

City of Ottawa Lessons Learned Workshop

Revenue Service and the Maintenance Term

Goals of this Session

- The City and Project Co have a number of responsibilities under the Project Agreement for reaching Revenue Service and during the Maintenance Term. This session seeks to provide an overview of these responsibilities.
- Provide the City with an understanding of their roles and responsibilities during these phases of the Project and the responsibilities of Project Co.
- Provide City with information to assist in starting preparations for Revenue Service, and additional questions they may have moving closer
- Provide an overview of the Maintenance Requirements
- Share best practices and lessons learned from IO's previous experiences.
- Have an interactive session where participants can engage with speakers
- **The City should fully familiarize itself with their commitments and obligations under the PA as it relates to Revenue Service and the Maintenance Term.**

Agenda

- **Introductions and Welcome – 5 Minutes**
- **Revenue Service Requirements- 120 minutes**
 - Revenue Service Requirements & Overview
 - Integrated Revenue Service Availability Testing
 - Additional Revenue Service Requirements
 - Safety and Security Certification
 - Commissioning
 - Completion Process
 - Lessons Learned & Considerations for the City
- **Maintenance & Rehabilitation Phases - 60 minutes**
 - Key Project Agreement Schedules
 - Project Co Responsibilities
 - City's Roles and Responsibilities
 - Payment Mechanism Considerations
 - Team Structure
 - Lesson's Learned
- **Question and Answers - 30 minutes**

Introductions and Welcome

- IO Attendees
 - Kitty Chan, Senior Project Manager, Transit
 - Meghan O'Donnell, Senior Project Coordinator , Transit
 - Frank Panacci, Senior Project Manager, Transit
 - Charl van Niekerk, Contracts Director, Highways
 - Natalie Stasko, AFP Operations
 - John Traianopoulos, Vice President, Transaction Finance

Part 1: Achieving Revenue Service

Revenue Service - Overview



- To achieve Revenue Service involves a number of parallel processes
- The City, IC and Project Co are inherently involved
- Project Co is ultimately responsible for providing a complete, tested and safe system for Revenue Service
- The City has Delegated Authority under the *Railway Safety Act*
- This section of the workshop will provide an overview of these processes

1) Revenue Service Availability Testing

Integrated Revenue Service Availability Testing

- **Trial Running Objectives:**
 - Exercise the complete OLRT system and confirm readiness for Revenue Service
 - Familiarize staff with the system
 - Validate operating schedules
 - Confirm Safety and Certification Requirements have been met
 - Confirm operating reliability under multiple testing environments
- Done for 12 consecutive days following successful completion of commissioning
- Project Co is responsible for developing Performance Criteria for Trial Running Acceptance
- Project Co review daily progress of trial running with Commissioning Team
- City has ability to approve failure scenarios that are tested
- Validation is performed by the Independent Certifier
 - Including that travel times and headways can be met

2) Safety & Security Certification

Safety and Security Certification

- In order to achieve Revenue Service, Project Co must comply with the Safety requirements as outlined, as approved by the Safety Auditor
- Key Safety and Security requirements are outlined in:
 - Schedule 15-2, Part 1, Article 10
 - Schedule 15-2, Part 4 Regulatory Standards
 - City Delegation Agreement
 - Railway Safety Act Regulations
 - Railways Safety Management System Regulations
 - Safety approaches of other municipal light rail systems
 - Standards of established professional associations
- Safety and Security Certification on OLRT is defined by:
 - Safety and Security Certification Plan
 - Design Criteria
 - Technical Specifications
 - Applicable Law, Codes and Standards

Safety and Security Certification – City Obligations

- The City has certification obligations for the OLRT System through the Delegation Agreement between HMQ and the City:
 - The agreement covers Parts III (Operations and Maintenance of Railway Works) and IV (Equipment and related to Non-Railway Operations Affecting Railway Safety) of the Canada Transportation Act and Railway Safety Act
- The City must:
 - Adopt, enact, modify and administer Regulations;
 - Approve design, construction and operations of any new, supplemental or modified railway
 - Apply said regulations to any person involved in the design, construction, operation, safety and security and/or use of the Railway (i.e. Project Co)
- Schedule 15-2, Part 4 outlines the regulatory framework for which Project Co must develop Safety and Certification Regulations
 - These Regulations are critical to the Certification Process
 - They establish the Safety and Security Framework that allow the City to meet their obligations under the Delegation Agreement
- ***Certifiable elements of the system need to be identified and verified, Certificates of Conformance will be signed and issued to Responsible Parties***

Safety and Security Certification – City Obligations

- The City, through Project Co must develop appropriate Regulations and Documentation to support the:
 - Safety Management System
 - Security Management System
 - Threat and Vulnerability Assessment System
 - Standard Operating Procedures
 - LRT Operating Rules and Procedures
 - Monitoring and Enforcement Procedures/Manuals
 - Standards (i.e. EN50126, EN50128, IEC61508 etc.)
- Project Co should have developed a timetable for developing and having the City approve the required Regulations and Supporting Documentation to support design and construction
 - All proposed Regulations and Support Documentation must be submitted to the City 90 days prior to Revenue Service
 - * This should start MUCH earlier
 - City is required to respond within 14 business days whether they are rejected, or need further review/discussion/amendment
- ***If City fails to respond, Project Co may be entitled to a Compensation Event, Delay Event or Excusing Cause***

