December 18, 2007 Commission Meeting

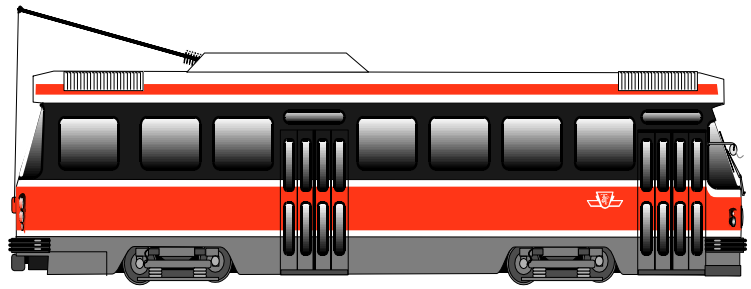
Low Floor Light Rail Vehicle Procurement

Stephen Lam, P.Eng.
Superintendent
Streetcar Engineering

Jim Lee
Chief
Project Procurement

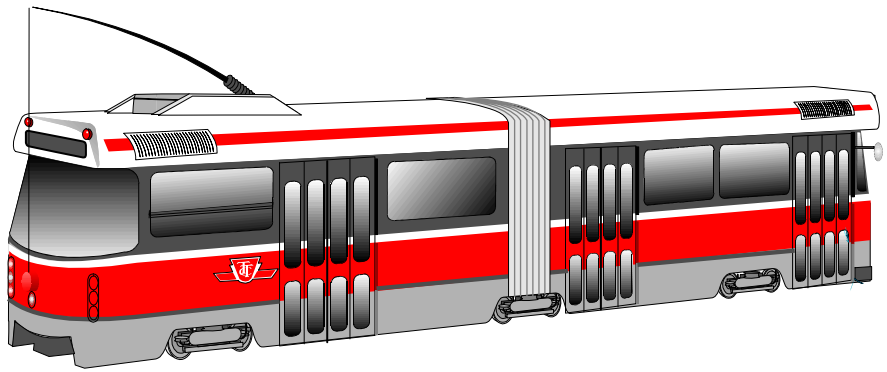
Streetcar Facts – Current System

Annual Streetcar Passenger-trips ~ 80 million



Vehicles:

- **196 CLRVs (Car 1 – 1977)**
- **52 ALRVs (Car 1 – 1987)**



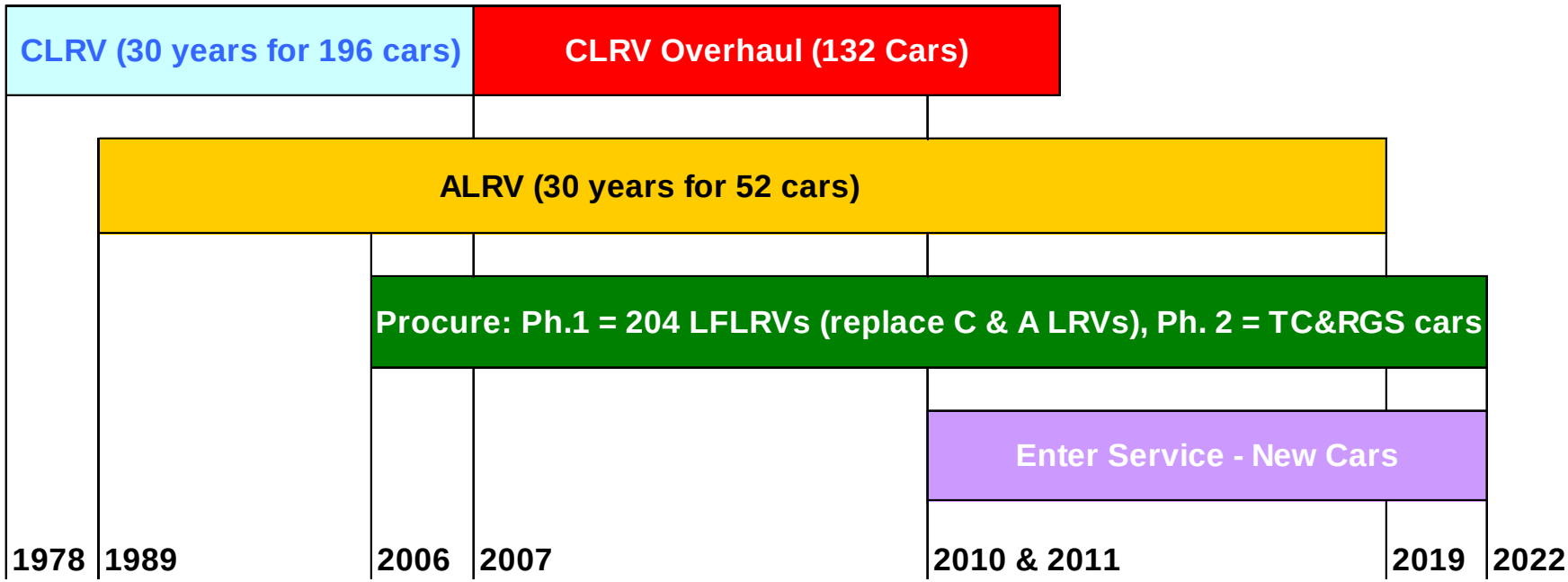
Tracks:

