Replacement & Spare Substation Equipment ($1,107,000)

Q. Provide the criteria or guidelines used to determine the level, amount and types of spare equipment maintained for substations. If past experience is a consideration, provide details of such.

A. The criteria used to determine the level, amount and types of spare equipment maintained for substations is based primarily on past experience. A review of plant in service and existing spares is done using factors such as physical condition, environmental risk, potential repair costs, past failures, and equipment age. The 2003 budget includes replacement & spare potential transformers, reclosers, a circuit breaker, voltage regulator panels and breaker compressors.

Potential Transformers (PTs)
Newfoundland Power has approximately 500 PTs in service. These devices are used as voltage sources for protection and metering schemes. The majority of these PTs are oil-filled. Each year some of these PTs fail while in service or are required to be removed from service due to severe deterioration. The 2003 budget includes funds for two 138 kV and two 66 kV PTs. These new PTs will be a dry type design that will eliminate the environmental risk associated with the older oil-filled units.

Reclosers
NP has approximately 200 reclosers in service. Reclosers are used to automatically isolate electrical faults on the distribution system from the electrical grid. Many of these faults are temporary in nature (for example, a tree brushing a line during a windstorm). A recloser will check to see if the fault has cleared and, if it has, the recloser will automatically restore power. Reclosers minimize the duration of customer outages.

Newfoundland Power's reclosers can be divided into four basic types - hydraulic, relay, resistor, and electronic. These four types vary in the sophistication or capabilities they offer with respect to protection, coordination, and remote control capability. The capabilities increase in the order listed - hydraulic units have the least capabilities while electronic units have the greatest capabilities. Due to these capability differences, some types of reclosers cannot be used to replace others. Electronic reclosers are the most flexible since they can be used to replace any of the other three types. On the other hand, a hydraulic recloser will often not be able to be used to replace one of the other types.

Reclosers are generally replaced for one of five reasons – electrical failure; severe physical deterioration; inability to provide adequate protection; technical obsolescence; and routine maintenance.

In order to respond to any of these problems, Newfoundland Power requires a minimum level of spare equipment to reduce customer outage time and to continue to supply electrical energy in the safest and most reliable manner possible. The 2003 budget

includes two spare electronic recloser units. The purchased units will be oil and maintenance free and will be capable of replacing any other recloser that fails in the NP system.

Circuit Breakers

Newfoundland Power has approximately 400 breakers in service. Their purpose is similar to reclosers in that they are used to isolate power system electrical problems. However breakers are often used for higher voltage levels such as 66 kV and 138 kV. These units are often oil filled and represent significant environment risk. By the nature of their operation breakers will deteriorate over time and will require replacement. Based on our past experience, Newfoundland Power requires at least one spare 138 kV and two spare 66 kV breakers in order to respond to field failures. The budgeted figure for one 66 kV breaker for 2003 will return our 66 kV spare level to two units.

Each year as part of our preventative maintenance program, equipment repair often requires that new components be purchased to replace deteriorated ones. These replacements will extend the equipment life and defer the purchase of full replacement units.

Breaker Compressors

The compressors are required to replace defective units on 138 kV KSO bulk oil breakers. Replacement compressors represent approximately 2% of the cost of purchasing complete replacement breakers.

Voltage Regulator Panels

Newfoundland Power has approximately 340 voltage regulators in service. These regulators are used to maintain individual phase voltages within required limits on primary distribution circuits. Each of these regulators has an associated control panel containing the electronics that govern the unit's operation. These panels often fail resulting in the regulator becoming non-functional. Many of these panels utilize obsolete electronic components making their repair expensive or impossible. Experience with repaired panels has shown that they often fail again due to their overall poor condition soon after being returned to service. Repair costs are 30 to 50% of the cost of a replacement unit. In 2002 we identified a universal replacement control panel complete with a stainless steel weatherproof enclosure. These replacement panels will enable us to extend the life of existing regulators at about 15% of the cost of an entire new regulator.

The 2003 budget figure includes 32 replacement panels (or approximately 10% of the units in service). Aside from being far more corrosion resistant, these panels will also give increased functionality to the existing equipment. These functions include reverse power flow capability, more accurate voltage control and optional remote control capability.