

# TORONTO TRANSIT COMMISSION REPORT NO.

**MEETING DATE:** April 30, 2014

**SUBJECT:** PROCUREMENT AUTHORIZATION AMENDMENT –  
DESIGN & SUPPLY RADIO BASED AUTOMATIC TRAIN CONTROL  
FOR YUS SUBWAY – CONTRACT CHANGES 19 and 21

## **ACTION ITEM**

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### **RECOMMENDATION**

It is recommended that the Board authorize staff to proceed with contract changes to the Design and Supply of Radio Based Automatic Train Control (ATC) for Line 1 YUS (Yonge-University-Spadina) Subway contract with Alstom Power & Transport Canada Inc. (Alstom) no later than May 5, 2014 in the amounts inclusive of applicable taxes as follows:

1. Include cancellation of Contract Change 16, Design and Installation of ATC on Toronto-York-Spadina Subway Extension (TYSSE), credit amount of \$19,032,880.55;
2. Increase \$2,644,490.90 for supply of ATC parts for 10 additional subway train sets purchased from Bombardier;
3. Increase \$51,677,167.24 for adding Automatic Train Control to TYSSE, scope changes to Line 1 and contract schedule extension of five years; and
4. The expenditure of funds up to a total allowance amount of \$2,486,940.00 for foreign exchange rate adjustments, extension of existing Letter of Credit for performance of the Contract, and shipping costs. Refer to Appendix 1 for further information;

This results in a total additional authorized expenditure of up to \$37,775,717.59 and a total authorized contract value of \$128,347,983.20.

### **FUNDING**

Sufficient funds for this expenditure have been included in Project 2.4, YUS ATO Resignalling in the State of Good Repair/Safety category as set out on pages 308-380 of the 2014-2018 TTC Capital Program, as approved by City Council on January 29/30, 2014.

### **BACKGROUND**

The existing TTC subway signalling system consists of an aging infrastructure and a train operation technology that is not capable of keeping up with an ever increasing passenger ridership. This results in delays due to signal equipment breakdowns, overcrowding on station platforms and customer service deterioration.

Specialized TTC signal system engineers and maintenance staff carry out continual troubleshooting and emergency/corrective repair work to ensure the safe operation of the subway system.

Signal systems generally have an expected life of 25 to 30 years. End of life replacement programs for the signal systems on Line 1 and Line 2 (Bloor-Danforth) were initiated in 2008. The south Yonge portion of Line 1 was the first subway built in Toronto and opened in 1954. The south Yonge signal system is now 60 years of age and is experiencing frequent failures and causing extensive customer service delays. It was assigned first priority for replacement and is being replaced with a Computerized Based Interlocking System (CBI).

As the existing signalling system is replaced, the TTC has also taken the initiative to install an Automatic Train Control System in addition to the new CBI signalling system. ATC is a telecommunication system that manages the distance between moving trains while ensuring safe braking distances. This system allows trains to travel closer together in a safe operating manner, which allows more trains to be scheduled on the line. This in turn increases customer carrying capacity. The minimum headway between subway trains operating under the existing signal system is 140 seconds. The ATC system will permit the headway to be safely reduced to at least 110 seconds.

ATC is proven technology that is in operation at more than 100 subway systems throughout the world such as Hong Kong, Shanghai, London and Paris. All new subway systems are being constructed with ATC systems. End of life signal system replacements elsewhere have also incorporated ATC into the design to increase customer carrying capacity similar to TTC plans.

Contracts for design and installation of a replacement signal system and an ATC system for Line 1 and a new signal and ATC system for the Toronto York Spadina Subway Extension have been awarded and underway since 2008. The following provides a chronology and background on the various contracts and contract changes.

### **2008: Existing Signal System Replacement with CBI – South Yonge**

Signal system replacement on south Yonge was identified as Phase 1 on Line 1. Approval was received from the Board for award of a contract in September 2008 for design, supply and installation of a CBI signal system on the south Yonge portion of Line 1 to Ansaldo STS Canada Inc. through a pre-qualified competitive procurement process. Minutes of the Board meeting are available on the TTC website. Refer to Agenda Item 12 in the following link:

[http://www.ttc.ca/About\\_the\\_TTC/Commission\\_reports\\_and\\_information/Commission\\_meetings/2008/Sept\\_18\\_2008/Supplementary\\_Agenda/index.jsp](http://www.ttc.ca/About_the_TTC/Commission_reports_and_information/Commission_meetings/2008/Sept_18_2008/Supplementary_Agenda/index.jsp)

As a result of numerous technical problems and contractor performance issues, the expected completion date for this contract has been delayed from June 2013 to October 2015.

**2009: ATC – Entire Line 1**

Approval was received from the Board in April 2009 for award of a contract to Alstom for design, supply and installation of ATC on the entire Line 1 and supply of ATC equipment for 60 Toronto Rocket subway trains through a publicly advertised competitive procurement process.