- **85 double track km**
- **89 special track work**

Service Routes:

- **11 Routes total**
- **3 Semi-Right-of-Way**

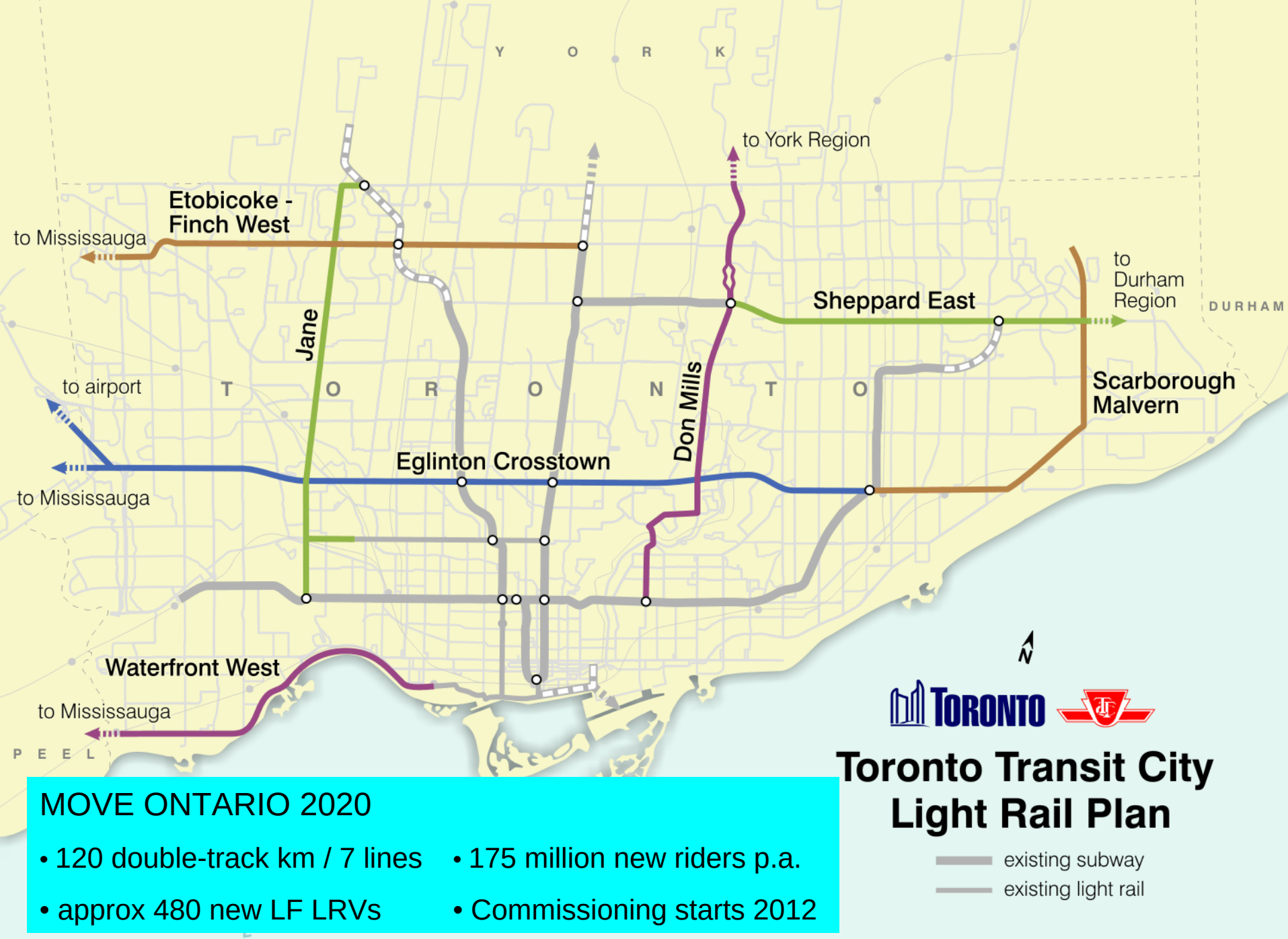
Streetcar - LRV Fleet Plan



Main Project Objectives

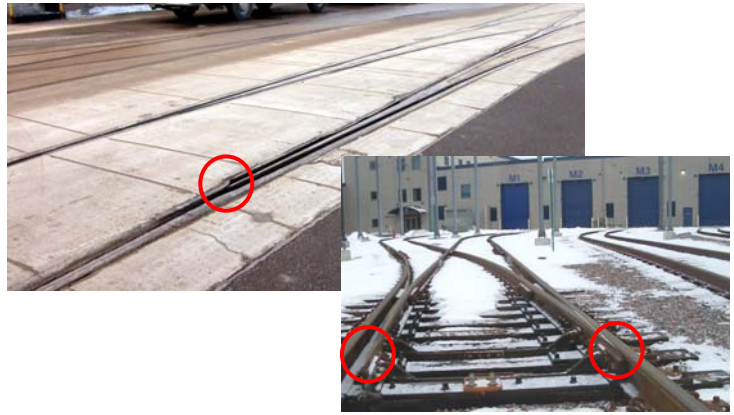
Base 204 LF LRVs will:

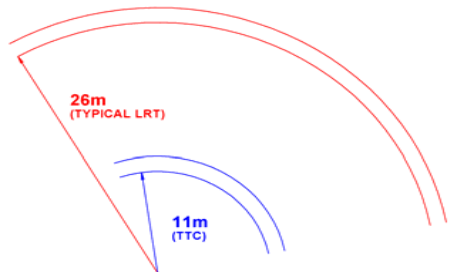
- **Replace aging fleet, relieve congestion & accommodate natural ridership growth**
- **Provide accessible, safe and customer-friendly vehicles; attract ridership**
- **Improve fleet reliability, availability & maintainability**
- **Form base design for adaptation for Transit City LRVs for improved reliability, maintenance efficiency and reduced spare parts ratio**

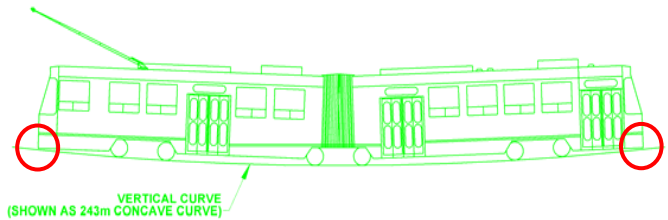

Y O R K
to York Region
Etobicoke -
Finch West
to Mississauga
Jane
Sheppard East
to
Durham
Region
DURHAM
to airport
T O R O N T O
Don Mills
Scarborough
Malvern
Eglinton Crosstown
to Mississauga
Waterfront West
to Mississauga
P E E L
N
TORONTO
Toronto Transit City
Light Rail Plan
existing subway
existing light rail
MOVE ONTARIO 2020
• 120 double-track km / 7 lines
• 175 million new riders p.a.
• approx 480 new LF LRVs
• Commissioning starts 2012

