LF LRV Procurement Project
Cancellation of RFP & Way Forward

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The Toronto Transit Commission operates one of the most unique streetcar systems in the world.
Unique TTC Environment

vs.

Standard LRT

1. Track Switch (Single vs. Double-Point)

2. Tight Loop and Curve Radius (11m vs. 25m)

3. Gradeability Requirements (8% vs. 5%)

4. Ground-borne Vibration
Low Floor Light Rail Vehicle

Importance of Appreciating an Operating Authority’s Environment

DERAILMENT OF BOSTON’S NO. 8 CARS
(100-car order signed May 1995)

Main Causes:
• Carbuilder was permitted to use “San Francisco track geometry” for vehicle design due to lack of complete in-house engineering data
• Carbuilder was permitted to simulate derailment behaviour not based on vehicle being proposed

Consequences:
• 4 derailments between April and July 2000; fleet grounded
• Service resumed April 2001
• 3 derailments between June and August 2001; fleet grounded
• Changed wheel profile, upgraded track; service resumed in 2003
• Vehicle derailed onto station platform in August 2004
• Contract truncated at delivery of Car No. 85 at YE 2006
DERAILMENT OF BOSTON’S NO. 8 CARS
Massachusetts’ State Auditors’ Report Publicly Released
Feb. 16, 2007:

AUDIT RESULTS:
1. THE MBTA’S INABILITY TO ENSURE THAT THE NO. 8 LOW-FLOOR GREEN LINE CARS WERE PROPERLY DESIGNED FOR THE GREEN LINE INFRASTRUCTURE WILL COST THE AUTHORITY APPROXIMATELY $101 MILLION IN ADDITIONAL CONTRACT AND TRACK MAINTENANCE COSTS

2. THE MBTA DID NOT ADEQUATELY PLAN AND TEST THE NO. 8 LOW-FLOOR CARS, THEREBY CONTRIBUTING TO A DERAILMENT FLAW THAT CAUSED A SIGNIFICANT DELAY SERVICING ITS DISABLED PATRONS
TTC’s Procurement Process to Meet Challenges (1)

1. Analyzed technical risks & identified best practices

2. August 15, 2006 - Advertised & issued Request for Information (RFI) to known carbuilders – 7 responded

3. Summer 2007 - Public consultation

4. On-going discussions with industry and internal stakeholders

5. TTC and its consultants conducted:
   a) 3-D track geometry mapping to ensure compatibility of LRV with TTC infrastructure – data subsequently included in RFP
   b) Simulated LFLRV behaviour – ground-borne vibration, overhead power capacity

6. May to June 2007 - In-depth technical discussions with various interested carbuilders
6. Cont’d
   a) Safety Against Derailment - single point track switch & tight radius curves. Preliminary carbuilders’ analyses suggested requirements could be met with appropriate vehicle customization
   b) Gradeability – all wheels powered
   c) 100% low floor
   d) Ground borne vibration

7. August 14, 2007 - Released pre-RFP specification for industry comments. Suggested changes were incorporated as appropriate while encouraging competition and protecting the Commission’s interests

8. December 2007 - Canadian Content requirements finalized

   a) 13 addenda issued
   b) no question was received during the 5½ month RFP period re: safety against derailment, wheel profile, coefficient of friction or allowable wheel climb

10. February 11, 2008 – Pre-Bid Meeting

11. June 30, 2008 – RFP Closed
5-Step RFP Evaluation Process

**STEPS:**
- **Step 1.** Compliance of Proposals (Commercial)
- **Step 2.** Pass/Fail Technical Requirements
- **Step 3.** 25% Canadian Content Plan
- **Step 4.** Qualitative Technical Evaluation Score
- **Step 5.** Pricing including Life Cycle Cost

- Negotiate with preferred Proponent

**PROCESS:**
- Proponent must meet all requirements of steps 1, 2 and 3 above to have its proposal qualitatively technically evaluated (Appendix C – Instructions to Proponents, Part B)

- Evaluation process was structured, fair & transparent – all bidders evaluated on the same basis

- Evaluation process was overseen by Fairness Monitor
STEP 1.
COMPLIANCE OF PROPOSAL

- Form of Proposal
- Bid Bond
- Proposal submission requirements
STEP 2.
PASS/FAIL TECHNICAL REQUIREMENTS:

• 13 criteria in 5 general categories

• Proponent must pass ALL of the 13 technical criteria
RFP Submissions & Evaluation Summary

Two Submissions Received*:
- TRAM Power Ltd.
- Bombardier Transportation Canada Inc.