Safety and Security Certification – Project Co Obligations

- Obligations under the Delegation Agreement to develop appropriate Safety and Security Certification Regulations are the responsibility of Project Co
 - Outlined in Schedule 15-4
- Project Co has a number of other obligations related to Certification to support the City Certification Process:
 - Undertake Appropriate validation and verification related to:
 - Design Criteria - verify that safety and security criteria are incorporated into construction documents
 - Construction Specifications- Ensure safety and security requirements are met in the as-built system or facility
 - Testing – Notify City when city-identified Witness Points are occurring, undertaking Safety related testing, undertake Safety training and drills
 - Hazard and Vulnerability Analysis – perform a Preliminary Hazard Analysis including identification of Project-specific hazards and mitigation and record and track hazards for implementation
 - Compliance with Authorities Having Jurisdiction Fire/Life Safety Requirements, including support to the City during the approval process
 - Prepare checklists for monitoring the completion of certifiable elements
 - Implement a Risk Analysis Management System (should have been developed prior to detailed design)
 - Operations and Maintenance Manuals

Safety and Security Certification – Project Co Obligations (cont'd)

- Cooperation and facilitation of Safety Audits by the City or any Authorities having Jurisdiction
- Prepare and Submit Certificates of Conformance
- Preparation of Monthly Certification Progress Reports
- Submit a record copy of safety and security certification to the City
- Development of a number of Safety and Security Programs to meet the requirements of the City and the Railway Safety Act:
 - Safety Case – demonstrations by Project Co, as approved and audited by the General Manager of the City, that the System complies with the System Safety Standards
 - Safety Management System – Safety protocol established by Project Co which is reviewed and approved by the City General Manager and governs the safety protocol for all operations and maintenance activities
 - Security Management System – Security protocol established by Project Co which is reviewed and approved by the City General Manager and governs the security protocol for all operations and maintenance activities
- Schedule 13 – Proposal Extracts captured a number of RTG's approach to Safety and Certification
 - Approach to establishing the Safety and Security Management Systems
 - Confirming City's interpretation of requirements of the Railways Safety Act

Safety and Security Certification – Regulatory Working Group

- RTG's proposal contemplated the establishment of a Regulatory Working Group with representatives of the City/RTG which will guide the Safety and Security Certification Process, including:
 - Annual Planning against safety goals
 - Produce procedures detailing work which will impact operations, maintenance and safety
 - Implement training programs
 - Performance Monitoring and Incident Management Program
 - Define Corrective and Preventative Action procedures
 - Develop formal Auditing Process
 - Establish and Maintain a risk registry and risk management process
 - Commission an independent Threat and Vulnerability Assessment – identifying vulnerabilities and priorities
 - Establish safety Classification for all OLRT jobs
 - Develop Security Management System to manage security activities (develop using Transport Canada Guidelines for Urban Transit Security)
- ***The City should review Schedule 13 and identify key approaches***

Safety and Security Certification - Matrix

- Schedule 15-2, Part 1, Article 10 (e) provides a matrix of Project Co's Primary and Secondary tasks related to Safety Certification
- Project Co is responsible for Primary tasks, and must provide support on Secondary tasks

Project Co Safety and Security Responsibilities Matrix		
Safety and Security Certification Tasks	Project Co Responsibility	Comments
Attend SSSCT and FLSSC review meetings and participate in safety issue updates	S	
Perform PHA and hazard analysis	P	
Incorporate resolutions of PHA, hazard analysis mitigations into design and maintain files and metadata in the hazard tracking system	P	
Perform Team Control Hazard Analysis and supplementary Hazard Analysis, if necessary, and integrate results into Design	P	
Perform TVA and supplementary TVA, as necessary	P	
Incorporate TVA results into design, and maintain files and contribute to vulnerability tracking system	P	
Update Design Criteria Conformance Checks and Construction Specifications Conformance Checklists	P	
Verify Design Criteria Conformance Checks and Construction Specifications Conformance Checklists for completed Work	P	
Prepare and submit Design Criteria Conformance Certificates of Completed Design for acceptance	P	

Project Co Safety and Security Responsibilities Matrix		
Safety and Security Certification Tasks	Project Co Responsibility	Comments
Prepare and submit Construction Specifications Conformance Certificates of Completed Work for acceptance	P	
Update Safety Related Testing Conformance Checklists	P	
Perform safety related testing	P	
Verify Safety Related Testing Conformance Checklists	P	
Prepare and submit Safety Related Testing Conformance Certificates of Completed work for acceptance	P	
Cooperate and facilitate safety and security audits of the Project Co	S	
Develop and implement the System Integration Test Plan	P	
Develop and implement the System Activation Plan and Procedures	P	
Attend Safety and Security Operations Review Committee meetings and participate in activities as needed	S	
Complete Project Co Provided Training, Project Co Provided Operations and Maintenance Manual Conformance and Issue Certificates	P	
Coordinate and Participate in Emergency Drills	S	Participate
Follow routine safety protocols/ Procedures	P	
Update and maintenance of System Safety Case	P	

Steps to Revenue Service Availability

- 180 days prior to the Revenue Service Date, Project Co issues a notice confirming if the Revenue Service Date will be achieved
- If this notice is not received in the required timeframe, the City is to assume that the Revenue Service Date is delayed

- If Project Co has issued the Required Notice, but determines they will not be able to achieve Revenue Service by the scheduled date, a Subsequent Notice will be provided outlining a new Proposed Date (minimum one month after proposed date)
- If Project Co notifies City that the Revenue Service Date will be achieved but fails to achieve that date (regardless of Subsequent Notice), the City is entitled to \$1M in Liquidated Damages from Project Co