Minutes of the Board meeting are available on the TTC website. Refer to Agenda Item 4 in the following link:

[http://www.ttc.ca/About the TTC/Commission reports and information/Commission meetings/2009/Apr 27 2009/Agenda/index.jsp](http://www.ttc.ca/About%20the%20TTC/Commission%20reports%20and%20information/Commission%20meetings/2009/Apr%2027%202009/Agenda/index.jsp)

A contract change was subsequently issued January 2013 to Alstom to increase the supply of ATC equipment for Toronto Rocket subway trains from 60 to 70 trains. Approval for this contract change was within staff's signing authority under the Authorization for Expenditures and Other Commitments Policy.

Approval was received from the Board in February 2013 for a contract change with Alstom for design, supply and installation of an ATC System on the Toronto York Spadina Subway Extension. Minutes of the Board meeting are available on the TTC website. Refer to Agenda Item 12 in the following link:

[http://www.ttc.ca/About the TTC/Commission reports and information/Commission meetings/2013/February 25/Supplementary Agenda/index.jsp](http://www.ttc.ca/About%20the%20TTC/Commission%20reports%20and%20information/Commission%20meetings/2013/February%2025/Supplementary%20Agenda/index.jsp)

**2012: Existing Signal System Replacement with CBI – Remainder of Line 1**

Approval was received from the Board for award of a contract in March 2012 for design, supply and installation of a CBI signal system for the remainder of Line 1 in four phases to Ansaldo through a pre-qualified competitive procurement process. Minutes of the Board meeting are available on the TTC website. Refer to Agenda Item 13 in the following link:

[http://www.ttc.ca/About the TTC/Commission reports and information/Commission meetings/2012/March 30/Minutes Other/Sup Agenda Mar 30.jsp](http://www.ttc.ca/About%20the%20TTC/Commission%20reports%20and%20information/Commission%20meetings/2012/March%2030/Minutes%20Other/Sup%20Agenda%20Mar%2030.jsp)

## **DISCUSSION**

### **ATC System – Moving Forward Plan**

The ATC system phased installation must follow the existing signal system phased installation.

The contract for ATC on the entire Line 1 was awarded prior to a confirmed schedule for replacement of the existing signal system on the entire Line 1. The contract completion date of August 2015 for the ATC contract was based on best estimates at the time, for completion of the existing signal system replacement on the entire Line 1. The delays associated with Phase 1 replacement of the existing signal system have subsequently delayed the completion of the ATC for the entire Line 1 and TYSSE.

In order to continue with the ATC contract in a phased integrated sequence with the signal system replacement work, the ATC contract schedule must be completed under a new schedule that revises the completion date from August 2015 to July 2020. This schedule was developed based on working with both the signal system replacement Contractor (Ansaldo) and the ATC contractor (Alstom).

The overall ATC schedule requires extension from the original six years to 11 years. Completion of ATC work on the Line 1, including ATC on the TYSSE line, is based on a revised six phase implementation approach. This revised schedule addresses a number of complex scope and scheduling issues between the signal system replacement and ATC contracts of which some of the more significant issues are as follows:

- The difficulties of introducing ATC to an operating subway service without causing any extended delays to normal revenue service, while continuing the maintenance of an old unreliable system, were originally underestimated in terms of technical and implementation complexity;
- The unplanned impact of other state of good repair programs to existing subway facilities required for the ATC and signal system replacement equipment have arisen, such as north Yonge asbestos abatement and deferral of Davisville Area Rehabilitation Program (track reconstruction between St Clair and Eglinton stations);
- A new test strategy to significantly increase testing of signal system replacement subsystems independently and then in parallel with ATC prior to a combined commissioning. This mitigates unacceptable risks associated with commissioning two new systems simultaneously;
- The introduction of an extra phase of commissioning. Splitting the original Phase 4 commissioning was required to reduce the risks associated with the commissioning process during service closures. This introduced more software releases;

- Interdependencies of ATC on Line 1 and TYSSE require the introduction of ATC onto TYSSE to be completed sequentially and not in parallel, thus adding additional time to the overall schedule requirement. This change was not anticipated or known prior to the award of the ATC contract to Alstom;
- Increasing the fleet of TR's from 70 to 80 (approved by the Board at the March 26, 2014 meeting); and
- The increased number of computer software baselines due to additional phases and revised implementation strategy that requires extensive software programming.

The following matrix summarizes the main changes to the ATC scope for the key technical and implementation activities resulting from the schedule extension and the revised ATC - CBI rephasing, including the addition of TYSSE ATC scope:

**ATC Scope Changes Summary**

<b>Scope</b>	<b>Original</b>	<b>Revised</b>	<b>% Increase</b>
Phases	4	6	50%
Trains	70	80	14%
CBI Interlockings	13	17	31%
CSS Software releases	10	22	120%
CSS Hardware	3	4	33%
Zone Controllers	2	4	100%
ATC Software Baselines	12	15	25%

**ATC System Contract Change**

As a result of the scheduling complexities and delays on the signal system replacement and ATC contracts, the TTC advised Alstom of the following actions:

- To quote supply of ATC parts for 10 new trains;
- To quote for extended schedule of ATC work, scope changes to Line 1 and addition of ATC to TYSSE;
- To accept cancellation of Contract Change 16 as the ATC installation for TYSSE is now incorporated with the new phasing schedule.

