

TORONTO TRANSIT COMMISSION REPORT NO.

MEETING DATE: October 23, 2008

SUBJECT: PROCUREMENT AUTHORIZATION AMENDMENT – OPTION
TO PURCHASE 120 FORTY-FOOT LOW FLOOR CLEAN DIESEL
CITY BUSES

ACTION ITEM

RECOMMENDATION

It is recommended that the Commission note that further to the approval received on August 27, 2008 (report 5(d)), to award the contract options for 120 hybrid buses, based on the issues outlined in this report, staff now recommend that the Commission:

- 1) Authorize staff to exercise the contract option with Daimler Buses North America Ltd. (Daimler) in an amount of \$40,088,969.94 including all taxes, for the purchase of 80 Forty-foot low floor clean diesel Orion VII NG buses for delivery in 2010 with the option to be exercised no later than October 31, 2008, and
- 2) Authorize staff to exercise the contract option with Daimler Buses North America Ltd. (Daimler) in an amount of \$20,044,484.97 including all taxes for the purchase of a supplementary order of an additional 40 Forty-foot low floor clean diesel Orion VII NG buses also for delivery in 2010 with the option to be exercised no later than October 31, 2008, subject to the approval by Council of the City of Toronto, and
- 3) Forward a copy of this report to the City of Toronto for consideration by Council in conjunction with the August 27, 2008 report request.

FUNDING

Sufficient funds for the purchase of the 120 low floor buses were included in 4.11 Purchase of Buses, under Future Purchase of 280 Replacement Forty-Foot Low Floor Diesel-Electric Hybrid Buses or Equivalent (2010 on) as set out on pages 1005 to 1006 – category State of good Repair/Safety of the TTC 2009-2013 Capital Program as approved by the Commission on August 27, 2008.

Funding for the additional purchase of a supplementary order of 40 additional low floor clean diesel buses is the subject of a separate Executive Committee report (BU33.13) which was approved by Executive Committee on October 6, 2008 and will be considered by Council on October 29 and 30, 2008.

BACKGROUND

In order to accommodate the Commission’s anticipated Bus Fleet plan requirements for the period of 2009 through 2010, a Request for Proposals (RFP) for the supply of forty-foot low floor hybrid and/or diesel buses, was undertaken in 2007, from which the Commission received submissions from Daimler and New Flyer Industries Ltd. (New Flyer).

The Daimler RFP submission offered the lowest pricing for both the hybrid and clean diesel forty-foot bus configurations.

As a result of the RFP process, the Commission awarded Contract C32PY08704 in December 2007, to Daimler for the procurement of 130 forty-foot diesel-electric hybrid buses to ensure deliveries in 2009 and allow staff to continue a further review of TTC requirements for 2010 deliveries.

Contract (Daimler 130 forty-foot clean diesel bus) current details are as follows:

Original Contract Amount	\$ 89,992,616.94
Previously Awarded Amendments	1,519,994.94
Amount of this Amendment (80 Buses)	\$ 40,088,969.94
Amount of this Amendment (40 Buses pending City approval)	\$ 20,044,484.97
Revised Contract Amount	\$ 151,646,066.79

As part of the aforementioned RFP process, Daimler also offered to maintain the preferred 2009 delivery pricing terms as established in the original RFP for the optional purchase of additional hybrid and/or clean diesel buses for delivery within 2010 with a validity date for Commission acceptance until October 31, 2008, with additional cost increases to be applicable thereafter.

As a result of the fair and reasonable offer, the Commission approved staff’s recommendation at its meeting of August 27, 2008 to exercise the contract option with Daimler for the purchase of 120 hybrid buses for delivery in 2010. However, as a result a recent escalation of lead acid battery failures and an unexpected drop in reliability of the hybrid drive system, staff have determined that the re-assessment of the purchase of additional hybrid buses is prudent at this time and have not released the award for the optional hybrid purchase to Daimler until a decision is made in regard to the drive technology to be used.

DISCUSSION

Prior to the introduction of hybrid buses at TTC, staff monitored the experience at New York City Transit in the operation of 10 prototype city buses beginning in 1998 using a BAE

Hybrid Drive system with lead acid batteries. Based on the success of this venture, New York procured their first fleet of hybrids in the Spring of 2004. A representative from NYCT visited Toronto later in 2004 and made a presentation to the Commission that demonstrated the positive results of their evaluation and confirmed their plans to expand their hybrid fleet. At this time they are operating 825 diesel hybrid city buses with their latest order for a quantity in excess of 800 diesel hybrid buses presently in manufacture at Daimler Bus.

As a result of New York's experience, TTC staff recommended the purchase of hybrid buses to take advantage of the benefits of this technology in regard to reduced fuel use and engine exhaust emissions.

The first 150 buses of this type were delivered to Arrow Road in 2006. Since that time, more hybrids have been delivered, with our hybrid fleet approaching 564 buses by year end 2008. All of these buses are fitted with a BAE Series Hybrid system using lead acid batteries.

