

1    Q.    **Asset Management**

2            Further to the response to PUB-NLH-084 provide, in tabular form, the number of  
3            terminal station equipment corrective maintenance (CM) work orders scheduled for  
4            completion during each year, the number of CM work orders completed during  
5            each year and the number of CM work orders scheduled to be completed during  
6            each year, but not completed by year's end (overdue/backlogged) for year's end  
7            2011, 2012, and 2013. Do not include relays.

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10    A.    Hydro actively manages its terminal station maintenance through a work order and  
11            backlog management process using its computerized maintenance management  
12            system (CMMS) (JD Edwards). There are two categories of work managed in this  
13            system:

- 14            a.    Preventive maintenance (PM): PM tactics and frequencies are established by  
15                   the Long-Term Asset Planning (LTAP) group taking into account such things as  
16                   asset criticality for safe reliable service, best practices of other utilities and  
17                   manufacturers' recommendations. The PM program is set up and maintained in  
18                   the CMMS by the Short Term Planning and Scheduling (STPS) group; and  
19            b.    Corrective maintenance (CM): CM work orders are generated from multiple  
20                   sources (e.g. System Operations, field employees, supervisors, etc.) and are  
21                   created to formally record and schedule additional maintenance work that has  
22                   been identified during regular inspections, general observations of qualified  
23                   staff and planned maintenance activities. CM work orders, when identified, are  
24                   reviewed, prioritized and approved by the Work Execution group. Once  
25                   approved the work is planned for execution in accordance with its priority and  
26                   then placed in the backlog for scheduling when the equipment can be removed  
27                   from service, with careful consideration of the impact of the equipment outage

on customer service reliability. Some CM work can be addressed while keeping production and delivery assets on line and operating, some cannot and require outages. The design of Hydro's asset systems provide redundancy in critical applications which enable associated CM work to be packaged and held in backlog for the next upcoming annual maintenance outage. Different assets have different lead times or warning intervals from when the onset of degradation is detected until when the asset can no longer perform its required function and has failed. When assessing priority on a CM work order and establishing a due date for completion, the potential impact to safety, production and delivery are the main considerations, along with the anticipated lead time to failure, as well as the potential to avoid cost escalation through excessive asset degradation and damage. In this context some CM work orders must be actioned in the near term to avoid functional failure, while other CM work orders can remain in backlog for extended periods of time before the asset degrades to the point where maintenance attention is required to avoid functional failure.

In this context, it is useful to note that the number of CM work orders in the "Backlog" represents those ready for completion, meaning the CM work order has all up front planning completed with required parts available and it is waiting to be scheduled, is scheduled for a future point in time, or is in progress. CM work orders are only planned and made ready to complete once they have received the required approvals. The number of CM work orders in the "Backlog" does NOT represent a backlog of CM work that was scheduled and not completed (overdue), rather it represents the number of work orders that are ready for completion in the "backlog" at a given point in time which could be weeks, months, or years away. It is also useful to note that the list of CM work orders in the backlog (ready for completion) includes both of the following type of work orders:

- a. CM work orders that are directly related to equipment required for delivery of electricity; and
- b. CM work orders such as building cleaning and painting which are not directly related to equipment required for delivery of electricity.

As the focus is on ensuring that critical service reliability and safety work orders are carried out on a priority basis, the Short-Term Planning and Scheduling group continually reviews work orders in the backlog to ensure items of critical importance to system reliability and safety are included in the weekly work schedules in addition to those planned to coincide with infrequent equipment outages. Lower priority items are carried over until such time as they can be completed. In addition to the regular reviews, prior to the start of each year, work orders from the backlog are reviewed by LTAP, Work Execution, Operations and STPS to ensure work that is critical to safety, environment and reliability are included in the annual work plan.

The response to PUB-NLH-084 provided the PM and CM work orders for all work, (i.e. work orders both directly related to equipment required for delivery of electricity and not directly related to equipment required for delivery of electricity) associated with Hydro's terminal stations on the Island Interconnected System completed in each of 2011, 2012 and 2013. It also provided the cumulative number of work orders created and ready for completion up to the end of each of those years and which remained in the backlog in March when the response was prepared. The PM work orders in backlog are past their preferred completion date.

Since Hydro's response to PUB-NLH-084, in addition to executing and completing some of the work orders in the backlog, a review has been completed of the backlog resulting in the closing of any work orders that were duplicate, related to

obsolete equipment or the work order is going to be addressed by a capital program.

The following table restates and updates the table of CM work orders provided in response to PUB-NLH-084 by providing: the number of CM work orders created and approved for placing in the backlog for scheduling; the number of those completed in the year and the number of work orders completed in that year from the work orders in backlog from prior years; the number of cumulative work orders in backlog as of March 2014 and for this update, those in backlog as of September 2014; and those in backlog as of September 2014 excluding CM work orders such as building cleaning and painting which are not directly related to equipment required for delivery of electricity.

