GO RAIL NETWORK ELECTRIFICATION

TRANSIT PROJECT ASSESSMENT PROCESS

Public Meeting Round #3
June – July 2017
What We’ve Done - Electrification

✓ 15 public meetings held as part of Consultation Round #1 - February/March 2016.
  • Summary Report posted online.
✓ 13 public meetings held as part of Consultation Round #2 - November 2016.
  • Summary Reports posted online.
✓ Completed Environmental Impact Assessment Studies.
  • Draft Reports posted online.
✓ Prepared Draft Environmental Project Report.
✓ Held numerous meeting with municipalities, stakeholders, and utilities.
✓ Ongoing engagement with regulatory authorities, indigenous communities and community groups.
Benefits of Electrification

• A faster, more attractive service:
  o Electric trains can accelerate faster and stay at top speed for longer, saving time for customers.
  o By attracting additional riders, frequent electric train service reduces road congestion and reduces greenhouse gas emissions from automobiles.
  o Regenerative braking puts energy back into the system.

• A more efficient, reliable service:
  o More frequent service reduces reliance on scheduled trips and increases the number of available seats.
  o Lower operating and maintenance train costs; we can offer more trips with electric service than diesel service.

• Other supporting benefits:
  o Reductions in rail greenhouse gas emissions, which form a minor part of the regional emissions total.
  o Improved local air quality.
Electrification Project Scope

• Union Station Rail Corridor – UP Express Union Station to Don Yard Layover.
  o No Traction Power Facilities.

• Lakeshore West Corridor – From just west of Bathurst St. (Mile 1.20) to Burlington GO Station.
  o 2 Hydro One Taps, 2 Traction Power Substations, 2 Switching Stations.
  o Mimico 25kV Feeder Route.

• Kitchener Corridor – Highway 427 to Bramalea.
  o 1 Paralleling Station.
  o Bramalea 25kV Feeder Route.

• Barrie Corridor – Parkdale Junction to Allandale GO Station.
  o 1 Hydro One Tap, 1 Traction Power Substation, 1 Switching Station, 2 Paralleling Stations.
  o Allandale 25kV Feeder Route.

• Stouffville Corridor – Scarborough Junction (off Lakeshore East Corridor) to Lincolnville GO Station.
  o 1 Hydro One Tap, 1 Traction Power Substation, 2 Paralleling Stations.
  o Scarborough 25kV Feeder Route.

• Lakeshore East Corridor – Don Yard Layover to Oshawa GO Station.
  o 1 Hydro One Tap, 1 Traction Power Substation, 2 Switching Stations, 1 Paralleling Station.
  o Scarborough 25kV Feeder Route.

By the numbers:
• Approximately 250 kms of corridor to be electrified, including:
  • 5 Hydro One Tap Locations
  • 5 Traction Power Substations
  • 5 Switching Stations
  • 6 Paralleling Stations
  • 4 25kV Feeder Routes

1. The portion of the Kitchener Corridor from Strachan Ave. to the airport spur (at Highway 427) was previously assessed/approved as part of the Metrolinx UP Express Electrification EA (June 2014).
Power Supply – Hydro One

- Metrolinx and Hydro One are co-proponents for the Electrification Transit Project Assessment Process.

- Electrical power will be supplied by Hydro One’s power grid through tap connections from existing 230kV transmission lines and transformer stations.

- The infrastructure required for the five Hydro One Tap connections (e.g., new towers, transformers) are being assessed as part of the TPAP.

How the System Will Work

- Traction power substations transform the voltage from 230kV to the appropriate voltage (25 kV).

- Distribution of power along rail corridors via Overhead Contact System (OCS), feeders and gantries.

- To ensure reliable power supply, switching stations and paralleling stations are needed.
### Traction Power Supply

#### Transmission Tap Structures
The point at which electric power is ‘tapped’ from the existing Hydro One power source.

#### 230kV Transmission Connections
New tap structures will draw electrical power from Hydro One’s existing 230kV grid. From there, the power will be routed to new Metrolinx Traction Power Substations via 230kV high voltage connections routes (either aerial or underground).

#### Traction Power Substation (TPS)
A facility that transforms the utility supply voltage from 230kV to 25kV for distribution to the trains via Overhead Contact System (OCS). Approximate minimum footprint required: 75m x 50m (plus access road).

#### Gantries
The 25 kV feeder wires from the TPS will be connected to the OCS with the help of gantries. The main gantry (also referred to as the catenary feeding gantry) is the one parallel to the track.
Switching Station (SWS)
Switching stations are traction power facilities that are required approximately mid-way between Traction Power Substations in order to split the electrical sections.

Paralleling Station (PS)
This type of traction power facility contains an autotransformer which helps support the OCS voltage in the electrified system.

