Q. Please provide a status report describing the actions taken by Hydro in response to each of the 56 recommendations listed in Appendix D, titled "*January 11, 2013 – Winter Storm Events,* to the *January 11, 2013 Power System Outage Report*", filed with Hydro's March 24, 2014 Report to the Board. In the response include any future actions required and the date for completion of each action.

A. The 56 actions as identified in the January 11, 2013 report are contained in PUB-NLH-160 Attachment 1. A status update of the actions is carried out on a monthly basis and is coordinated by the Transmission Working Group of the Performance and Reliability Committee. A meeting was held with Project Execution and Technical Services (PETS), Transmission and Rural Operations (TRO), System Operations and System Planning on February 22, 2013 to review the recommendations and assign accountability for evaluation, action planning, and initial risk and constraint analysis, fast tracking any high value and readily actioned recommendations. On August 1, 2013, TRO chaired a meeting with PETS, TRO, System Operations and System Planning to discuss information from the front-end work, update status and assign relative priorities to the recommendations. The round table discussion considered the potential impact to safety, cost, reliability and customer service and the likelihood of occurrence. This resulted in priority rankings for the recommendations as described below. The team also considered the requirements to implement solutions and the ability to action those within the constraints of normal system operations, ultimately arriving at a schedule of the highest priority activities that could be actioned in 2013. In 2014, work continued on the next layer of priority recommendations, integrated and prioritized in a similar manner, with the supply disruption events of this winter taken into account.

The priority system developed and utilized in 2013 was:

1. Priority A – To be completed before the 2013/2014 winter season.
2. Priority B – Engineering work (if required) to be completed in the winter of 2014 and field work to be completed before the 2014/2015 winter season.
3. Priority C – Engineering work or study to be completed in 2014.
4. Priority D – To be scheduled in 2015 or beyond.

Updated **April 14, 2014**

Follow-Up Action - January 11, 2013 Event - TRO

Legend

Open	Completed
Information	Action required/Overdue

Action Item #	Initiating Event	Date Due	Action Item Description	Priority (A/B/C/D)	Status	Date Resolved	Comments
1	January 11, 2013 Winter Storm	12/31/13	There were many issues with breakers, particularly the 230 KV class, during these events. A review of the preventative maintenance schedules and procedures for these breakers should be carried out to ascertain whether they are being carried out adequately. In addition, this review should address whether or not they are adequate for the age of the breakers. One issue is the failure to trip which is related to the auxiliary contact in the trip circuits and may be mitigated by the exercising of the breakers. A schedule for this 'exercising' should be developed and monitored, possibly with the assistance of EMS data which reports the opening and closing of the breakers, to identify 'dormant' breakers.	A	Completed	07/01/13	Updated PMs and schedule in JDE. Will be monitored through short term planning and scheduling. Please refer to PUB-NLH-159.
2	January 11, 2013 Winter Storm	12/31/13	Although inspection of the suspected station faulted area for the Holyrood Unit 3 trip at 0413 hours was performed following the fault, a more thorough inspection of the area should be performed during a scheduled outage, to ensure that no damage exists and to confirm the fault mechanism. The area of concern is from the unit's transformer bushings to the unit breakers.	A	Completed	09/13/13	The area in question was inspected during the breaker RTV coating program associated with Unit 3 with no deficiencies found.
3	January 11, 2013 Winter Storm	12/31/13	The maintenance program pertaining to the application of the RTV coating on the Holyrood station equipment should be reviewed. The review should also address the extent of the equipment involved, as the current coverage appears to be associated with the unit breakers only.	A	Four of Six breakers completed		Four of six breakers were completed. The two breakers not completed in 2013 are scheduled to be replaced in the summer of 2014. In addition, the RTV coating program is currently being reviewed beyond the unit breakers in conjunction with the breaker replacement program.
4	January 11, 2013 Winter Storm	12/31/13	The indications associated with the Holyrood Unit 1 disconnect should be checked during opening, as there appears to be no "in transit" position but rather two "opens". The auxiliary cam switches which provide for the indication need to be checked.	A	Completed	10/06/13	This disconnect and auxiliary cam switches have been checked with no deficiencies found.
5	January 11, 2013 Winter Storm	12/31/13	Testing should be carried out on line 39L protection, in particular the 51N relay as it appears that the disk is not fully resetting.	A	Completed	10/06/13	Testing carried out and no deficiencies found.