- The City has 10 days to approve the new Revenue Service Date
- Once the City has approved the Proposed Date, this becomes the New Required Revenue Service Date
- If Revenue Service is not achieved by the New Required Revenue Service Date, additional \$1M in liquidated damages apply

3) Additional Requirements of Revenue Service

Operations Staff Training

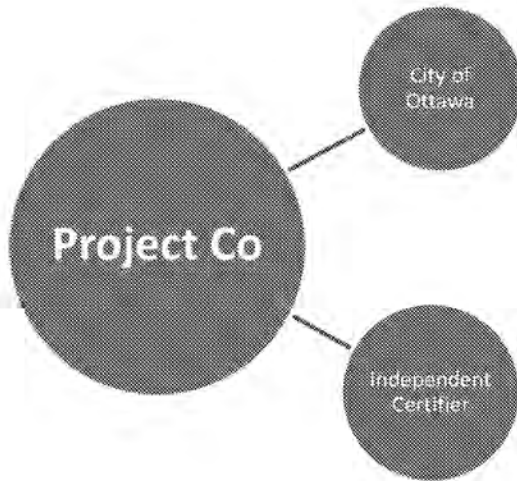
- Project Co is required to implement a full training curriculum for operations staff prior to Revenue Service:
 - The City is permitted to review and comment on the training curriculum, Project Co must incorporate City comments into materials before commencement of training program
 - Project Co must train Project Co and OC Transpo vehicle operators
 - Project Co will implement a “train the trainer” approach with OC Transpo trainers and is responsible for training at minimum 5 trainers prior to commencement of trial running
 - Project Co must train OC Transpo Controllers
 - Must ensure controllers are certified to undertake dispatching functions
 - An adequate number of controllers must be trained prior to trial running
 - Training is also required for Emergency Service Providers

Light Rail Vehicle Bill of Sale

- The final condition of achieving Revenue Service is to provide the City with a Vehicle Bill of Sale, including vehicle fixed equipment and warranties from Alstom
 - As outlined in Schedule 34

4) Commissioning

Commissioning - Overview



- Commissioning the OLRT system will be a large and complex undertaking
- Project Co is responsible for *planning, coordinating and executing all commissioning activities*
- The City and IC are inherently involved in the commissioning process

Commissioning – Key Project Agreement Requirements

- Key Project Agreement Schedules relating to the Commissioning phase:
 - Schedule 14 – Commissioning
 - Identifies key commissioning activities
 - All systems identified in this Schedule will require commissioning
 - Schedule 10 – Review Procedure
 - Sets out procedures for City review of the Commissioning Submittals
 - Schedule 15-2, Part 1
 - Additional technical components for commissioning

Commissioning – City’s Responsibilities

- During design/construction review commissioning submittals and provide feedback:
 - In accordance with the requirements of Schedule 10 – Review Procedure
- “Spot” Check commissioning tests as required
 - The Commissioning Plan will outline a schedule of when testing will be undertaken
- Participate in the Commissioning Team and monthly commissioning meetings as required
 - Identify key City employees/consultants that need to participate/witness testing
- Supply drivers and controllers for commissioning tests
- Participate in Integrated Revenue Service Availability Testing
 - Familiarize the operating and maintenance staff with the integrated system
- ***The City has the right to request additional testing beyond the tests outlined in the Output Specifications***

Commissioning – Independent Certifier Responsibilities

- Monitor the requirements, process and results of all Project Co Commissioning including:
 - Review Commissioning Plan and Schedule
 - Review training agenda and scheduling
 - Review Operations and Maintenance Manuals
- Validate the trial running acceptance
- Sample witnessing of tests/performance testing/seasonal performance testing
- Participate in the Commissioning Team
 - Review reports
 - Attend meetings
- Report to the City on the progress of commissioning
- Certifies Substantial Completion, Revenue Service Availability, Milestone Acceptance and Final Completion

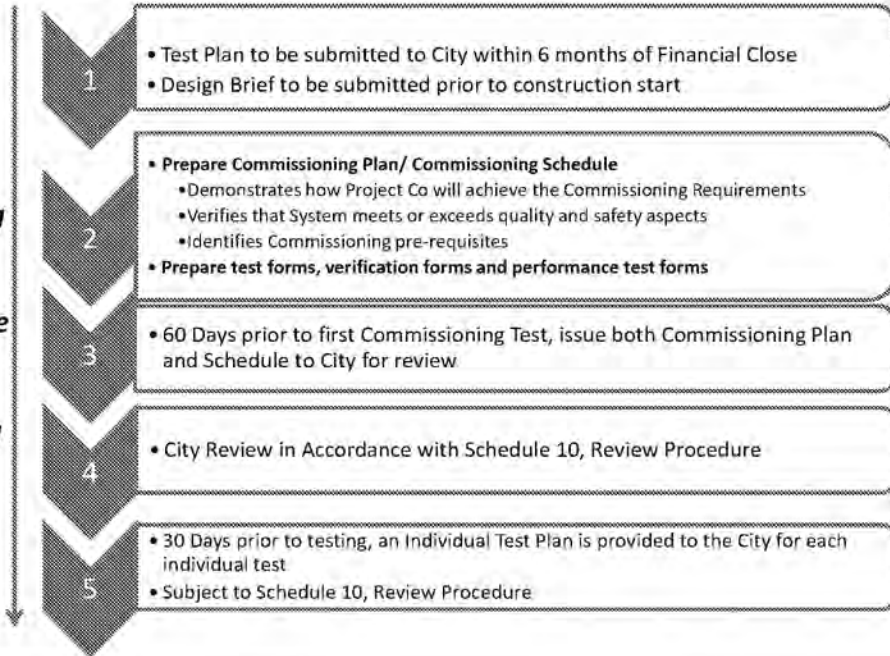
Commissioning – Project Co Requirements

- ***Overall responsibility for commissioning lies with Project Co***
- Trial run the system as a fully integrated system
 - This should demonstrate the functionality of the system as a whole
- **Develop the Commissioning Plan and Schedule**
 - Schedule to be incorporated into the Works Schedule
 - City should review Commissioning Schedule early
 - Identify what certificates are needed from design team/commissioning team
- **Establish Commissioning Team**
 - Project Co Representative
 - Subcontractors as required
 - Representatives from Vehicle Manufacturer
- Ensure relevant parties are present during commissioning tests
- Submit Monthly reports to the City on Commissioning Progress
- Provide orientation to the Ottawa Emergency Services

