Q. Why was only a 15-year inflow sequence used in the analysis of optimum penstock size rather than the full hydraulic record (page 2, Appendix C, Volume II)?

A. Page 2, Appendix C, Volume II states that "A 15 year inflow sequence was used in the simulation, as in the Water Management Study."

A 15 year inflow sequence was used since the average of a 15 year period has been found to be similar to the average for a longer period. As outlined in the 2000 Water Management Study, completed by SGE Acres (the "Study") and filed with the Board on December 15, 2000, checks were completed on Newfoundland Power's systems to confirm that the 15 year inflow sequence is similar in results to the long term average. It has been proven through the Water Management Study that running a 15 year inflow sequence results in similar output as running a full hydraulic record.

A copy of Section 2.2.3 *Selection of Length of Sequence* from the Study is provided in Attachment A.

Section 2.2.3 "Selection of Length of Sequence" from the 2000 Water Management Study completed by SGE Acres

The main concern when developing an inflow sequence to be used for simulating long term production is not whether the flow was exactly as estimated on any particular day, but whether on a daily basis the estimated sequence represents the ups and downs of flows that can be expected over the long term.

A review of the characteristic high and low values for the basins with EC stations on the Avalon Peninsula from previous flow duration curve analysis work by Acres showed that these characteristic values were similar for all stations. The records to be used for patterning were therefore chosen on the basis of proximity and orientation, since it can be expected that basins in the same area with a similar orientation with respect to weather systems would have similar runoff patterns.

The selection of records to be used for patterning for systems on the rest of the island was similarly made considering high and low flow characteristics as well as location and orientation of the basins.

For each system, a record from a nearby EC station was selected for patterning. The sequence developed from this record is referred to as the primary inflow sequence. A second record was usually also identified for sensitivity analysis, and the resulting sequence is referred to as the sensitivity inflow sequence. In cases where an EC station is located near an NP system with no other suitable nearby EC stations, only the primary inflow sequence was used with no sensitivity analysis. In most of those cases the MAR was assumed to be the same as that of the EC basin.

2.2.3 Selection of Length of Sequence

The length of the inflow sequence is limited by the length of the EC record used for patterning. Techniques are available for developing synthetic records by correlation and extension, but they generally maintain the statistics of the same data sets, so there is no particular advantage in applying such techniques in this study.

In general, a long record is preferred over a shorter record for power and energy analysis, to ensure that a full range of wet, average and dry conditions is modelled. In Newfoundland, there are few good stations that have been in place more than 15 to 20 years; however, in the early 1980s EC expanded its network considerably, adding over a dozen stations on the Avalon Peninsula alone. These

records provide valuable information for estimating MAR, and offer more choice in the selection of a record for patterning.

After review of the records, a 15 year sequence based on historic years 1984 to 1998 was selected. This period contains representative wet and dry years, and the average of the 15 years is similar to the average for a longer period (at stations where the records are long enough to allow comparison). For each of NP's systems there is at least one station in the region with a suitable record for patterning, having data for most of this 15 year period. In a few cases, the records used for patterning required extension by a year or two to provide the full length for the inflow sequence. In these cases, records from nearby stations were reviewed, and the one with the best correlation with the selected station was used.

As a check, where an EC record used for patterning was available for significantly longer than the 15 year period from 1984 to 1998, one of the simulation models using that gauge was tested using the full period of record. For the Topsail and Seal Cove stations on the Avalon Peninsula, this check confirmed that the 15 year period was representative of the longer-term inflows. The same check when conducted for the Rose Blanche Brook station (using the record for the EC station at Isle Aux Morts River) indicated that the period from 1984 to 1998 was slightly drier than the entire 36 year period of record available at that station. For consistency however, the same 15 year period was used to estimate the long term production for this station.

2.2.4 Information for Sequence Development

Table 2.1 shows the estimated MAR for each of NP's systems, together with the EC station record to be used for patterning. The MAR and drainage area (DA) for the EC stations are provided to allow proration to NP basins (and subbasins) of different sizes. To obtain the required inflow sequence, each daily flow is prorated by MAR and by DA (that is, multiplied by the ratio of the MAR's and by the ratio of the DA's).

The information required for extending an EC record where required is also provided in the notes to the table.