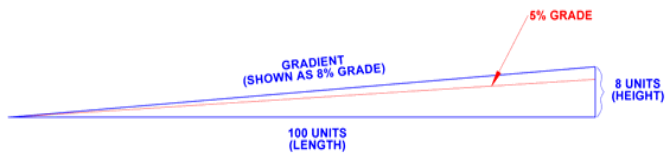
Unique Technical Challenges in Toronto

1. Track Switch
   (Single vs. Double-Point)
2. Tight Loop and Curve Radius
   (11m vs. 25m)
3. Grade Requirements (8% vs. 5%)
4. Ground-borne Vibration
5. Overhead Wire Capacity
6. Buff Load (Collision Strength)
7. Fare Collection

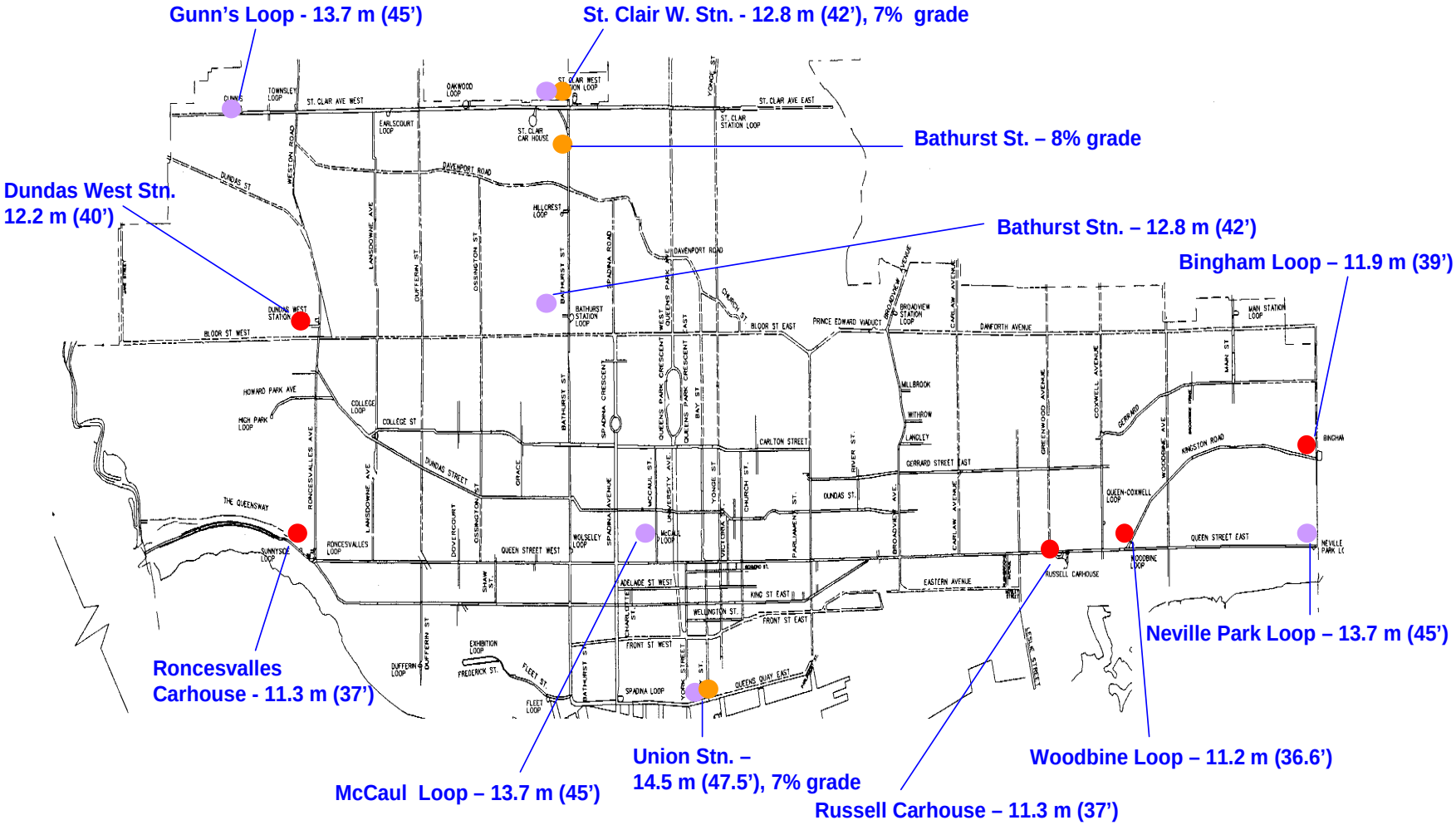








2. Tight Curve Radius & 3. Steep Gradient



TTC STREETCAR NETWORK

SAMPLE OF TIGHT RADIUS CURVES AND STEEP GRADES

- Curve or Loop under 12.2 m (40') radius
- Curve or Loop between 12.2 and 14.6 m (40'1" and 48')
- Grade steeper than 7%

Queen at Mutual, December 1933

Derailment Video – Prague, the Czech Republic

LF LRV Main Features (1)

- 27m – 30m long (CLRV = 15.4m; ALRV = 23.2m)
- Single ended, 4 doors, air-conditioned
- ~ 260 passenger crush load (CLRV = 132; ALRV = 205)
- Customer input driven design
- Accessible – 2 wheelchair positions, bike rack, audio/visual stop announcement
- Secure – cameras, advance warning to motorists about impending stops, anti-microbial coating on stanchions
- Safe – performance, crash energy management, outward visibility, meet SSP

LF LRV Main Features (2)

- Environmental impact mitigation:
  - Regenerative braking
  - Equipment right-sizing
  - L.E.D. exterior lighting and intelligent auxiliary power control
  - Energy efficient glazing and insulation
  - Non-ozone depleting air conditioning freon
  - Aggressive weight and end-of-life recyclable material management programs
- Enclosed cab - ticket vending & validation machines
- Go anywhere – steep grades, tight curves, extended tunnel operation
- High reliability and maintainability
- Easy adaptation for Transit City vehicles