*Alstom Transportation Inc. and Siemens Canada Limited submitted “no-bid” letters prior to closing

Evaluation Team:
- TTC Staff
- External Consulting Engineers provided advice

Evaluation Summary:
- TRAM Power’s Proposal failed at Step 1 – Compliance of Proposals (Commercial)
  - Did not submit required documentation including Form of Proposal and Bid Bond
- Bombardier’s Proposal failed at Step 2 – Pass/Fail Technical Requirements
  - Failed Safety Against Derailment analysis
Simplified Derailment Theory

- Left wheel and rail
- Right wheel and rail
Simplified Derailment Theory

- Vertical Weight
- Lateral Force
- Front Wheel Flange Angle
Step 2: Technical Evaluation

Coefficient of Friction at wheel-rail interface

TTC WHEEL FLANGE ANGLE
70° FRONT & 70° BACK

Wheel Flange
## Step 2: Technical Evaluation

**TTC Specification**

Input data for Safety Against Derailment simulation analysis requirements:

- TTC wheel profile and existing TTC track data
- Use Coefficient of Friction = 0.5
- No wheel climb

### Wheel Profile:

- Flange angle = 70° front and back, tapered bottom

### 11m Curves

- 10 km/h operation
- 70° front and back flange angle

### 14m End Loops

- 15 km/h operation
- 70° front and back flange angle

### Single Point Trackswith

- 15 km/h operation
- 70° front and back flange angle
Low Floor Light Rail Vehicle

Step 2: Technical Evaluation

High lateral force in the loops and curves causes:
1. Increased risk of derailment
2. Accelerated wheel flange wear and rail gauge wear (reducing wheel and rail life)

Conclusion:
Modify existing system or modify a standard LF LRV
Modification to TTC Surface Rail Network

Expand all curves to minimum 20m radius - approx. 90 intersections and loops
Modification to TTC Surface Rail Network

Expand on-street 15m curves to 20m radius – King & Dufferin
Low Floor Light Rail Vehicle

Modification to TTC Surface Rail Network

Infrastructure changes to expand approximately 90 tight radius curves and loops to 20m radius, including property acquisition is not feasible

In addition:

– Cost prohibitive
– Service disruption
– Must have all curves and loops done to mitigate risk
– Existing carhouses present major problem with physical constraints to expand curvature
– Time line - 10 years to complete change
Impact of adopting a “standard” wheel profile without expanding curve and loop radii:

- Requires change of existing streetcar wheel flange angles
- Requires frequent wheel machining to maintain steeper wheel flange angles
- Still requires grinding of special track work
- Not practical, expensive and presents unacceptable risk of derailment
The existing network or streetcars cannot be modified.

“Standard” LF LRV must be modified to be compatible with the TTC network.
• Fairness Monitor reviewed and supported the decision
  – “I am satisfied that both submissions were evaluated fairly and in a manner consistent with the RFP.”
  – “The RFP establishes the rules of the game, and in that sense its provisions must control the evaluation process. In fairness to the two proponents who responded to the RFP, and to those who may have chosen not to respond to it, it would be wrong to treat the RFP as an invitation to negotiate. Rather the RFP is a document that triggers a competitive process where proposal submissions are subject to evaluation as prescribed with clarity in the RFP.”
RFP Cancellation Activities (2)

• Cancellation of RFP letters issued to TRAM Power and Bombardier – July 17, 2008
• TTC contacted carbuilders who responded to RFI or purchased a copy of RFP and asked a series of 5 questions
Results of 5 Questions

4 Companies Considered:

• Tram Power does not have proven 100% LFLRV
• 3 other proven Carbuilders have 100% LFLRV
• Alstom, Bombardier, Siemens clearly indicated that they could provide 100% LFLRV that can operate on all of unique requirements of the TTC’s track system

• Proceed with 3 proven carbuilders
Recommended Way Forward (1)

Structured Multi-Phase Bid Process:

• Phase 1 - Introduction
  – Invite Alstom, Bombardier and Siemens to participate based on proven experience in manufacturing 100% LF LRVs
  – Develop preliminary timeline
  – Commitment to participate

• Phase 2 - Technical
  – Carbuilders to demonstrate ability to meet Pass/Fail requirements
  – Carbuilders to demonstrate ability to meet other technical requirements
Recommended Way Forward (2)

Structured Multi-Phase Bid Process:

• Phase 3 - Commercial
  – Negotiate acceptable commercial conditions

• Phase 4 – Competitive Bidding
  – Formal process for submitting pricing and Canadian Content plan

• Phase 5 – Commission Approval / Award
Recommended Way Forward (3)

STRUCTURED MULTI-PHASE BID PROCESS

Benefits:
• Process structured & competitive
• 3 proven carbuilders-100% Low Floor LRV
• Bidders engaged throughout process
• Address questions/concerns (Tech/Comm)
• Encourage participation/competitive bids
• Formal process: pricing & Canadian Content
• More likely to result in compliant bids
RECOMMENDATION:

It is recommended that the Commission authorize staff to proceed with the Multi-Phase Bid Process to procure 100% Low Floor Light Rail Vehicles.