Project Co Step's Leading up to Commissioning Start

These are the PA mandated timeframes.

Commissioning discussions should start well in advance (~1 year) to start of commissioning process



Commissioning – Goals of the Commissioning Plan

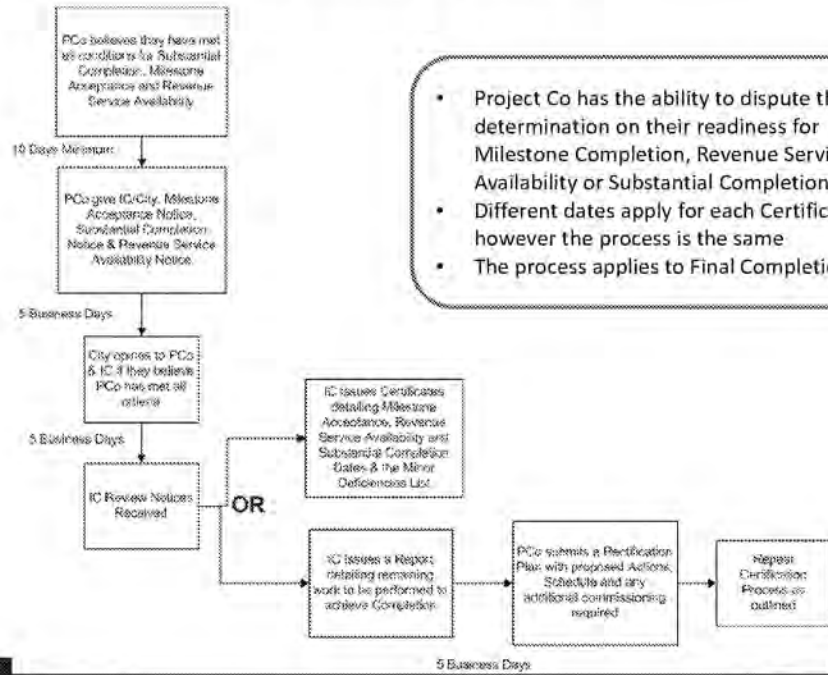
- Ensure System is installed correctly and operating according to the PA
- Establish a 'road map' to completion
 - Include the required sign-offs of City and IC
 - Required documentation for certification
 - City can use IC to help guide Project Co
- Ensure performance meets/exceeds PSOS
- Link to the Safety and Security Certification requirements
- Ensure training for all applicable persons has been undertaken as per PA
- As-Built drawings and operations/maintenance manuals have been submitted to the City
- Commissioning Manuals are prepared and submitted to the City
- LEED documentation is prepared
- Outline the training program

5) Completion Process

Completion Process

- To reach Revenue Service and the Maintenance Term, Project Co must perform all Project Agreement requirements to meet Milestone Acceptance, Substantial Completion, and Revenue Service Availability
 - In accordance with Section 26 of the Project Agreement
 - Includes Substantial Completion of the Civic Works
- Project Co must give City & IC notice prior to reaching Milestone Acceptance, Substantial Completion and Revenue Service Availability:
 - Milestone Acceptance Notice
 - Substantial Completion Notice
 - Revenue Service Availability Notice
- Once Project Co has substantially completed the Fixed Facility and Vehicle components the final Milestone Payment is made
- Upon commencement of Revenue Service, the Revenue Service Availability Payment (minus any Mobility Matters deductions) is made to Project Co

Achieving Substantial Completion, Milestone Acceptance & Revenue Service Availability (S26.2)



- Project Co has the ability to dispute the IC's determination on their readiness for Milestone Completion, Revenue Service Availability or Substantial Completion
- Different dates apply for each Certification, however the process is the same
- The process applies to Final Completion

Countdown Notices & Minor Deficiencies

Countdown Notice

- 60 Days prior to Milestone Acceptance or Substantial Completion (or earlier if approved by the City)
 - Project Co must issue the City and the IC a Countdown Notice which notifies the City of the anticipated Substantial Completion or Milestone Acceptance Dates
- If Project Co fails to deliver the Countdown Notice, the original Milestone Acceptance and Substantial Completion dates are assumed to be the scheduled dates outlined in the Project Agreement

Minor Deficiencies

- As part of Substantial Completion and Milestone Acceptance the IC may identify Minor Deficiencies:
 - Work that is not completed, but should not hold up issuance of the Certificates
- If Project Co fails to rectify these deficiencies, the City can withhold 200% of the amount of the deficiencies as estimated by the IC Report or can engage others to complete the work at the cost to Project Co
 - Once the work is completed, the City releases the holdback

