Q. Reference: "2020 Capital Budget Application," Newfoundland Power, July 5, 2019, Report 2.1 "2020 Substation Refurbishment and Modernization," secs. 3.1 and 3.2

On page 4, Newfoundland Power states "The installation of three 138 kV circuit breakers . . . will allow for the removal of the high-speed ground switch presently being utilized for transformer protection . . ."

On page 7, Newfoundland Power states "The installation of a 138 kV circuit breaker . . . will allow for the removal of the high-speed ground switch presently being utilized for transformer protection."

Please provide customer outage statistics for the past five years for outages caused by operation of the high-speed ground switches at Marystown and Bonavista Substations as well as the SAIDI and SAIFI statistics for the past three years for the feeders fed from the Marystown and Bonavista Substations.

A. Newfoundland Power does not collect outage statistics for individual pieces of equipment. The Company is therefore unable to provide customer outage statistics for the past 5 years for outages caused by operation of the high-speed ground switches at Marystown and Bonavista substations, as requested.[1]

Newfoundland Power installed high-speed ground switches in some rural substations at a time when its transmission network was rapidly expanding. This form of protection for small power transformers was both cost effective and allowed for rapid construction at a time of high growth.[2]

[1] While outage statistics for individual pieces of equipment are not tracked, a review of Newfoundland Power's system event log identified some examples of outages caused by high-speed ground switches within the last 5 years. For example, 2 high-speed ground switch operations occurred in Bonavista Substation in November 2018. The 1st operation on November 15, 2018 resulted in 839,369 customer outage minutes and was due to a failed current and potential transformer combination. The 2nd operation on November 24, 2018 was due to a failed power transformer and resulted in 3,369,273 customer outage minutes. On May 15, 2016, the Linton Lake high-speed ground switch operated, causing an outage at both Linton Lake and Marystown substations, resulting in 298,294 customer outage minutes.

[2] High-speed ground switches were previously installed for protection of power transformers when the cost of supplying other protective equipment was deemed unjustifiable and the amount of system disturbance that the high-speed ground switch creates was judged acceptable. In many locations the use of a high-speed ground switch avoided the need to install high-voltage breakers and bus structures. Transmission lines could be terminated directly on the air-break switch, isolating the power transformer. This simple design required less time for construction and cost less.

The time for a high-speed ground switch to operate and the upstream circuit breaker to trip, is slower than a standard circuit breaker operation.[3] This exposes a transformer and low-voltage bus to increased fault levels for longer periods of time, which effectively reduces the life of the assets exposed to the fault. Replacing high-speed ground switches with transmission line breakers provides standard protection and the ability to remote control operation of the transmission lines.[4] The replacement of the high-speed ground switches at Marystown and Bonavista substations will provide standard protection of the power transformers in these substations.

Table 1 provides the SAIDI and SAIFI statistics for the past 3 years for the feeders fed from the Marystown and Bonavista substations, as requested.

Table 1
Marystown and Bonavista Substation Feeders
Reliability Statistics
(All Events Excluding Loss of Supply)

	SAIDI			SAIFI		
Feeder	**2016**	**2017**	**2018**	**2016**	**2017**	**2018**
MSY-01	1.73	1.40	1.96	1.95	2.01	1.40
MSY-02	4.07	3.48	1.30	2.13	1.44	1.42
MSY-03	3.03	1.57	5.10	2.70	2.55	3.97
MSY-04	1.55	1.35	4.38	1.13	0.61	4.23
BVA-01	3.90	17.29	40.04	5.55	7.62	7.06
BVA-02	4.28	4.40	32.49	4.75	4.28	6.96
BVA-03	1.29	4.23	34.04	2.02	2.68	8.24

[3] This form of transformer protection relies on the transmission line protection at the upstream substation detecting the ground fault applied by the high-speed ground switch in the downstream substation. The operation of the high-speed ground switch is initiated by the transformer protection for a fault in the transformer, on the low voltage bus, or on a distribution feeder where the fault is not cleared by the feeder recloser.

[4] Newfoundland Power's *2014 Supplemental Capital Application* to address certain distribution and substation issues following #darkNL included the replacement of high-speed ground switches on transmission line 39L from Bay Roberts to Holyrood. The improvements to transmission line 39L were subsequently approved by the Board in Order No. P.U. 14 (2014).