Possible Worldwide Solutions

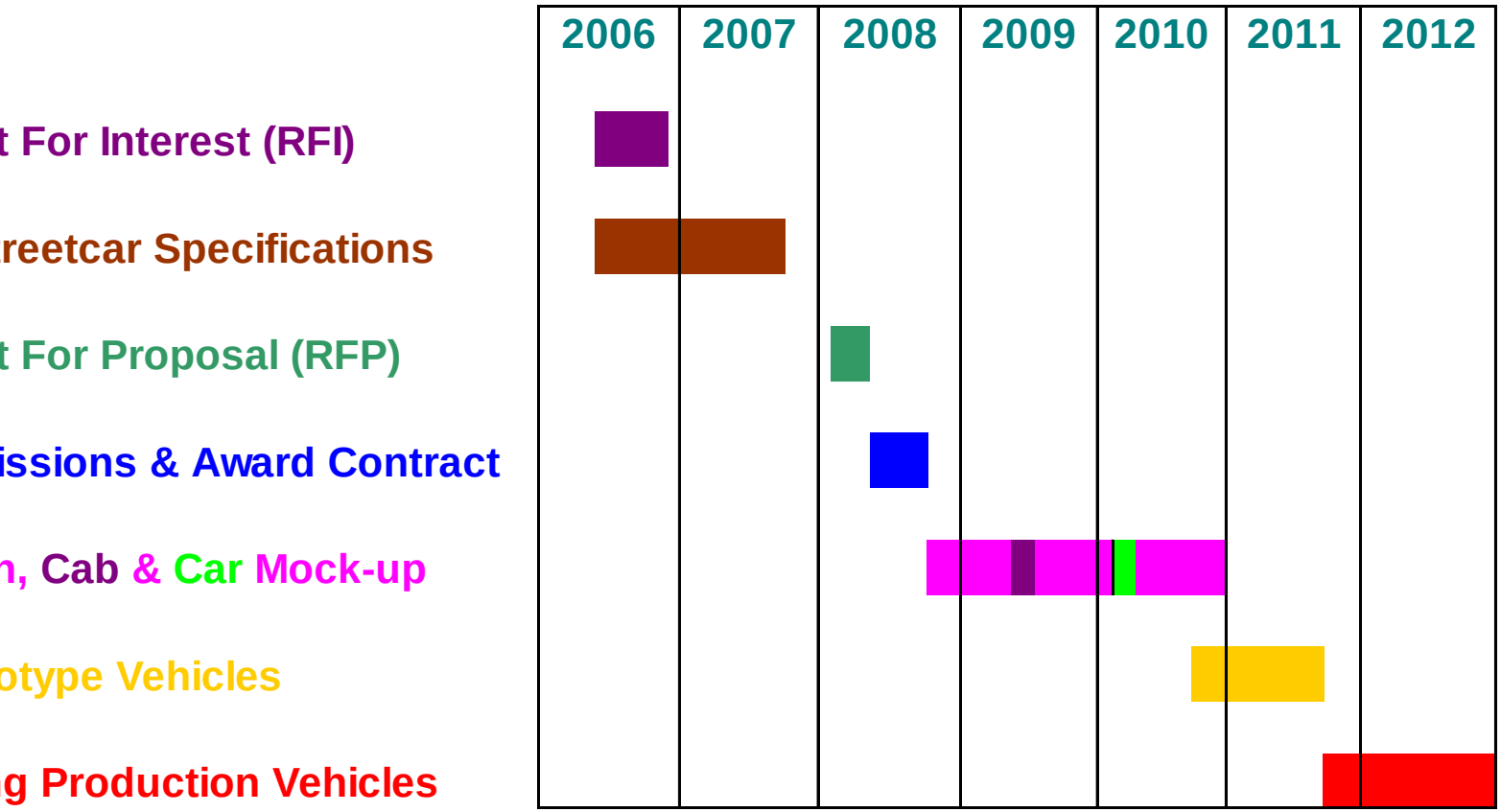
Possible Worldwide Solutions

Possible Worldwide Solutions

Possible Worldwide Solutions

Possible Worldwide Solutions

LF LRV Procurement Schedule



Procurement Process to Meet Challenges

1. Analyze technical risks & Identify Best Practices

2. Advertise & Issue Request for Interest (RFI) to known carbuilders – 7 responded

3. Public consultation

4. Canadian Content

5. Meet with internal stakeholders

6. a) 3-D track geometry mapping to ensure compatibility of LRV with TTC infrastructure
   b) Simulate LFLRV behaviour – ground-borne vibration, overhead catenary capacity

7. In-depth technical discussions with 4 carbuilders
   a) Safety Against Derailment - single point track switch & tight radius curves
   b) Gradeability – all trucks powered, 100% vs. partial low floor
   c) Ground borne vibration

8. Release draft specification for industrial comments

9. Issue Request for Proposal (RFP)

RFP Submission Evaluation Process (1)

- Two Envelope process
- Pass/Fail technical requirements
- Qualitative technical evaluation
- Pricing (including relevant life cycle costing)
- Canadian Content requirement
- Negotiate with recommended qualified proponent

RFP Submission Evaluation Process (2)

- Complete evaluation process identified in RFP
- Qualitative technical evaluation (includes specific scoring for various technical elements)
- MUST reach a minimum of 85% to be considered qualified

Canadian Content

- RFP will include Canadian content requirement
- Booz Allen developed target
- Designed to provide competitive bids
- Contract will include audit provisions to validate Canadian content
- Holdbacks will be in place to protect the Commission

Low Floor Light Rail Vehicle Procurement

Thank you