Metrolinx Electrification Project

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Electrification Performance Specification
EPS-09000 Operations Control Centre
Final Version

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Submitted to:
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PARSONS BRICKERHOFF
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1. PURPOSE

Metrolinx intends to implement traction power electrification within the system of GO Transit routes serving metropolitan Toronto. Studies have determined that this shall consist of a 2x25 kV ac system with a 1x25 kV spur delivering power to trains by means of an overhead contact system (OCS), and collected by roof-mounted pantograph current collectors on each train’s locomotive or electric multiple unit (EMU) rail vehicles.

The performance specifications, 13 in all, have the purpose of establishing the basis for electrification design such that an efficient, safe, and cost-effective installation shall result.

The purpose of EPS-09000 Operations Control Centre is to provide the design criteria relative to the addition of the Traction Electrification System (TES) to the Metrolinx Operations Control Centre (OCC). The focus of this document is to discuss both the functions available to the operator and the hardware required at the OCC.

The OCC shall be designed in compliance with existing applicable Metrolinx GO Transit Operations Control Centre standards, requirements, and procedures as well as to implement industry best practices. Except where noted, OCC systems shall be designed to achieve full compatibility and integration (at user or system level) with existing and planned systems. The following clauses shall apply to the extent that they are not in conflict with current Metrolinx standards, requirements, and procedures.
2. SCOPE

This document consists of a general description of an OCC, with emphasis on the Traction Electrification Systems. The design of the overall OCC shall be accomplished under a separate contract with Metrolinx. The design of the communication infrastructure that supports the SCADA system at the OCC and the remote locations at stations or in the field shall be under a separate contract.
3. REFERENCE DOCUMENTS

Metrolinx documents that contribute directly to the subject of OCC requirements are listed in Table 1: Reference Documents, below. Established standards for electrified railways and related topics relevant to the OCC shall be determined under a separate contract. Other materials supporting the understanding of this document are provided in Appendix A: Definitions and Appendix B: Abbreviations and Acronyms.

Table 1: Reference Documents

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<td>GO Electrification Study – Final Report including Appendices</td>
<td>Delcan Arup JV</td>
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Other relevant reference documents are to be provided by the Operations Control Centre designer.
4. RESPONSIBILITIES

The operations control centre plan and specifications are the responsibility of the Systems Engineering Team. It is the responsibility of all users of this document to:

- Develop detailed specifications and designs based upon the principles outlined in this document;
- Support all design work with back-up calculations which shall be made available to Metrolinx on request; and
- Inform Metrolinx in the event of any conflict between the contents of this document and any other document produced for the Metrolinx Electrification Project.
5. GENERAL REQUIREMENTS

The OCC shall operate 24 hours a day, 7 days a week. All OCC functions and networks shall be designed to achieve current industry standards for high availability and reliability in accordance with the details outlined in EPS-08000 Traction Electrification SCADA. In case new OCC facilities are required, it shall be constructed to meet accessibility and all other applicable operation rules and regulations. The introduction of the Traction Electrification Systems function to the OCC shall not adversely affect in any way the existing levels of safety, security, accessibility, reliability, availability, and redundancy within the OCC.

TES equipment in the OCC Control room shall be imbedded together with other subsystems which includes: CCTV system, voice radio equipment, telephone, signalling system, and overview display walls (mimic screens), to provide integrated OCC functionality. For the first phase of electrification, other means of displaying the energized tracks may be employed. The TES status should be viewable on a TES mimic board as well as on the overall systems operators’ screens.
6. FUNCTIONAL REQUIREMENTS

The following describes the functional requirements of the OCC.

The OCC shall be capable of monitoring and controlling the TES, including Maintenance Storage Facility (MSF), through the TES SCADA interface consoles. There shall be two SCADA operation consoles in the OCC Control Room for Traction Power Directors.

Each console shall include a workstation that is equipped with monitor(s), keyboard, and pointing device(s). Telephone and Radio devices shall also be available on the desktop to support operation. A printer shall be available for Traction Power Directors to produce various reports. Provisions shall be made to add workstations for additional Traction Power Directors as the electrification system expands beyond Phase 1. It is conceivable that the number of Traction Power Directors could expand to four positions.

The Traction Power Directors shall be able to see the status of the TES as well as the sections of the track that are energized on desktop monitors as well as on a mimic display boards. SCADA information as it relates to the rail operations shall also be displayed on the overview display system, including the status of electrification.

The following functions for monitoring/control of the TES shall be available at the OCC:

- Capability to turn on/off and control essential traction power supply system circuit breaker functions, including OCS sectionalizing switches, alarms and visual indication of status changes;
- Monitoring and control of traction power equipment;
- Monitoring of parameters of TES, such as line voltage, line current, MW, MVA etc. at TPF;
- Capability to selectively remove and restore traction power;
- Capability to monitor interfaces with Hydro One; and
- Coordinate traction power shut downs with first responders and other emergency service providers

One additional SCADA interface console shall be provided in OCC control room for following OCC staff profiles: OCC Supervisor, Traffic Controller, Station Controller, and Maintenance Facility Controller.
The TES SCADA console shall be also available at the OCC SCADA equipment room for administrative, maintenance and training purposes. User control authority, logons, passwords, and manual management work assignments to consoles shall be developed by the SCADA supplier and incorporated in the system to provide the required flexibility as well as the overall security of the system, subject to review by system designers. The TES SCADA system at the OCC shall monitor and control all traction power facilities and wayside power control cubicle (WPC) equipment, except for pieces of equipment that are noted to be for manual control only or under the control of Hydro One. The details of the SCADA system implementation are specified in EPS-08000 Traction Electrification SCADA System.