Updated April 14, 2014

Follow-Up Action - January 11, 2013 Event - TRO

Legend			
Open	Completed		
Information	Action required/Overdue		

Action Item #	Initiating Event	Date Due	Action Item Description	Priority (A/B/C/D)	Status	Date Resolved	Comments
6	January 11, 2013 Winter Storm	06/30/14	A more thorough inspection of the equipment associated with the 138 KV bus - B8 (A phase) at the Holyrood terminal station should be performed to determine the location of the bus fault that resulted in the bus lockout.	B	On-going		A bus outage to Bus B8 and 39L is required for this inspection. An outage will be planned for the summer of 2014 prior to the due date.
7	January 11, 2013 Winter Storm	12/31/13	A thorough inspection of the external area of B12L17 should be conducted to look for evidence of an external fault on B and C phases in the TL217 line protection zone. Particular emphasis should be on B phase, the phase of B12L17 which failed to clear.	A	Completed	10/06/13	The inspection has been completed with no evidence of fault or damage.
8	January 11, 2013 Winter Storm	12/31/13	Further testing and inspection of breaker B12L17 is required to determine why the breaker failed to clear the fault on B phase. In addition, the problem with the erratic status indication of B12L17 should be investigated, beginning with examination and testing of the auxiliary contacts used for the indication. If no evidence of an external fault is found on B phase in the area of the breaker and its CT, an internal inspection of the B phase contacts and operating mechanism should be performed, as it suggests that B phase faulted, tripped and re-struck internally before being cleared via the breaker failure operation of B12T10.	A	Completed	09/30/13	Testing and inspection was completed with no deficiencies found.
9	January 11, 2013 Winter Storm	09/30/14	Function testing of the 94TS/T1 Unit 1 transformer backup protection contacts in the breaker failure (B1/TF) and breaker failure lockout (86/BF - B1L17) circuits should be performed to ensure the timer is set and operating correctly to trip the breaker failure lockout.	B	On-going		Function testing completed but timer not verified. This work to be completed during the planned outage on Unit 1 which is scheduled to start in July 2014.
10	January 11, 2013 Winter Storm	12/31/13	Based on the damage found internally in breaker B1L22 at Springdale, other 138 KV KSO breakers on the system should be tested or inspected for resistor damage.	A	On-going		There are 2 such breakers on the system, BIL23 in SPL and B8L39 in HRD. B1L23 is scheduled for replacement in 2014 and as a result no action is required. B8L39 is scheduled for replacement in 2019. The inspection of the resistors will be carried out in conjunction with item 6.
11	January 11, 2013 Winter Storm	12/31/13	Further investigation and testing should be performed on Buchans breaker L05L33 to ensure that the failure to trip B phase, failure to trip on disagreement, and the subsequent closure on loss of air is more completely understood, with repairs as required.	A	Completed	08/28/13	Breaker was overhauled using parts from the old Hardwoods breaker B1L36 which was replaced in 2013.

Updated	April 14, 2014		Follow-Up Action - January 11, 2013 Event - Thermal Generation				
					Legend	Open	Completed
						Information	Action required/Overdue
Action Item #	**Initiating Event**	**Date Due**	**Action Item Description**	**Priority (A/B/C/D)**	**Status**	**Date Resolved**	**Comments**
19	January 11, 2013 Winter Storm	12/31/13	Plant management to review instructions for recording protection targets after unit trips to ensure they are recorded by the operator before being reset.	A	Completed	12/03/13	Instructions were reviewed with Operations Staff.
20	January 11, 2013 Winter Storm	12/31/13	On unit #3, the 87GT3 should be function tested to ensure the relay targets flag when the relay operates.	A	Completed	11/30/13	TRO Cent Planning completed during annual outage in 2013.
21	January 11, 2013 Winter Storm	06/30/14	The plant SOE indicates the operation of unit #3 generator lockout 86-2 but no lockouts were reported in the system SOE. All points on the Plant SOE should be confirmed into the System SOE log.	B	On-Going		A full review of the points is required and an action list to be developed with Plant Operations and PETS P&C
22	January 11, 2013 Winter Storm	12/31/13	Unit trip reports for all unit trips should be completed by plant personnel to determine systems operated as designed.	A	Completed	12/03/13	Trip reports are regularly completed on Unit trips.