Alstom provided the following response to TTC's requests:

- Submission of price for additional 10 train sets of ATC equipment in the amount of \$2,644,490.90;

- Submission of a discounted option price for extended schedule of ATC work. This included TYSSE ATC scope in the amount of \$51,677,167.24, conditional on TTC issuing a Letter of Intent by March 28, 2014, after which the price would increase. TTC staff subsequently issued the Letter of Intent to lock in the discounted price (a savings of approximately \$4M) conditional on Board approval by April 30, 2014;
- Acknowledged the future cancellation of contract change 16 for a total credit amount of \$19,032,880.55.

This represents a net contract increase of \$35,288,777.59 including taxes.

Alstom's pricing included a detailed activity schedule and month by month work force plan that TTC staff reviewed in detail with Alstom. Staff is in agreement with the scheduling and work force resourcing identified to complete the work over the additional five years. Costing analysis for the recommended award amount has determined that 96.4% of the net additional cost is attributed to the direct labour resources required for the extension of the contract and 3.6% for the additional equipment and material.

The labour costs are based on additional resource time over five years including additional software engineering hours resulting from the rephasing. The quotation utilizes previously approved contract labour rates that will remain firm for the five year extension of the contract. The additional equipment and material required for the scope change also carries a cost for extending the warranty for an additional five years for all ATC equipment.

The quotation submitted by Alstom is considered fair and reasonable based on the final negotiations by staff and is considered acceptable and recommended for award.

The ATC contract with Alstom has a Letter of Credit in place for performance of the contract and is currently valid until March 2015. As this Letter of Credit will have to be revised if the subject recommendation is approved, staff is carrying an allowance as noted in the attached Appendix 1 to cover the increase in the amount of coverage taking into consideration the increased value of the contract and the extended time for the coverage.

Alstom also submitted a quotation for the supply of additional carborne equipment for installation into the 10 TR trains approved by the Board in March 2014. Minutes of the meeting for the additional train purchase are available on the TTC website. Refer to agenda item 5 in the following link:

[http://www.ttc.ca/About the TTC/Commission reports and information/Commission meetings/2014/March 26/Agenda/index1.jsp](http://www.ttc.ca/About%20the%20TTC/Commission%20reports%20and%20information/Commission%20meetings/2014/March%2026/Agenda/index1.jsp)

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The price quoted of \$2,644,490.90 is comparable to a similar purchase in 2013 for supply of 10 additional sets of carborne equipment for 10 additional train sets. The quotation from Alstom includes for a single delivery of the required equipment, however since Bombardier requires the carborne ATC equipment at the time each TR is in production, a freight allowance is included to provide for multiple deliveries of equipment as noted in Appendix 1.

The pricing submitted by Alstom is subject to foreign exchange rate adjustments. Consequently the final pricing may vary depending on the exchange rates on the date of issuance of the contract changes as noted in Appendix 1.

Contract details are as follows:

Original Contract Amount	\$52,056,498.59
Previously Approved Contract Changes	\$38,515,767.02*
Amount of this Amendment	\$56,808,598.14 **
Less Cancellation Value for Contract Change 16	(\$19,032,880.55)
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Total Revised Contract Amount	\$128,347,983.20

\* Includes Contract Change 16 for ATC design and installation on TYSSE.

\*\* Includes allowances as detailed in Appendix 1.

**JUSTIFICATION**

The additional scope and schedule extension is required in order to complete the deployment of the new ATC technology. As well, the additional ATC carborne equipment is required for the 10 additional subway trains.

Approval of the forgoing contract changes is necessary to complete the implementation of the ATC system according to the revised integration schedule and to put the ATC control equipment onto the 10 additional trains for TYSSE. Delay in implementing the change for the revised implementation schedule will immediately impact further progress of the work and put the project into further delay and the prices quoted will incur significant price increases.

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April 10, 2014  
6.240  
Appendix 1

**PROCUREMENT AUTHORIZATION AMENDMENT –  
DESIGN & SUPPLY RADIO BASED AUTOMATIC TRAIN CONTROL FOR YUS SUBWAY  
CONTRACT CHANGE 19 & 21**

**Appendix 1**

**CALCULATION OF ALLOWANCES**

Category	Cost Estimate	HST	Total Estimate	Notes
Foreign Exchange Adjustment	\$1,180,000.00	\$153,400.00	\$1,333,400.00	Foreign exchange is currently in fluctuation. Calculation is based on adding 3% to March 21 rates. Final calculation will be performed on day of issue of the contract changes.
Contract Security (LOC)	\$975,830.00	\$126,860.00	\$1,102,690.00	This is based on preliminary estimate and will be finalized after a coverage amount is determined.
Shipping Costs	\$45,000.00	\$5,850.00	\$50,850.00	This estimate is for additional shipping costs for ATC carborne equipment. The quote carried two deliveries, whereas multiple deliveries will be required and will be determined after Bombardier confirms their delivery schedule requirements.
<b>Total Allowances</b>	<b>\$2,200,830.00</b>	<b>\$286,110.00</b>	<b>\$2,486,940.00</b>	

Acronyms:  
LOC – Letter of Credit