The TES SCADA system shall interface with the Centralized Traffic Control (CTC) system at the OCC. Indications of electrification status shall be sent from the SCADA system to the CTC such that the CTC can inhibit train movements into de-energized sections of track.

A SCADA Training facility shall be provided at OCC. The SCADA Training system shall have all the TES SCADA system functions. The SCADA Training subsystem shall have its own dedicated hardware and software platform separated from the revenue SCADA system to avoid revenue service interruption.

Other facilities will be determined by a concept of operations study to be performed as part of the System Engineering function by the OCC designer.
7. **OCC OPERATIONS**

The assumed operating concept has all of the operational personnel co-located within the OCC. The OCC is a multi-functional coordination centre, which provides for coordination of services for GO Transit. The details of the operations at OCC are specified in EPS-06000 Operation and Maintenance Requirements.

### 7.1 Emergency Coordination

In case of emergency, the following coordination shall happen between the TES and other subsystem within OCC:

- Control and monitoring of elements of the GO Transit system;
- Coordination with Canadian National Railway (CN) and Canadian Pacific Railway (CP) operations;
- Employee support functions; e.g. call-offs, employee tracking;
- Facilities management;
- Emergency services/first responders; and
- Traction Power Directors.

### 7.2 Traction Power Directors

Traction Power Directors shall be responsible for monitoring and controlling power supplied to the GO Transit electrification system.

The Traction Power Directors manage the maintenance and emergency work that occurs around the clock. One Traction Power Director position is dedicated to coordinate work protection and manage the lockout and tagout process, while the other positions are responsible for monitoring SCADA alarms. Traction Power Directors shall be able to cut and restore power at the direction of the supervisor and at their own discretion.

The Traction Power Directors shall maintain regular and frequent contact with the Hydro One Control Center controlling the incoming HV supplies for Metrolinx traction power substations, especially during traction power supply contingency conditions, to ensure continuous
| EPS-09000 | Operations Control Centre |

uninterrupted availability of HV supply for traction purposes and also to ensure that Hydro One system is not adversely affected by Metrolinx TES.
8. PERFORMANCE REQUIREMENTS

There shall be enough space provisioned in the OCC Control Room to support TES operation. The size of the room for Electrification SCADA depends upon the requirements of the Traction Power Director. A requirements study would need to be conducted by the OCC designer with the client to finalize this. However, for planning purpose, a 20 metre by 30 metre (65 feet by 100 feet) room is assumed to be sufficient. The Traction Power Director consoles shall have redundant power inputs with UPS support. Also redundant network connections shall be provided between the consoles to the SCADA communication infrastructure in the OCC SCADA equipment room.

The resolution of the monitor of the Traction Power Director console shall be capable to display the overall TES system on one (1) screen with clear indications and alarms to the operator.

The OCC SCADA equipment room shall have enough space provision to support both SCADA equipment and the supporting communication infrastructure. A 20 metres x 15 metres (65 feet by 50 feet) room is assumed for planning purpose for the SCADA and communication equipment. A working space shall also be provisioned for in the SCADA equipment room for onsite testing and maintenance and training activities. Redundant power supplies and UPS shall be available in the SCADA equipment room for SCADA equipment. A redundant fibre optic network shall be available to connect the SCADA servers to the SCADA equipment at remote Traction Power Facilities.

The OCC SCADA Training room shall have enough space provision for trainers/trainees and training equipment. For planning purpose, a 10 meters x 5 meters room is assumed to be sufficient.

Both the OCC control room and the OCC SCADA equipment room shall be compliant with current industry regulation and standard (AREMA and OBC) for environment requirements. For details please refer to EPS-08000 Traction Electrification SCADA System.
APPENDIX A: DEFINITIONS

**Human Machine Interface (HMI)**
The means of connecting the human operator to the device being used (i.e., a computer mouse)

**Operations Control Centre (OCC)**
The central control and communication centre, consisting of displays and controls that permit all necessary interfaces with the train control and communications subsystems

**Operations Control Centre Operator (OCC Operator)**
Any operations staff member whose working area is the OCC and who uses train control equipment and other communication, control, audio, and visual equipment to interact with the System to achieve optimum System performance. The OCC Operator can refer to one or more such persons when describing actions or capabilities

**Supervisory Control and Data Acquisition (SCADA)**
The Operations Control Centre may contain one or more SCADA Systems. General practice is to use different SCADA systems for different purposes. Most common facilities have one for signals and one for traction power, both normally located in separate rooms or operating theatres, although both could be in the same theatre

**Traction Electrification System (TES)**
The system that converts utility power to levels required by the rail vehicles and distributes this power for use by the vehicles

**Traction Power Director**
One or more personnel stationed in the OCC and responsible for operation of the Traction Electrification System

**Train Director**
Person(s) stationed in the OCC and responsible for train operation
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**Wayside Power Cubicle (WPC)**  
The supply system for the motor operated sectionalizing switches
APPENDIX B: ABBREVIATIONS AND ACRONYMS

ac Alternating Current
AREMA American Railway Engineering and Maintenance of Way Association
ARL Air Rail Link
CN Canadian National Railway
CP Canadian Pacific Railway
CTC Centralized Traffic Control
EMU Electric Multiple Unit
EPS Electrification Performance Specification
JV Joint Venture
kV Kilovolt
MSF Maintenance Storage Facility
MVA Mega Volt Ampere
MW Mega Watt
OBC Ontario Building Code
OCC Operations Control Centre
OCS Overhead Contact System
SCADA Supervisory Control and Data Acquisition
TBD To be Determined
TES Traction Electrification System
UPS Uninterruptable Power Supply
WPC Wayside Power Cubicle.