



# TTC Green Bus Program

TTC-OPG-THESL Framework for Agreement

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Bem A Case, Head of Vehicle Programs



# Background

## Existing eBus Electrification Infrastructure

### Generators



### Energy Storage



### Switch Gear



### Chargers and Dispensers



# Background

## Electrification Schedule

Phase	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030→2040
Phase 1 Existing	Arrow, Eglinton, Mt. Dennis, Birchmount										
Phase 2 ~40 eBuses / Garage			Wilson, Eglinton, Malvern, McNicoll, Queensway								
Phase 3 Substation enabled-50% Garage Electrification					Arrow, Mt. Dennis, Eglinton, Birchmount, Malvern, Wilson, McNicoll, Queensway						
Phase 4 Full Garage Electrification										All Garages	

Sequence of garage electrification subject to change



# TTC-OPG-THESL Framework for Agreement

## Roles and Responsibilities



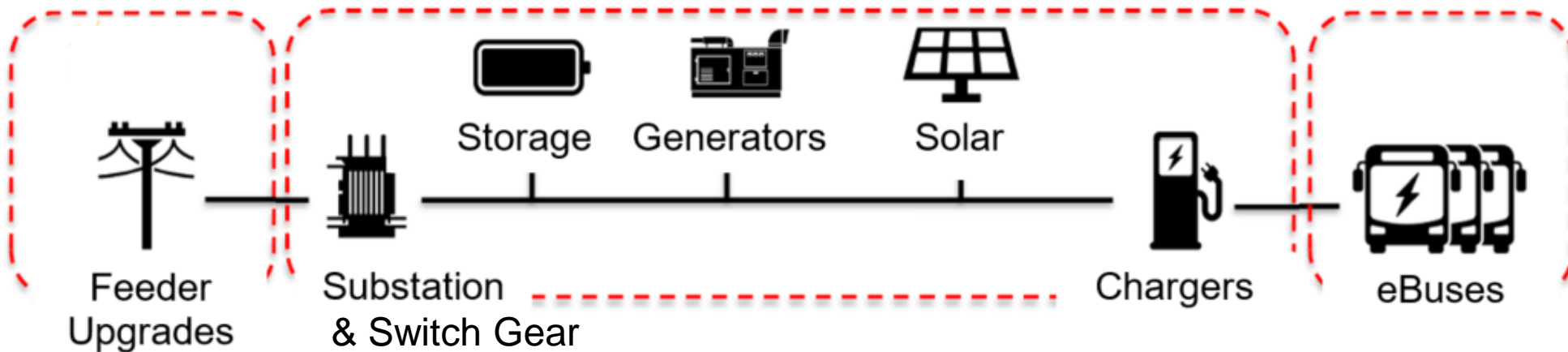
Provides reliable electrical supply to TTC sites



Co-invests, designs, builds, owns, maintains and operates the electrification infrastructure at TTC sites



Scope, timing, funding, coordination, and oversight.  
Operations focus on deliver of bus service



# Key Takeaways

## Electrification Infrastructure

- Multiple capital delivery models have been assessed
- TTC-OPG-THESEL Framework for Agreement offers highest potential benefit and lowest overall risk
- Parties are aligned in purpose and approach
- Co-investment and co-ownership by OPG is a unique opportunity to optimize performance through the asset lifecycle and minimize costs
- Delivery model allows TTC to remain focused on operations





Thank you



# Appendix



# Framework for Agreement

## Electrification Infrastructure

### 1) Declaration of Common Interest and Commitment to Cooperate:

TTC, OPG, and THESL agree to provide their assistance and share their expertise in an open, reasonable, and transparent way to implement the TTC's Green Fleet Program. Such expertise shall include the expertise of:

- TTC in the acquisition and operation of electric vehicles
- OPG in the engineering, procurement, construction, operation, and maintenance of infrastructure at TTC Sites; and
- THESL in the delivery of electrical service to TTC Sites.



# Framework for Agreement

## Electrification Infrastructure

### Roles and Responsibilities

- a) TTC will develop and maintain the TTC's Green Fleet Plan, including the: scope, timing, funding, coordination, and oversight.
- b) OPG will deliver, own, maintain and operate the Electrification Infrastructure required at TTC sites, including: co-investment, asset management, operations and maintenance, and ensure compliance with regulatory and technical requirements.
- c) THESL will provide a reliable electrical supply to TTC sites, including: upgrades to electrical connection points to TTC sites.