#### CM Work orders

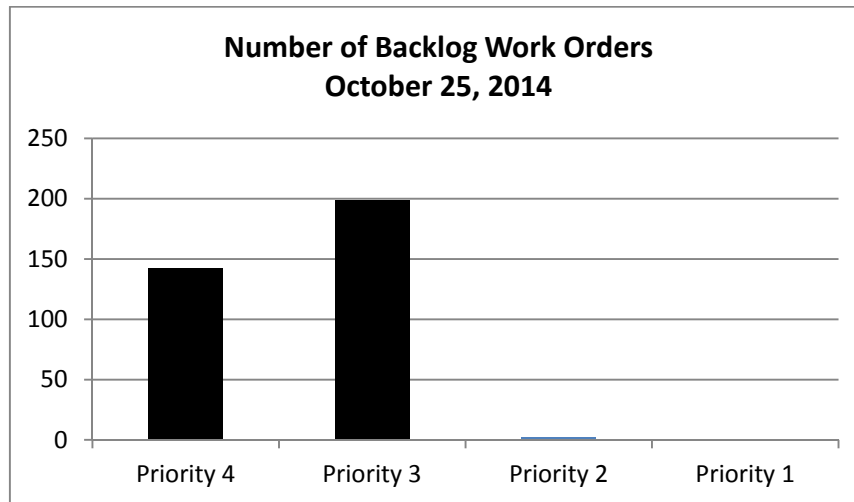
Year	Work Orders Generated	Current Year Work Orders Completed	Work Orders Completed from Backlog	Total Work Orders Completed in Year
2011	604	382	177	559
2012	684	358	168	526
2013	590	406	180	586

Created Up to Year Ending	Backlog as of March 2014	Backlog as of September 2014	
		All Terminal Station Work	Electricity Supply Equipment Only
2011	247	184	88
2012	353	260	136
2013	480	352	187

As of October 25, 2014 cumulative total CM backlog for these terminal stations including both CM work orders that are directly related to equipment required for supply of electricity and CM work orders such as building cleaning and painting

which are not directly related to equipment required for supply of electricity is 343 work orders and the CM work orders related to the supply of electricity remains at 187.

As mentioned above, Hydro ensures that work is scheduled and completed on a priority basis and as a result the majority of CM work orders in backlog are lower priority work as demonstrated in the chart below. Within Priority 3 there are subsets of work orders that have not yet reached the lead time for maintenance intervention before functional failure, as well as work orders on non-critical assets that have no immediate risk to safe, reliable production and delivery and can be held to aid in work load and resource levelling. In PUB NLH-083, Hydro described its work order priority system which reflected specific timeframes for completion of work orders. However it is not always practical to meet these timeframes because of the requirement to remove equipment from service to complete the work in the described time frames and the impact the required equipment outage can have on customer service reliability. Hydro therefore also utilizes the priority system to ensure the work orders in the backlog are relatively ranked in order of importance. For example, Priority 3 work orders may not be completed in the specified timeframe because the equipment outage schedule does not allow it and the asset's function is not critical enough to warrant a forced outage for immediate attention, but are separated from Priority 4 to ensure they are completed during the next available outage. The CM backlog is managed to ensure it does not include any work that is imminently critical to safety, environment or reliability and the STPS group schedule work from backlog as opportunities arise such as planned outages and travel to geographically remote locations.



It is important to note there is always expected to be CM work orders in the “backlog”. Also the backlog is expected to vary throughout the year as the equipment outages required to enable the work must be scheduled whenever possible outside the high winter demand period. Therefore the backlog level will be highest during the winter and will be reduced throughout the lower electricity demand summer period where equipment outages are more preferable. Hydro’s objective is to always be reviewing the backlog and scheduling the CM work to address the most critical work while balancing the impact of equipment maintenance outages on reliable customer service. Hydro has been monitoring the growth and volume of work in the backlog to determine whether adjustments in the level of resources are required. This has resulted in increases in the deployment of temporary and contractor resources in 2014. This increase in resources will continue in 2015 as required to maintain a stable level of work in the backlog which ensures critical work is completed, and recognizes the reality of increasing maintenance activities resulting from aging equipment and its components.

The table below provides the information requested which is a summary of the terminal station equipment CM work orders excluding P&C Equipment (Relays) and

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those such as building cleaning and painting which are not directly related to equipment required for the supply of electricity. The work orders in the backlog as of September 28, 2014 have been provided.

<b>Maintenance/Repair (CM) Work Orders</b>				
<b>Year</b>	<b>Terminal Station Equipment</b>			
	<b>New Ready to Complete</b>	<b>Completed including Prior Year Backlogs</b>	<b>Change in Cumulative Backlog<sup>1</sup></b>	<b>Cumulative Backlog of current &amp; prior years as of September 2014</b>
2011	589	554	35	88
2012	562	514	48	136
2013	560	509	51	187 <sup>2</sup>

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<sup>1</sup>The cumulative backlog as it existed at the end of each year is not readily available as the CMMS records are not defined by the asset group requested (i.e. electrical supply related equipment.) In order to provide the annual work orders completed a manual search of each work order was undertaken to determine the type of work. The work orders ready to complete are all work orders identified in the manual search of the correct type of asset that were created in the requested year and have either been completed or are currently in the backlog. The change in cumulative backlog was provided to indicate the growth in the number of work orders in the back log in each year.

<sup>2</sup> 187 represents the cumulative total of all work orders in the backlog for work orders created in 2013 and earlier.