognizes the significant impact of the variability inherent in the inflow patterns to the various reservoir systems on the Island. The variability also is reflected in the average hydraulic production in the forecast used in the test year. To the extent that the period from 1950 to 1971 is important in operation of the power system it is also important to reflect that period when calculating the average used for forecasting test year production.

(b) The RSP will account for any variances between the forecast hydraulic production and the actual hydraulic production. Therefore, any financial implications of this variance will be accounted for in the RSP. If the RSP did not exist another accounting mechanism would have to be put in place to ensure the financial implications of the variances do not result in either significant financial gain or loss by Hydro due this highly variable and uncontrollable factor. Therefore the RSP itself does not add any more flexibility than any other mechanism. The reality is that the forecast will likely be wrong, but the forecast should be the utility's best estimate using sound utility practice and engineering judgment so that the variances from the forecast will over time average to zero and the balance in the financial accounting mechanism will tend to zero over time.

(c) It is prudent to use the known patterns of the reservoir inflows in the planning of the operation of the power system's hydraulic resources and also to reflect the reality of the average of those inflows in the forecasts. This should not be characterized as conservative or not, as it reflective of the facts of the available information.

Q. (a) Mr. Henderson states at page 2 of his supplemental evidence, that utilities with significant hydraulic generation use the “full historic reliable data record” and the “length of record depends on the particular facility with the length of records varying from 90 to 20 years”. Isn’t this inconsistent with Hydro’s approach in that the data used by Hydro does not depend on the generation facility but is the same for all facilities (i.e., Bay D’Espoir, Hinds Lake, Cat Arm)?

(b) If Hydro does not use the same hydrologic data record for all facilities, provide for each hydroelectric plant the number of years of hydrologic data used to determine the normal.

A (a) As per the practice of other utilities with significant hydraulic generation, Hydro develops its production estimates based upon the full reliable historic record available for each of its generating and reservoir facilities. These record lengths vary by generation and reservoir facility.

(b) See response to IC-155 and IC-169.

Q. At page 3 of his supplemental evidence, lines 7-8, Mr. Henderson states that it is “prudent to use and reflect all reliable inflow records in determining average hydraulic generation”. Has Mr. Henderson conducted any studies to determine the accuracy of the inflows imputed for the 1950’s?

A. Inflows calculated for periods prior to project construction were developed using well-established hydroelectric design principles. Gauged streams used in the development of inflow records for the Bay D’Espoir, Hinds Lake, and Cat Arm hydroelectric developments were:

- Salmon River (starting in 1949);
- Grey River (starting in 1958);
- White Bear River (starting in 1964);
- Exploits River (starting in 1928);
- Upper Humber River (starting in 1929);
- Torrent River (starting in 1959)
- Hinds Lake Brook (starting in 1956); and
- Cat Arm River (starting in 1968)

With respect to the 1950’s, the development of inflow records for the above projects is considered to be reliable, as reliable streamflow gauging data was present for all hydroelectric projects, and correlations for the developments compared to adjacent gauged rivers were high. This information was considered to be reliable at the time, as large financial commitments were made based upon this information.

Q. Does Mr. Henderson believe that the climate today is the same as it was in the 1950s? Has Mr. Henderson discussed the issue with Environment Canada?

A. Issues of climate change and climactic trends pose a challenge to owners of hydroelectric generators. Nobody knows with any degree of certainty what the future climate trends will be. Environment Canada states on its web site, "Indications are that as climate warms both global evaporation and precipitation will increase. This will affect each region differently since precipitation belts will shift. Some previously wet regions will become much drier while other areas may become far wetter than usual" (A Primer on Climate Change – Forecasting the Future, Environment Canada).

When contacted by staff in Mr. Henderson's department, Environment Canada indicated that there is no current research that would provide meaningful indication regarding the impact of climate change upon hydrology conditions on the island of Newfoundland. As a matter of interest, the Atlantic region summer precipitation for 2001 was the third driest on record, falling between the years 1957 and 1960 in the 54-year seasonal ranking.

Q. At page 3 of RJH supplemental evidence, Mr. Henderson states that use of a 30-year moving average would result in Hydro "Planning operation of the system ignoring the driest period of inflows, which would place energy supply at increasing risk".

(a) Please quantify the increased risk to the system of setting rates based on a 30-year average of inflows rather than a 51-year average.

(b) How will the setting of rates based on a 30-year average affect how Hydro plans the operation of the system?

A. (a) Hydro does not propose setting rates based upon a 51-year average *per se*, but rather setting rates using the expected energy capability of its hydroelectric facilities using their full reliable record, as detailed in IC-155 and IC-169.

Regarding the risk that is imposed in using a 30-year average, it is difficult to quantify the risks associated with operating the system under one set of rules and setting rates under a different set. However, as noted in part (b) below, introducing inconsistency between the averages used to estimate hydraulic production as used in rate setting and those used for operating poses problems and may introduce systemic uncertainty into the operation of the power system.

(b) It will not have a significant impact upon the system. However, rates are a key input into the determination of the load forecast. Higher rates discourage consumption and hence reduce the amount of energy to be generated. Assuming that rates are based upon the 30-

year average, the expected hydroelectric production used in the rate-setting process will be higher, assumedly reducing the general rate level to customers. Everything else being equal, load will be marginally higher than if Hydro's existing methodology were used.

In operating the system, Hydro would continue to use its full historic record in order to plan and dispatch its various generating units. The average expected production for operating purposes would be less than that currently envisaged for the 30-year average. In turn then, Hydro would operate its reservoirs higher in order to maintain more storage to meet the additional loads, thereby relying upon more thermal production. Everything else being equal, introducing an inconsistency between the hydroelectric production estimates used for rate setting and operating may result in higher required reservoir levels, and more thermal production in the short term to maintain these levels.

Also, as reservoirs are operated higher, there is less flexibility in accommodating significant precipitation or runoff conditions. The requirement for higher levels, particularly in the early winter months will mean that in the event of early runoff, Hydro may be unable to accommodate the water, resulting in spill and thereby additional thermal production.

Q. Is Environment Canada the official source of the data used by Hydro in determining inflows? If not, please disclose the source of information for each plant.

A. No, Environment Canada is not the official source of data used by Hydro in determining inflows. Currently all of Hydro's major reservoirs are equipped with staff gauges and/or telemetry installations, providing water elevation data for the purposes of calculating inflows. Information for two of these reservoirs, Hinds Lake and Long Pond, are provided to Environment Canada (Water Survey of Canada) on a monthly basis by Hydro.

Environment Canada (Water Survey of Canada) stream flow records were used in the development of synthesized data for hydroelectric developments. See NP-308 for further details.

Environment Canada (Atmospheric Environment Services) precipitation data is not used by Hydro in determining historic inflow data as the two do not necessarily correlate due to variances in location of precipitation monitoring stations and the reservoir system, the effects of temperature and wind on evaporation, the effects of ground water and lake levels, the uptake of water by vegetation and the general effect of the terrain in the area of the reservoir on the rate of runoff.