Lesson's Learned

- **Achieving Revenue Service is a large undertaking, including a number of parallel processes**
 - Ensure that discussions regarding commissioning and Safety Certification begin early (~a year before)
 - Do not underestimate the importance and scale of commissioning and certification
 - Every system will need individual checklists, documentation and certification
- **Review Commissioning /Completion/Safety Certification Schedules in detail:**
 - Identify key testing that City wants to witness
 - Identify additional testing that City may want Project Co to perform, *'acting reasonably'*
 - Determine if enough time has been allotted for key commissioning and certification processes
- **Request Independent Certifier prepare a 'Certification Matrix'**
 - Clearly outlines Project Co's responsibilities for Commissioning
 - The IC can help to drive what documentation the team wants to see

Lesson's Learned & Further Considerations

- Identify key team members for processes early
 - Determine what experts the City will need
- Confirm that Project Co is currently undertaking required Safety Certification obligations
- Consider hiring an independent Commissioning Consultant
 - To assist with commissioning process between Project Co and City
- Identify Safety Auditor for Safety and Security Certification
- Large amounts of money are tied to the Substantial/Milestone Payments
 - This will incentive Project Co to provide required documentation for commissioning and Safety Certification
- Review current Technical Advisor Scope of Work
 - Confirm if contract covers scope for Commissioning, Safety Certification or Completion processes
- Focus on critical systems early

Part 2: Maintenance & Rehabilitation Phases

Maintenance & Rehabilitation - Overview

- Project Co is required to carry out and be fully responsible for the Maintenance Services outlined in the Project Agreement
- Maintenance services begin on the Revenue Service Availability date (subject to conditions)
- The City has obligations under the Maintenance Provisions and will be inherently involved during the Maintenance and Operations Term
- The Maintenance Responsibility Table (Appendix A, Attachment 15, Schedule 15-3) provides a general guideline of division of responsibilities for the Maintenance Term

MAINTENANCE RESPONSIBILITY TABLE	Project Co	City / Other
LRT Systems & Power	✓	
Subsystems	✓	
LRT Vehicles	✓	
Vehicles	✓	
Non-Revenue Vehicles	✓	

Key Project Agreement Requirements

- Majority of the key maintenance provisions can be found in Schedule 15-3
 - Maintenance and Rehabilitation Requirements
- Additional relevant Project Agreement Schedules include:
 - Schedule 8 – Energy Matters
 - Energy considerations and adjustments
 - Schedule 10 – Review Procedure
 - For review of Maintenance related submittals
 - Schedule 11 – Quality Management
 - Schedule 17 – Environmental Obligations
 - Schedule 22 – Variation Procedure
 - Variations during Maintenance Term (i.e. reductions in service levels)
 - Schedule 27 – Dispute Resolution Procedure
 - Schedule 39 – Operations Matters
 - Operating Performance Parameters

City Responsibilities

- The Maintenance Term is a partnership between the City (operations) and Project Co (maintenance)
- The City holds a number of responsibilities the PA, which the City can choose to implement:
 - Conduct Safety Audits as required by the Delegation Agreement and report to the Minister
 - Conducting quarterly formal reviews of Project Co's performance
 - City has right to issue an Action Plan to Project Co based on issues identified in the review
 - Provide approval to Project Co for scheduling of maintenance services
 - Mutually agreed upon schedule for maintenance activities
 - Perform inspections, provide oversight and monitoring, and audit the system
 - Minimize impact to maintenance activities of audits
 - Perform remedial action if required
 - During emergency situation, public safety concerns or during an event of default
 - Perform City Maintenance activities (i.e. communication systems, existing bridges, existing artwork etc.)
 - As identified in Article 4
 - Notify Project Co of deficiencies in Maintenance Services

City Responsibilities - Operation of the System

- **City is responsible for operation of the system**
 - They determine applicable service levels and confirm to Project Co, impacts maintenance service and Monthly Service Payments
 - Identify Revenue Service requirements
- **Major changes in service levels of Operations require written notice to Project Co**
 - Service Level Increase triggers changes to and increase in the Annual Service Payments and Volume Payment
 - Service Level decrease results in change to the Annual Service Payments and Volume Payment through a variation
- **The initial Operations Service Plan is included in Appendix A, Schedule 14-3, Attachment 2**

Project Co Roles and Responsibilities - General

- Project Co is ultimately responsible to **conduct all maintenance activities** as outlined by the Project Agreement, including (but not limited to):
 - Appointing a Maintenance Director
 - With full responsibility for the Maintenance Activities
 - Conducting preventative, corrective, custodial and handover maintenance activities
 - Conducting their maintenance to minimize interference on customers and the system as a whole and in daily coordination with the City
 - Provide training to personnel carrying out the maintenance services
 - Record failure incidents in the system
 - Deal with weather related events
 - Be present for City Audits
 - Allow City access to MSF for educational and public tours
 - Retain all maintenance records
 - Shut down portions of the system during Revenue Service for major maintenance activities
 - Maximum 80 hours per Contract Year
- ***An entire shutdown of the System is not permitted***

Key Project Co Maintenance Submittals

- A number of submittals are required of Project Co prior to, and during the maintenance period including (but not limited to):
 - Maintenance and Rehabilitation Plan
 - Submission 90 days prior to start of Commissioning
 - Includes:
 - Custodial Maintenance Plan
 - Corrective Maintenance Plan
 - Preventative Maintenance Plan
 - At any time Project Co or the City can request a revision to this Plan
 - Annual Preventative Maintenance Plan
 - Traffic & Transit Maintenance Management Plans
 - Through coordination with relevant City and Third Parties
 - Determines the required transit and traffic related impacts of maintenance activities
 - Daily, monthly and annual reporting from the Maintenance Management System
 - Asset Management Plan