Feeder Routes
Feeders are cables/wires that carry power from a Traction Power Facility to the OCS via gantries. These will be routed either aerially or underground in duct banks.

Feeder routes will be used where it is not possible/feasible to locate a TPS directly adjacent to Hydro One infrastructure, or where a TPS is not located in close proximity to the Metrolinx rail corridor.
Overhead Contact System (OCS)

- OCS is a series of overhead wires which supply electricity to the electric trains. Power is supplied to the train through the pantograph which makes contact with the OCS.
- OCS is supported by cantilever and portal structures.
- Maximum distance between OCS supports is approximately 65 m.

**Cantilevers:** one foundation required

**Portals:** foundations to be installed on either side of tracks
Bridge Modifications

Bridge Barriers
Barriers are required on overhead bridges to ensure safety of the energized equipment; height of the barrier is approximately 2 metres; barrier will extend beyond any electrified wire(s) running under the bridge to ensure safety.

OCS Attachments
Used for support of OCS wires in situations with restricted clearance such as tunnels and overhead bridges.

Vertical clearance
In instances where overhead bridges do not meet the vertical clearance requirements for electrification engineering solutions being explored including: raise or replace the bridge, lowering the tracks, or modifying OCS to fit within the existing clearance / opening (if possible).

Other Bridge Modifications
Minor bridge modifications (e.g., flash plates) will be required on some bridges to ensure that the electrification system passes safely underneath the bridge.
Electromagnetic Fields (EMF) / Electromagnetic Interference (EMI) – Effects & Mitigation

As per Health Canada:

- On a daily basis, we are exposed to electric and magnetic fields (EMFs) generated by household wiring, lighting, and electrical appliances.
- EMFs are invisible forces that surround electrical equipment, power cords and power lines. You cannot see or feel EMFs.
- Every time you use electricity and electrical appliances, you are exposed to EMFs at extremely low frequencies.
- EMFs are strongest when closest to the source. As you move away from the source, the strength of the fields fades rapidly.
- Based on the EMI/EMF assessment completed as part of the TPAP, no adverse EMI effects are anticipated due to the installation/operation of the electrified GO Transit system.

Mitigation Measures to be considered:

- Further testing and verification will be carried out during the detailed design phase once the rolling stock is established.
- Confirm background EMI/EMF measurements during detailed design;
- Implement an Electromagnetic Compatibility (EMC) Control Plan;
- Grounding and shielding measures.
Electrification TPAP – Next Steps

2016

- Stakeholder Engagement
- Baseline data collection
- Impact Assessment
- Public Meetings Round # 1
- Public Meetings Round # 2

2017

- Notice of Commencement
- Public Meetings Round # 3
- Notice of Completion
- Statement of Completion

2018 - 2025

- Procure Design and Build
Share Your Thoughts

Online:
  • www.gotransit.com/electrification

E-mail:
  • electrification@metrolinx.com

Phone:
  • 416.869.3200

Comment forms:
  • Please fill out a comment form and leave it with the project team. We want to hear from you!

Join the conversation:
The Allandale Tap location has been revised since November 2016 based on further discussion with Hydro One and advancements in engineering design.

Previous site is being carried as an alternative siting location; final site and configuration will be determined during detailed design.

Revised site is currently zoned Light Industrial, General Commercial and Highway Industrial.

Vegetation communities not considered sensitive or significant and effects from facility installation/construction can be mitigated. Mitigation measures may include: work timing outside the breeding bird season, installation and maintenance of sediment and erosion controls, detailed Species at Risk surveys during detailed design.

No cultural heritage features were identified on the site.

A portion of the site requires a Stage 2 Archeological Assessment.
Noise & Vibration Assessment

A Noise and Vibration Study was undertaken as part of the GO Rail Network Electrification TPAP to examine the noise & vibration effects of future electrified RER service levels.

When is mitigation required?

There are two key protocols in place that Metrolinx follows:

- The 1995 draft Transit Noise and Vibration Protocol from the Ontario Ministry of Environment and Climate Change (MOECC)/GO; and
- The 2013 Noise Guideline (NPC-300) from the MOECC (applies to stationary noise sources including train stations, e.g., announcements at the station)

Noise

The 1995 draft MOEE/GO Transit Noise Protocol stipulates that:

- Mitigation must be considered if the project is expected to cause a 5 dB increase or greater in the average noise (referred to as “Leq”) relative to the existing noise level or the MOE objectives of 55 dBA for daytime and 50 dBA for night-time
- Noise mitigation is required if it is administratively, operationally, economically and technically feasible
- Noise barriers are considered technically feasible if they can reduce noise by at least 5 dB. Mitigation measures were investigated for all receptors with a significant adjusted noise impact (i.e., 5 dB increase or greater) in accordance with the MOEE/GO Draft Protocol