Shortly after the delivery of the first 150 hybrid buses, failure of the lead acid batteries began to occur. Initially it was thought that these failures were a result of quality problems during manufacture. Since the rate of failure of batteries has escalated drastically in recent months, a study by battery specialists retained by Daimler Bus to investigate the problem, has revealed that the batteries have reached the end of their life at an age of 1 to 1½ years. The original expectation for lead acid battery life, based on the New York experience, was in the order of 4 years. The Daimler warranty for these batteries was also 4 years. As a result of the warranty program, defective batteries are being changed at no cost to TTC. Of course, frequent battery problems play a significant role in the reliability of our fleet and require excessive garage workforce time to affect the change outs. In recent weeks, TTC has experienced battery failures in the range of 130 to 140 individual battery failures in one week related to buses that range between 1 to 1½ years old. Additionally, failures have also been experienced in the electronic control system, adding to concerns for long term system reliability. BAE are presently retrofitting some components in an effort to improve reliability.

Failures at such a high rate have made it very difficult to meet the scheduled service requirements each day. At this time, no measures are in place to significantly improve battery life, although investigations by Daimler and BAE continue.

In the spring of 2007, in recognition of evolving battery technology, Daimler Bus and BAE announced a change in the battery technology to Lithium Ion Nanno-phosphate (Li-Ion) batteries beginning in 2009. This is leading edge technology in the world and has attracted the attention of manufacturers of all product lines using rechargeable battery technology, including the manufacturers' high end domestic power tools and those in the automotive industry. TTC has had one bus fitted with Li-Ion batteries on test since the spring and has ordered 5 buses similarly equipped for delivery later this year. Additionally, the 130 Orion VII hybrid buses scheduled for delivery in 2009 will come equipped with Li-Ion batteries as the new standard configuration. The claimed benefits for these batteries are a 5 year life at TTC,

and a much smaller battery package that will reduce the weight of a bus by approximately 1,000 kilograms. Daimler will provide a 5 year warranty for these batteries.

In considering the planned purchase of 120 more hybrid buses with Li-Ion batteries in 2010, there is concern, based on our current experience with lead acid batteries, that the TTC duty cycle is very different from New York and other large transit properties, and that the Li-Ion technology is very leading edge and relatively unproven in the Toronto and other operating environments. Other failures in the hybrid drive control system have been experienced that require further development by BAE to improve reliability. Based on existing orders by the end of 2009, we will have 694 hybrid buses in our fleet with a level of reliability that is not predictable based on our experience to date. Due to our posted service schedules, it is absolutely critical that the availability of buses for service is maximized and that the buses in service are as reliable as can be to ensure our rider expectations are met. Recent publications have reported the planned application of Lithium Ion batteries to the automotive industry. These reports indicate that the state of development is almost complete, but a few engineering challenges remain in scaling up the technology for automotive use. Staff believe this would also apply to buses.

It is thought, therefore, that it would be prudent to delay further expansion of our hybrid fleet until the new battery technology in TTC service is proven. In view of our continuing need for bus replacement, a viable alternative would be the purchase of the latest buses fitted with clean diesel technology that uses revised engine control technology, and exhaust after-treatment that includes a diesel oxidizing catalyst and particulate trap to significantly reduce engine exhaust emissions as compared to our older diesel fleets. These engines are so clean that 99% of all unburned hydro-carbons and particulate matter are eliminated from the exhaust. TTC experience in operating our latest 100 clean diesel buses fitted with this system indicates that they are very reliable in comparison to the hybrids, and will provide an effective back-up to the hybrid fleet should current hybrid problems continue.

Once the Li-Ion battery systems are proven, TTC can revert to the original plan to purchase hybrid buses when the next generation of better drive technology becomes available in the future, and also consider the conversion of the original hybrid buses, currently equipped with lead acid batteries, to Li-Ion technology.

In view of the Commission's need for new buses to both replace the older vehicles in our fleet and to accommodate ridership growth requirements as scheduled in 2010, and the substantial bus production lead time requirements ranging between 18 to 24 months between award and delivery, it is essential that the new reliable buses are procured at the earliest possible date. Fleet availability and in-service reliability must be maximized to meet the Commission's service commitments. It is essential, therefore, that this criteria be considered when purchasing new buses. Based on our most recent experiences with our newest hybrid and clean diesel fleets, the modern clean diesel buses present much less risk in achieving the Commission's service objectives than does the hybrid technology until it

becomes more mature and service proven in the next few years. Since the option pricing offered by Daimler for additional clean diesel buses is deemed to be fair and reasonable, representing a price reduction of approximately \$200,000 per bus to that of a hybrid, and since all optional buses can be delivered in 2010, staff recommend that the Commission exercise the bus option order for an additional 120 clean diesel buses in the contract with Daimler to take advantage of the favourable pricing, and realize an overall savings in the approximate amount of \$24.2M in lieu of an equivalent hybrid bus order, and the related benefits of a common model in the TTC fleet and also to ensure that the program can be entered into Daimler's production schedule to prevent any delay in delivery.

The recommended procurement of clean diesel buses includes costs for the provision of additional features such as bike racks, a security camera system, and the rough-in provision for a station stop announcement system.

JUSTIFICATION

It is critical that the availability of buses for service is maximized and that the buses in service are as reliable as can be to ensure our ridership expectations are met. Therefore, it would be prudent to delay further expansion of our hybrid fleet until the new hybrid battery technology is proven in TTC service.

October 9, 2008
5-92-91