Updated	April 14, 2014		Follow-Up Action - January 11, 2013 Event - PETS, P&C Section		*Legend*	Open	Completed
						Information	Action required/Overdue
Action Item #	**Initiating Event**	**Date Due**	**Action Item Description**	**Priority (A/B/C/D)**	**Status**	**Date Resolved**	**Comments**
23	January 11, 2013 Winter Storm	06/30/14	Lockouts from HRD Units 1 and 2 to be tied into the HRD breaker fail scheme of the terminal station. A review of all breaker fail designs schemes on the system should be conducted to ensure that all schemes are adequate. Ensure they have the correct initiating inputs such as the lockouts and trip the required breakers in the event of a breaker failure.	A/C	On-Going		A draft design was completed and reviewed by TRO P&C East. There was a concern with maintenance of the design. A new design was completed which requires lockout switches and additional cabling. The lockouts and cabling has been purchased. Cables will be installed in the spring/summer of 2014. The breaker fail review is scheduled for 2015 and is being revisited in light of January 2014 events.
24	January 11, 2013 Winter Storm	12/31/13	A new protection design philosophy should be developed with overlapping protection zones to cover all new installation. This is in conjunction with the recommendation that all new breakers have CTs installed on both sides of the breaker.	A	Completed	12/13/13	All new protection designs will incorporate overlapping protection zones.
25	January 11, 2013 Winter Storm	12/31/13	The application of appropriate settings for the load encroachment feature on all SEL 321 relays should be done to prevent operation during off-frequency events. A review of SEL's final recommendation report (pending) should also be carried out. A setting of 100 ohms primary for all lines is recommended based on the protection settings for the longest line on the system, TL206. This setting will accommodate a load of 529 MVA before blocking. The angles settings are PLAF=90, NLAF=-90, PLAR=90, NLAR=270. This approach is preferred over the setting of the 50PP1 current monitor as it is independent of minimum fault levels.	A	Completed	12/13/13	Setting changes for load enhroachments has been completed.
26	January 11, 2013 Winter Storm	12/31/14	Consideration should be given to the application of trip coil monitors at all breakers which have remote alarming features. The monitors would indicate issues with the circuits. Currently only local monitoring exists using panel lights. SEL has a trip coil monitor which might be suitable.	D	On-Going		A trip coil monitor has been selected and will be implemented on new breakers in 2014.
27	January 11, 2013 Winter Storm	12/31/13	The Zone 2 protection reaches on TL218, TL242 and TL217 need to be increased to ensure that they operate for faults at the remote terminal end. The second zone timers for TL218 and TL242 should also be decreased from 60 cycles to 18 cycles.	A	Completed	12/13/13	Protection setting modifications were completed.
28	January 11, 2013 Winter Storm	12/31/14	Previous reviews by Henville Consulting have recommended Zone 1 and Zone 2 protection setting changes for the Eastern lines in addition to setting changes for other line relaying. These should be revisited and implemented as soon as possible.	B	On-Going		To be completed during the Optimho relay replacement program starting in 2014.