<table>
<thead>
<tr>
<th>WHAT'S NOTICEABLE (dB)</th>
<th>Perception</th>
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</thead>
<tbody>
<tr>
<td>Increase in sound level</td>
<td>Perception</td>
</tr>
<tr>
<td>0 to 2.99 dB</td>
<td>Insignificant</td>
</tr>
<tr>
<td>3-4.99 dB</td>
<td>Noticeable</td>
</tr>
<tr>
<td>5 to 9.99 dB</td>
<td>Significant</td>
</tr>
<tr>
<td>10 dB or greater</td>
<td>Very significant</td>
</tr>
</tbody>
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COMPARING SOURCES OF NOISE (dBA)

- Military Jet Takeoff at 25 m: 140 dBA
- Chainsaw at 1 m: 110 dBA
- Vibratory Pile Driver at 15 m: 96 dBA
- Hairdryer Truck at 15 m: 86 dBA
- Normal Conversation at 1 m: 60 dBA
- Raindrops: 40 dBA
- Rustling Leaves: 10 dBA
- Threshold of Hearing: 0 dBA
Vibration
There are many factors that influence vibration levels, including:
- Soil type and conditions
- Rail condition
- Wheel condition
- Speed of vehicle
- Weight of vehicle
- Suspension system of vehicle
- Track bed (concrete, ballast, etc.)
- Distance between source and receiver

Vibration protocols in place:
The Ontario Ministry of Environment and Energy (MOEE) and GO Transit have a Draft Protocol for Noise and Vibration Assessment that Metrolinx follows. The Protocol indicates that if vibration levels of any project exceed the higher of the existing vibration level, or 0.14 mm/s by 25% or more, vibration mitigation needs to be investigated.

Measuring Vibration:
Vibration is measured in terms of particle velocity in millimetres per second (mm/s). Vibration can be felt by humans at levels as low as 0.10 mm/s and building damage (cosmetic or structural) occurs at levels about 50 times higher than this – around 5 mm/s.
Potentially Impacted Heritage Properties

Provincially Important Heritage:
• Union Station (Toronto)
• Credit River Bridge (Mississauga)
• Aurora GO Station (Aurora)

Locally Important Heritage:
• Islington Avenue Bridge (Toronto)
• Markham GO Station (Markham)
• Maple GO Station (Vaughan)
• Newmarket GO Station (Newmarket)
• Bradford GO Station (Bradford West Gwillimbury)
• Sixteen Mile Creek and Cross Avenue Bridge (Oakville)
• Bronte Creek Bridge (Oakville)
• Highland Creek Bridge (Toronto)
• Humber River Bridge (Toronto)
Cultural Heritage

Cultural Heritage Screening Report

Prepared to identify known or potential cultural heritage resources (CHRs) that may be affected by Electrification.

Cultural Heritage Evaluation Reports (CHERs)

Based on the CHIA, CHERs conducted to confirm cultural heritage value of potential CHRs and to identify associated heritage attributes.

Heritage Impact Assessments (HIAs)

Undertaken where there are any impacts to known Provincial Heritage Properties (PHPs) or Provincial Heritage Properties of Provincial Significance (PHPPS).

- 10/06 Properties (Provincial Heritage Properties of Provincial Significance) are properties found to have cultural heritage value or interest of provincial significance as evaluated using the criteria found in Ontario Heritage Act O. Reg. 10/06.

- 9/06 Properties are properties of cultural heritage value or interest as evaluated using the criteria found in Ontario Heritage Act O. Reg. 9/06 (local significance).

Modifications to Heritage Properties
1. OCS attachments (GO Stations and bridges)
2. Flash plate attachments (bridges)
3. Bridge barriers (overhead bridges)
Archaeology

Assessments

• A Stage 1 Archaeological Assessment (Impact Assessment) was prepared to describe the results of all background research and property inspection fieldwork conducted.

• Prior to construction or other site alteration Stage 2 Archaeological Assessments will be completed, where recommended.

Mitigation Measures

• Mitigation will be based on the results of the Stage 2 assessments and will be determined through further Stage 3 archaeological assessment and subsequent Stage 4 mitigation assessments, if required.

Stage 2 Archaeological Assessments will be completed for the following sites as part of the TPAP, where possible and where Permission to Enter (PTE) access is granted:

• Burlington Tap/TPS
• Bramalea PS
• Allandale Tap
• Gilford PS
• Barrie Rail Corridor – West of Minet’s Point Road in the City of Barrie
• Scarborough Tap/TPS
• Unionville PS
• Durham SWS

Stage 2 Archaeological Assessments have already been completed for the following sites:

• Mimico Tap/TPS
• Newmarket SWS
• Lincolnville PS

Based on the results of the completed Stage 2 Archaeological Assessments, no further assessment is required.