Project Co Maintenance – Technical Responsibilities

- City will monitor and audit all technical maintenance responsibilities
 - Including documentation
- Maintenance Plans and reporting are required for all maintenance activities
- Performance criteria is identified for all maintenance activities,
- Sample performance criteria:

FE Type	Category	Response	Rectification / Remedial	Recording Frequency
AF =Availability Failure SF = Service Failure QF = Quality Failure	Major Medium Minor Veh. Avail. = Captured by the Vehicle Availability deduction regime St. Avail = Captured by the Station Availability deduction regime	N/A = Not Applicable Immediate (“Immed.”) = The total planned travel time in minutes from Blair Station to Tunney’s Pasture Station, plus the headway in minutes on the System at the time of the	N/A = Not Applicable ND = Correct by start of service the following day	PR = Per Request PE = Per Event D = Daily W = Weekly M = Monthly Q = Quarterly B = Bi-Annually A = Annually R = Randomly, At Any Moment in Time

Project Co Maintenance – Technical Responsibilities

Maintenance Scope	Overview of Project Co Responsibilities
Systems Maintenance Services	<ul style="list-style-type: none"> -Custodial, Preventative and Corrective Maintenance -In compliance with the Fixed Component Availability Standard -Traction Power available at all times -Includes train control, transit service control centre, communications systems, Passenger Information Systems
Track Maintenance Services	<ul style="list-style-type: none"> - Custodial, Preventative and Corrective Maintenance - All track infrastructure in the system
Vehicle Maintenance Services	<ul style="list-style-type: none"> -Custodial, Preventative and Corrective Maintenance -Vehicle cleaning (light and heavy) and maintenance -Provisions for major repairs twice annually -Vehicle availability and revenue service requirements
Facilities Maintenance Services	<ul style="list-style-type: none"> -Custodial, Preventative and Corrective Maintenance -All major buildings and facilities
Passenger Station Maintenance Services	<ul style="list-style-type: none"> -Custodial, Preventative and Corrective Maintenance -Electrical, mechanical, elevators, green roof and structural elements -In accordance with the Passenger Station Access Standards
Tunnel Maintenance Services	<ul style="list-style-type: none"> -- Custodial, Preventative and Corrective Maintenance -Structural, drainage, and fire/life/safety systems -Include detailed inspections
Structure Maintenance Services	<ul style="list-style-type: none"> -Structures identified in the Maintenance Responsibility Table -Includes visual, tactile, underwater inspections and destructive testing
Alignment Maintenance Services	<ul style="list-style-type: none"> -Custodial, Preventative and Corrective Maintenance -Vegetation control, debris collection, drainage control, vandalism and graffiti repair, fencing maintenance, and snow and ice removal

Additional Project Co Maintenance Activities

- **Security Services**

- Project Co is required to provide security services for the system (including MSF), unless otherwise stated in Article 5

- **Help Desk Services**

- Implement help desk services 24/7/365
- Provide training to Help Desk users
- Maintain a daily log of all service requests and events
- *Project Co is not permitted to delete information from help desk records*

- **Coordination and Interface with City and Third Parties**

- Operations are not to be impacted by Maintenance Activities, limit shutdowns
- Daily and weekly coordination meetings with the City to discuss maintenance activities

- **Vandalism and Graffiti**

- Project Co must remove all graffiti with 24 hours
- Duty to report vulgar, racist graffiti to City
- Project Co is entitled to payment of direct costs for removal of graffiti

Asset Preservation

- Project Co is required to commit the necessary resources to preserve and repair current assets
- Project Co must provide an Asset Management Plan, outlining how they will meet the outcome objectives outlined in the PA for City review
- All of the Objective Outcomes of Asset Management is prescribed in Schedule 15-3 for each project element
- A sample Guideway Element Outcome Objective – Civil/Drainage/Utilities:

Item	Outcome Objectives
a Civil / Drainage / Utilities	<ul style="list-style-type: none"> • Ensure that track subbase, grading, and drainage provide a high quality track foundation • Convey surface and groundwater within and across the ROW in compliance with environmental requirements • Ensure that OVRT patrons and infrastructure are not at risk from flood, groundwater, scour and/or drainage system failures • Ensure that all surfaces remain free draining without ponding • Ensure utilities crossing or occupying the ROW are properly protected/isolated to provide their intended public service and do not pose a safety hazard to the System and its occupants

Asset Preservation

- Specific Asset Management Performance Measures are set based on levels of service established by the City
- Performance Measures are identified by Asset type and identify actions:

Asset Preservation Performance Measure	Structure Type	Intervention Criteria	Action	Maximum Response Time	Quality Failure*
PSTR1	Bridges Recreational Trail Bridges	<ul style="list-style-type: none"> • When BCI <70 • When 10% of any Key Structural Members is in Poor condition 	Undertake Structure Rehabilitation or repair works to address deterioration and defects	12 months	Major
PSTR2	Structural Culverts (including submerged Culverts)	<ul style="list-style-type: none"> • Structural Culverts with a BCI-C <70 	Undertake Structure Rehabilitation or repair works to address deterioration and defects	12 months	Major

Expiry Date Requirements

- PA identifies “hand back” provisions of the system
 - These are the state in which City can expect to receive assets back at end of Maintenance Term
 - Condition of the system must meet minimum standards
 - Project Co develops a Handover Maintenance Plan for City review
- Remaining Service Life conditions have been met if there is no need for repairs or rehabilitation at termination:
 - Project Co establishes service life by measuring each system element
 - Managed by a Professional Engineer with extensive experience with the OLRT project
- Prior to termination, three inspections are conducted jointly with City to review assets
 - Project Co performs any pre-handover maintenance required
- ***On Termination, Project Co submits a report confirming all assets meet the Standards of handback***