Updated **April 14, 2014**

Follow-Up Action - January 11, 2013 Event - PETS, P&C Section

Legend		
Open		Completed
Information		Action required/Overdue

Action Item #	Initiating Event	Date Due	Action Item Description	Priority (A/B/C/D)	Status	Date Resolved	Comments
30	January 11, 2013 Winter Storm	12/31/13	The Zone 1 distance protection settings on TL218 and TL242 (presently set at 88% and 82% of line lengths, respectively) should be decreased to a suitable level. A maximum 75% setting is recommended to ensure the protection does not overreach as occurred during these events. Previous studies have recommended a maximum setting of 80%.	A	Completed	12/13/13	Setting changes made at the same time as item 25.
32	January 11, 2013 Winter Storm	01/31/14	The recommended firmware upgrades should be implemented in the LPRO2100 relays. Testing should be done on the relays following the firmware upgrades to verify that the relays will no longer operate for these events. This can be performed by testing the relays with the file captured on January 11 as the input to control the test set.	A	Completed	01/24/14	All relay firmware upgrades were completed.
33	January 11, 2013 Winter Storm	05/30/14	The reclosing on 100L at Sunnyside should be re-evaluated and co-ordinated with Newfoundland Power such that, upon loss of voltage along the 138 KV loop and the tripping of 100L, the loop is opened at an appropriate location to ensure that a reasonable amount of load is re-energized upon reclose. This will help to prevent a repeat occurrence of the re-energization event as happened on January 11. If this cannot be coordinated then reclosing should be turned off.	B	On-Going		Discussions to be held with Newfoundland Power in May 2014 to determine next steps and actions.
34	January 11, 2013 Winter Storm	12/31/14	Application of frequency monitoring to capture abnormal frequency events such as occurred on this day should be considered for installation in various 230 KV stations - one in an Eastern station, another in Bay d'Espoir and one in a Western station.	C			Lower priority, not yet actioned.
35	January 11, 2013 Winter Storm	06/30/14	Further investigation into the tripping of TL236 at Oxen Pond should be conducted to ensure that the permissive overreaching logic is working properly on the P2 protection (SEL) relays. This protection tripped the Oxen Pond end during the 0742 hour event (trip of TL201). This was a nuisance trip of little significance at the time but could result in something of consequence in the future.	A	Completed	03/30/14	The investigation has been completed with no deficiencies found.

Updated	April 14, 2014		Follow-Up Action - January 11, 2013 Event - PETS, P&C Section		Legend	Open	Completed
						Information	Action required/Overdue

Action Item #	Initiating Event	Date Due	Action Item Description	Priority (A/B/C/D)	Status	Date Resolved	Comments
36	January 11, 2013 Winter Storm	12/31/13	With regards to the tripping of breaker B1L31 at STB at 0748 hours, further investigation is required into why the SEL 321 operated when the station was energized. A request has been sent to Schweitzer to determine if they have any suggestions. If the problem is not addressed by Schweitzer then the relay should be fully tested to ensure it is operating properly. In addition, the load encroachment feature should be applied to this relay even though the problems are not suspected to have originated from a memory/frequency tracking issue.	A	Completed	11/14/14	Schweitzer determined that frequency excursion was the issue. This is the same as item 25. Completion of item 25 has solved this problem.
		12/31/13	Since the breaker closed after tripping two phases, there should be a review of the three pole conversion circuitry for this line, as well as for all line protections, to ensure that the correct logic is applied to provide for three pole trip conversion on the tripping of two phases. The 94L2 three phase trip relay should trip the T relay to operate the TC1 and cancel reclosing. Other circuits should be checked to ensure that the 94L2 trips the T relay in this manner	A	Completed	11/14/14	The review has been completed with no deficiencies found.
37	January 11, 2013 Winter Storm	12/31/13	A timer should be added to extend the duration of the transfer trip signal from the STB TL235 protection which picks up the 85X at GFL FRC and provides for a direct trip of the three low side breakers 252T-1, 252T-2 and 252T-3 at GFL FRC.	A	Completed	11/25/13	The holdup time of the transfer trip has been extended by Communications/Network Services.
38	January 11, 2013 Winter Storm	12/31/14	Consideration and study should be given to the application of underfrequency relaying on the Hinds Lake generator and other hydro units to trip when extreme underfrequency levels are reached and maintained on the system or islanded areas, such as occurred on January 11. A level in the order of 54 Hz with a suitable timer might be appropriate. An alarm indicating an imminent trip would form part of the strategy to alert the operator to take action where possible.	C			Lower priority, not yet actioned.

