Q. Describe Newfoundland Power's strategies for protecting its transmission lines and circuit breakers, substation transformers, and distribution feeders from lightning and switching overvoltages. Explain the degree that these strategies have been applied and any practices in place for improving lightning protection in the future.

A. The following are the methods used by Newfoundland Power to protect its equipment from lightning and switching over voltages:

- Substation power transformers are equipped with lightning arrestors on both the high voltage and low voltage sides,
- Substation bus structures are grounded and the 138 kV and 66 kV steel structures are grounded with grounded lightning rods,
- 138 kV transmission lines have on overhead ground wire extending out 800 meters from the substation,
- 66 kV transmission line underground cable terminations have lightning arrestors installed,
- Distribution feeder underground cable terminations supplying pad mount transformers have lightning arrestors installed,
- Distribution pole mount transformers have lightning arrestors installed,[1]
- Distribution feeder downline reclosers have lightning arrestors installed,
- Distribution feeder voltage regulators have lightning arrestors installed, and
- Transmission lines and distribution lines are protected using instantaneous overcurrent protective relaying.

These lightning protection methods are incorporated into the Company's standard design criteria for all new installations. These methods are also implemented on existing transmission lines, substations and distribution feeders as part of the capital projects related to refurbishing existing assets.[2]

[1] Prior to the mid 1990's, lightning arrestors were not installed on distribution transformers. In 1995, following a review of distribution transformer failures, it was decided to install lightning arrestors on feeders that were most prone to lightning damage. Again in 2002, following several severe lightning storms distribution transformer damage was reviewed. Since 2003, lightning arrestors have been installed on all new distribution transformers and are installed on existing transformers as part of the Company's Rebuild Distribution Lines capital project.

[2] The capital projects focused on refurbishing existing assets include *Transmission Line Rebuild, Substation Refurbishment and Modernization, Distribution Reliability Initiative* and *Rebuild Distribution Lines*.