Energy Matters

- **Energy Matters:**
 - Identifies Energy requirements for MSF & Traction Power (different bands are identified for MSF and Traction Power)
 - Uses a painshare/gainshare model
 - If energy use increases or decreases Project Co and the City share the increase/decrease in costs (painshare only implemented if painshare in previous year was >5%)
 - Measurement and Verification Plan is provided to City at Final Completion; all subsequent Energy Analysis Reports are based on this plan
- **Energy Analysis Report provided annually**
 - General review meeting review report
 - Provides basis for any required adjustment
- **Project Co is required to participate in BOMA Best Program and conduct a water/energy audit every three years**

Operations Matters

- **Annual Driver Hours Target letter provided as part of Commercial Close**
 - Covers driver hours during the Maintenance Term
- **Provide Annual Driver Hours Measurement and Verification Plan in advance of Revenue service**
- **Project Co submits a Annual Drivers Hours Analysis Report**
 - Outlines the actual Drivers Hours for previous year
- **Conduct an Annual Review meeting based on this report**
 - Adjustments to driver hours are triggered by:
 - Change in service level
 - Changes to the Operations Plan
 - Any other City initiated changes as required
 - Monthly service payments are adjusted

Payment Mechanism & Failure Points

General Overview of Payment Mechanism

What the Paymech Is:

- The contractual document that specifies what Project Co will be paid over the 30 year maintenance term, in exchange for performing its obligations under the Project Agreement
- Enforces the performance measurements established in the Project Agreement and encourages the right behaviour
- Ensures that the desired level of service during the maintenance period is met
- A mirror of the Price Form in the RFP detailing the payments and potential adjustments to payments (service level change, inflation, insurance, energy pain/gain, etc.)

What the Paymech *Is Not*:

- A tool that entirely recovers any economic loss suffered by the sponsors for a particular event
- A way to overly penalize Project Co behavior

Monthly Service Payments

$$\text{ASP/12} + \text{Lifecycle Payment} + \text{Volume Payment} - \text{Deductions} + / - \text{Energy GS/PS}$$

Annual Service Payment

Repayment of debt and equity, "fixed" portion of maintenance costs (see next slide)

Volume Payment

Project Co. paid a cost per Vehicle Kilometer, which should correlate with "variable" portion of maintenance costs.

Lifecycle Payment

Project Co. is paid a monthly payment as bid to, for major capital work and repairs during the maintenance term. Amounts are "sculpted" in the payment mechanism

Deductions

Deductions from payments for vehicle or station unavailability, or quality/service failures

Energy

Energy gain share/pain share

DBFM vs. DBFOM

Concept of "Non-Project Co. Causes"

- Payment Mechanism contains a description of events that disrupt service, but will not result in deductions for Project Co since they are out of Project Co.'s control.
 - Similar to an Excusing Cause
 - Day-to-day project management issue, not a "lawyer issue"
 - Non-Project Co. Causes are generally events that disrupt service and are out of Project Co.'s control, including:
 - Slow order by operations control center (i.e. City decision to slow down service)
 - Accident caused by the operator
 - Failure by City to act in accordance with defined operating procedures
 - Passenger interference (emergency stops, passenger assistance alarm)
 - Interference with the system by third parties (contractors hired by City, emergency response authorities)

Operational baseline

- The City determines the LRT schedule and operating parameters (“Operations Service Plan”)
 - Hours of operations
 - Headways at peak and off-peak times (i.e. frequency of service)
 - Loading (how many passengers to a vehicle, on average)
- The Operations Service Plan determines the level of service that Project Co. has to provide
 - How many vehicles Project Co. must make available at a given time
 - How heavily vehicles are utilized
- The City provided an outline Operations Service Plan as part of the RFP, which forms the “baseline” level of service
- Proponents bid a different maintenance cost and associated payment, based on service level. When each service level is changed, the payment changes

Availability Concepts

Availability Measure	Concept
Vehicle and System Availability	<ul style="list-style-type: none"> • Measured based on Revenue Service Vehicle Kilometers • Vehicle Kilometers considered to be the best proxy for vehicle and system availability: <ul style="list-style-type: none"> • Not enough vehicles meet the standard to be put into service – translates into less service (fewer trains in service) and fewer vehicle km • System element down (example: malfunctioning signal) – closes down service on a segment of the line, translating into fewer vehicle km run
Station Availability	<ul style="list-style-type: none"> • Measured based on station availability hours vs. required station operating hours • Station is unavailable if: <ul style="list-style-type: none"> • Passengers cannot safely enter or exit the station • No elevators or escalators are functioning
"Available but Used" concept	<ul style="list-style-type: none"> • Vehicles must meet an Availability Standard to be put into service <ul style="list-style-type: none"> • No mechanical defects, no safety issues, etc. • City can 'waive' vehicles that do not meet this standard and put them into service anyway

Measuring Performance

Vehicle and System Availability

- Measured for each month by comparing planned Revenue Service Vehicle Kilometers (Operations Service Plan) vs. actual vehicle km traveled
 - Expressed as an Availability Ratio (percentage)
 - Example: Operations Service Plan requires 100 vehicle kilometers, Project Co. actually runs 98 km, Availability Ratio is 98%
 - Lost Revenue Service Vehicle Kilometers due to Non-Project Co. Causes are “added back” to the total
 - Availability ratio is translated into a percentage deduction from the Monthly Service Payment
 - Weighting factors applied for Peak/Off-Peak periods

Measuring Performance

Vehicle and System Availability

- System Events – per-event deductions imposed for poor service performance on a single day
- Don't want Project Co. to cause "chaotic" service levels on 2-3 days in the month, but not be penalized because aggregate service over the month averages out to 98%.