Updated **April 14, 2014**

Follow-Up Action - January 11, 2013 Event - PETS, P&C Section

Legend	Open	Completed
	Information	Action required/Overdue

Action Item #	Initiating Event	Date Due	Action Item Description	Priority (A/B/C/D)	Status	Date Resolved	Comments
39	January 11, 2013 Winter Storm	12/31/14	Consideration should be given to the addition of remote end tripping of line breakers in the event of breaker failure lockout operations, such as that which occurred on L05L33. The 86BF lockouts should initiate transfer trip to the remote end of the lines.	C	On-Going		Engineering work is scheduled for completion in 2014.
40	January 11, 2013 Winter Storm	12/31/13	Consideration should be given to timer setting changes for the Come By Chance capacitor banks in order to stagger the tripping of the banks for the first level (110%) overvoltage trip. Currently all banks have 10 cycle trip timers. These could be changed to 10, 20, 30 and 40 cycles for banks C1, C2, C3 and C4, respectively, or some other suitable times.	A	Completed	12/03/13	Setting changes were issued and work completed.
41	January 11, 2013 Winter Storm	06/30/14	Timers should be installed in the control circuits of the Come by Chance capacitor banks to block closure until at least five minutes have elapsed from the time of breaker opening. This would allow for the manufacturer's recommended discharge time.	A	On-Going		Temporary measures were put in place prior to the dues date. ECC has a tag on the breakers and Operations has a procedure for these breakers. Timers and additional relays have been purchased. Design is in complete and drawings have been sent to TRO. Scheduling installation in 2014.
42	January 11, 2013 Winter Storm	12/31/13	The analysis of these events has highlighted the value of having two different types of protections from two different manufacturers applied on the transmission lines. This philosophy should be considered for all new or upgraded protection applications.	A	Completed	12/31/13	The new relay has been chosen to replace the Optimho relay. This part of the Optimho relay replacement program is starting in spring 2014. It is being applied to the new Labrador west line and the new Soldiers Pond station.

Updated	April 14, 2014		Follow-Up Action - January 11, 2013 Event - PETS, Electrical Section		*Legend*	Open	Completed
						Information	Action required/Overdue
Action Item #	**Initiating Event**	**Date Due**	**Action Item Description**	**Priority (A/B/C/D)**	**Status**	**Date Resolved**	**Comments**
43	January 11, 2013 Winter Storm	12/31/13	New breakers in the Holyrood TS are to have an insulation creepage distance suitable for high contaminated environments. Ceramic type insulation, creepages of 31 mm per kV or greater	B	Completed	12/31/13	The specification for new breakers for Holyrood TS has been updated for the new creepage distance.
44	January 11, 2013 Winter Storm	12/31/13	New breakers to have CTs on both sides to provide overlapping zones. More then two to four CTs set could be required depending on breaker.	B	Completed	12/31/13	Specifications for new circuit breakers were updated to include current transformers on both sides of the breakers on all new purchases.

Updated	**April 14, 2014**		**Follow-Up Action - January 11, 2013 Event - PETS, T&D Section**		***Legend***	Open	Completed
						Information	Action required/Overdue
Action Item #	**Initiating Event**	**Date Due**	**Action Item Description**	**Priority (A/B/C/D)**	**Status**	**Date Resolved**	**Comments**
45	January 11, 2013 Winter Storm	12/31/13	Review standards for the length of jumpers used on transmission structures.	A	Completed	12/21/13	Jumper string length was reviewed. TL201 was patrolled and investigated for suspect jumpers. The following jumpers were identified: 282-1, 283, 284, 353,354,357, 189, and 154. All jumpers and associated hardware have been replaced as require for each structure identified.