# Framework for Agreement

## Electrification Infrastructure

### 3) Definitive Agreements

- a) TTC and OPG plan to enter into a master agreement through which OPG will co-invest, engineer, procure, construct, maintain, and operate the Electrification Infrastructure required at TTC Sites.
  
- b) TTC and THESL plan to enter into agreements in accordance with the Distribution System Code through which THESL will support the required increase in electrical loads and the distributed energy resources at TTC Sites.



# Framework for Agreement

## Electrification Infrastructure - Capital Asset Delivery Models

	1 Design-Bid-Build (DBB)	2 Design-Build (DB)	3 Contract Bundle 1	4 Contract Bundle 2	5 TTC-OPG-THESL Framework for Agreement
Description	<ul style="list-style-type: none"><li>▪ THESL to increase electrical supply</li><li>▪ TTC procures, operates, maintains and owns the electrification infrastructure, which is designed and constructed by different third-parties</li><li>▪ TTC procures, operates, maintains and owns the eBuses</li></ul>	<ul style="list-style-type: none"><li>▪ THESL to increase electrical supply</li><li>▪ TTC procures, operates, maintains and owns the electrification infrastructure, which is designed and constructed by a single third-party</li><li>▪ TTC procures, operates, maintains and owns the eBuses</li></ul>	<ul style="list-style-type: none"><li>▪ THESL to increase electrical supply</li><li>▪ TTC bundles the infrastructure under a single contract including design, build, operate, and maintain</li><li>▪ TTC procures, operates, maintains and owns the eBuses</li></ul>	<ul style="list-style-type: none"><li>▪ THESL to increase electrical supply</li><li>▪ TTC bundles the vehicles and infrastructure under a single contract including design, build, operate, and maintain</li><li>▪ TTC leases all infrastructure and buses under a single contract</li></ul>	<ul style="list-style-type: none"><li>▪ THESL to increase electrical supply</li><li>▪ TTC and OPG to co-fund infrastructure</li><li>▪ OPG to own assets and manage program across all TTC sites</li><li>▪ OPG to design, build, operate, and maintain</li><li>▪ TTC procures, owns, operates, and maintains eBuses</li><li>▪ Potential for government rate financing</li></ul>



# Framework for Agreement

## Electrification Infrastructure - Capital Asset Delivery Models

	1 Design-Bid-Build (DBB)	2 Design-Build (DB)	3 Contract Bundle 1	4 Contract Bundle 2	5 TTC-OPG-THESL Framework for Agreement	
Benefits	<ul style="list-style-type: none"> <li>Well understood approach</li> <li>Most control</li> <li>TTC can source buses competitively, separate from infrastructure</li> </ul>	<ul style="list-style-type: none"> <li>Transfer of most DB risk</li> <li>Potential DB efficiencies and cost savings</li> <li>TTC can source buses competitively</li> </ul>	<ul style="list-style-type: none"> <li>Transfer of most DB and O&amp;M risk</li> <li>Potential to optimize lifecycle cost</li> <li>Greater lifecycle cost and schedule certainty</li> <li>TTC can source buses competitively</li> </ul>	<ul style="list-style-type: none"> <li>Transfer of most DB, O&amp;M, and vehicle performance risk</li> <li>Potential to optimize lifecycle cost</li> <li>Greater lifecycle cost and schedule certainty</li> </ul>	<ul style="list-style-type: none"> <li>Co-investment and OPG ownership reduces overall risk</li> <li>Greatest potential to optimize lifecycle cost</li> <li>TTC can source buses competitively</li> <li>Opportunity for gov. rate financing</li> </ul>	
Risks	<ul style="list-style-type: none"> <li>TTC retains delivery and performance risk</li> <li>High integration risk</li> <li>Not likely to optimize lifecycle costs</li> </ul>	<ul style="list-style-type: none"> <li>TTC retains performance risk regardless of O&amp;M delivery model</li> <li>Not likely to optimize lifecycle costs</li> </ul>	<ul style="list-style-type: none"> <li>Less direct control</li> <li>Higher long-term maintenance costs</li> <li>Private sector rate financing</li> </ul>	<ul style="list-style-type: none"> <li>Interface risk between bus and infrastructure</li> </ul>	<ul style="list-style-type: none"> <li>May lose ability to source vehicles competitively</li> </ul>	<ul style="list-style-type: none"> <li>Regulatory developments may offer greater opportunity</li> <li>Some interface risk between bus and infrastructure</li> </ul>