Event	Deduction Applied
On any single day during a Contract Month, the Availability Ratio for either (a) morning Peak Period service (05:30am to 09:00am) or (b) afternoon Peak Period service (14:45pm to 18:00pm) is less than 88%.	\$50,000 per occurrence.
On any single day during a Contract Month, the Availability Ratio for that day is less than 90%	\$50,000 per occurrence.

Quality and Service Failures

- Similar to highway projects:
 - Quality Failures – per occurrence, Remedial Period
 - Service Failures – Response and Rectification times
- KPMs include:
 - Vehicle cleanliness (i.e. non-mechanical)
 - Station elevators and escalators
 - Landscaping, drainage around stations
 - Snow removal from stations/platforms
 - Passenger information systems
 - Station and operations control center janitorial maintenance

Examples

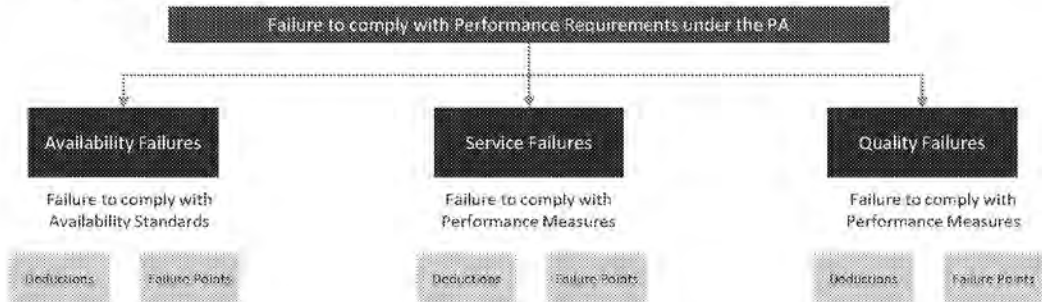
Issue	Result
<ul style="list-style-type: none"> Seven vehicles have mechanical issues and cannot be put into service for two days. 	<ul style="list-style-type: none"> Service is reduced – less vehicle km. Project Co. will miss vehicle km targets and suffer vehicle availability deductions.
<ul style="list-style-type: none"> A number of vehicles have cracked windows which persists for a few days. 	<ul style="list-style-type: none"> Failure to meet output specs, which require Project Co. to repair cracks within defined time period. Quality Failure deduction, based on period of time until failure is rectified.
<ul style="list-style-type: none"> Passenger information screens suffer an outage. Project Co. restores service within 30 minutes. 	<ul style="list-style-type: none"> Output specifications require Project Co. to rectify issues with screens within 1 hour. Project Co. has met output specs – no deduction.
<ul style="list-style-type: none"> Switching systems are broken and service is reduced for 3 days while the problem is fixed. 	<ul style="list-style-type: none"> Service is reduced – less vehicle km. Project Co. will miss vehicle km targets and suffer vehicle availability deductions.

Measuring Performance Station and Stop Availability

- Measured for each month by comparing Scheduled Station and Stop Hours vs. actual station and stop hours
- Expressed as an Availability Ratio (percentage)
 - Example; Operational Service Plan requires a station to be available for 654 hours per month, Project Co actually has the station available for 620 hours, Availability Ratio is 94.5%
 - Lost station hours due to Non-Project Co Causes are “added back” to the total
- Availability ratio is translated into a percentage deduction from the Monthly Service Payment
 - Weighting factors applied for Peak/Off-Peak periods and station/stop priority

Purpose of Failure Points

- A non-financial consequence to Availability Failures / Service Failures / Quality Failures in addition to dollar deductions
- Accumulation of Failure Points can trigger a set of escalating remedies set out in the Project Agreement



Failure Point Thresholds

Event	PA reference (NTD check)	Brief Description
Warning Notice	Section 31.3(a)	<ul style="list-style-type: none"> Assessed on a single payment period basis Official notification to Project Co that initial thresholds have been breached
Monitoring Notice	Section 31.4(a)	<ul style="list-style-type: none"> Assessed on a rolling 3 payment period basis Project Co increases the level of monitoring of its own performance on the relevant service until they have demonstrated to City that contracted performance levels have been achieved
Exercise of Remedial Rights	Section 32.1(a)(ii)	<ul style="list-style-type: none"> Assessed on a single payment period basis City may require Project Co to take steps as necessary to improve performance including replacement of a subcontractor Potential City step-in rights
Replacement of Service Provider	PA Section 45.5(a)(ii)	<ul style="list-style-type: none"> Assessed on a rolling 6 payment period basis City may require Project Co replacement of the service provider
Project Co Default	Section 45.1(a)(x to xii)	<ul style="list-style-type: none"> Assessed on a rolling 3, 6, or 12 payment period basis Project Co default

Other Considerations & Lesson's Learned

Maintenance & Rehabilitation Lesson's Learned

- Establish relationship with Project Co Maintenance Staff early and prior to Revenue Service
- Have a well defined Maintenance and Rehabilitation Plan
 - This will guide expectations on both sides
- Engage in a partnering session with Project Co Maintenance Team
 - Remember this is a 30 year partnership!
 - Establish expectations at the outset
- Consider hiring an external Maintenance Term ramp up consultant
 - IO typically hires these type of consultants to assist with the transition

Question & Answer Period