Updated April 14, 2014

Follow-Up Action - January 11, 2013 Event - System Operations & Planning

Legend	
Open	Completed
Information	Action required/Overdue

Action Item #	Initiating Event	Date Due	Action Item Description	Priority (A/B/C/D)	Status	Date Resolved	Comments
29	January 11, 2013 Winter Storm	12/31/14	Further investigation into why the Come by Chance 230 KV Capacitor bank, C4, tripped during the fault is required. The 94C4 operated to trip breaker B2C4 at 06:42:06, however this was at a time that the bank was required.	C	On-Going		System Planning will perform a study into requirements.
31	January 11, 2013 Winter Storm	12/31/14	Consideration should be given to the application of definite time overvoltage protection on the Hardwoods and Oxen Pond capacitor banks, with a trip time of approximately 5 cycles for the first bank and an added 5 cycles or so for each other bank (i.e., second bank at 10 cycles, third at 15 cycles, fourth at 20 cycles). This will permit for staggered tripping but still allow for the tripping of all banks in less than one second for severe overvoltages.	C	On-Going		System Planning to study and make a recommendation on what new settings will be required.
46	January 11, 2013 Winter Storm	12/31/13	Procedures pertaining to ECC Operator action during abnormal voltage conditions to be reviewed to ensure they are adequate in maintaining customer supply voltages within acceptable limits.	A	Completed	12/31/13	Procedures were reviewed with ECC.
47	January 11, 2013 Winter Storm	05/31/14	Procedures to be developed for a protocol or guideline for ECC operators to follows which addresses how to proceed when incorrect or questionable data occurs in the EMS.	B	On-Going		Further investigation determined that a protocol or guideline is not required. System Operations is working with the Energy Systems group to determine if there are changes on the EMS system that can be made to send an alarm to ECC operators.
48	January 11, 2013 Winter Storm	12/31/13	Missing SOE events at Buchans and Bottom Brook to be further investigated.	A	Completed	01/31/13	There were no missing SOE events.
49	January 11, 2013 Winter Storm	06/30/14	Further investigation and discussion required on the overvoltage condition which occurred after 160 MW of load shed following the Holyrood TS.	C	On-Going		Refer to item #52
50	January 11, 2013 Winter Storm	12/31/13	A detailed load flow and transient stability analysis should be conducted in concert with the comprehensive review of the SOE to understand the events which occurred.	A	Completed		Preliminary study has been completed. The outcome was to proceed to with a more detailed investigation. This has been included in the scope of item 52 and is on track for completion by June 30 2014.
51	January 11, 2013 Winter Storm	12/31/13	Guidelines should be developed and implemented for the optimum reactive power dispatch and levels of Avalon loading. Also to include a review of the operation of the Optimum Power Flow (OPF) application.	A	Completed	12/31/13	Completed are part of the procedures for Holyrood dispatch.

Updated	April 14, 2014		Follow-Up Action - January 11, 2013 Event - System Operations & Planning				
					Legend	Open	Completed
						Information	Action required/Overdue
Action Item #	**Initiating Event**	**Date Due**	**Action Item Description**	**Priority (A/B/C/D)**	**Status**	**Date Resolved**	**Comments**
52	January 11, 2013 Winter Storm	06/30/14	A system voltage study which simulates normal loading scenarios but also abnormal scenarios. This to include all Holyrood units offline with one line supplying the Avalon with load restoration on the Western system after a major outage. From this study, a suitable operation strategy/guideline should be developed to assist the ECC operators in maintaining system voltage within acceptable limits. Application of undervotlage and overvoltage protection schemes should be considered.	B	On-Going		Under and over frequency protection schemes also need to be developed. Discussions have been held with Newfoundland Power. On track for completion by June 30 2014.
53	January 11, 2013 Winter Storm	12/31/13	Surge and Trouble Reports (Trip Reports) to be prepared by System Operations for all disturbances. Reports to be issued and reviewed by all stakeholders.	A	Completed	01/31/13	Trip Reports are being completed for all 230 kV and 138 kV trips. Selected 66kV trips also being completed.

Updated **April 14, 2014**

Follow-Up Action - January 11, 2013 Event - Hydro Generation

Legend	Open	Completed
	Information	Action required/Overdue

Action Item #	Initiating Event	Date Due	Action Item Description	Priority (A/B/C/D)	Status	Date Resolved	Comments
54	January 11, 2013 Winter Storm	12/31/13	Further investigation required on the cause of the lockout operations on Cat Arm and Upper Salmon at 0742 hours. Simulation requiring a planned load rejection will be required to duplicate the conditions on Jan 11.	A	Completed	10/01/13	Further investigation into both trips was completed and no further action is required. A planned load rejection test was not required.
55	January 11, 2013 Winter Storm	12/31/13	In the future a trip report is required into every generator trip to determine the cause and whether the plant's systems operated properly. These investigations should include the collection of targets, alarms, and logs. The goal would be to identify and correct any deficiencies.	B	Completed	12/01/13	Trip reports are regularly completed on Unit trips.
56	January 11, 2013 Winter Storm	10/31/14	Further investigation required into the Cat Arm station service supply to correct issues with black start of the plant.	B	On-Going		Refer to TRO #18, Study to be completed in 2014.